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ASSESSING THE EFFECT OF ENTREPRENEURSHIP EDUCATION ON METACOGNITION AMONG STUDENTS OF ESTONIAN UNIVERSITIES

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I hereby declare that I have compiled the thesis independently
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ABSTRACT

Metacognition is a metacompetence related to enterprising behavior and thus leading to an increased probability of engaging in entrepreneurial activity, and therefore intriguing for Entrepreneurship Education (EE). The concept of Metacognition has been meticulously studied together with its well demonstrated effect on learning. Hence, EE will positively benefit from taking advantage of this powerful concept.

The following research looks to analyse metacognition levels among Estonian university students, before and after intervention, to show how EE can be used to increase metacognitive abilities in students. The research is quantitative, based on a web survey, centrally coordinated at four Estonian universities with data derived from students' online self-assessment of their metacognition levels, before and after attending an entrepreneurship course during autumn's 2018 semester.

The research offers a practical proposal on how metacognition can be developed systematically through EE.

Keywords: Metacognition, Entrepreneurship, Entrepreneurship Education (EE).

INTRODUCTION

The capacity to think about one's self cognitive processes (e.g. thinking, attention, concentration, strategy) and behaviour, including their regulation, is referred as Metacognition (Flavell, 1979). Metacognition is commonly seen as knowledge about what we know (Boulay, et al., 2010), i.e. the intrinsic ability to monitor how well we understand what is being learnt, as well as how well we regulate our learning activities (Flavell, 1979).

Metacognition then represents the control individuals have over their own learning and cognitions, as a function of a differing ability (among individuals) to be self-reflective while considering alternative cognitive strategies amid a changing environment (Haynie, et al., 2010).

That, what is beyond cognition and helps to monitor our gain of knowledge, is metacognition. For instance: We can read a book or be part of an oral class, but if we don't attempt to comprehend what is being communicated by thinking and even short-term memorizing what is being communicated, then we won't on average do well; i.e., learning involves an important level of proactivity for it to be effective. This entire example illustrates metacognition.

Having metacognition and its effect on learning been thoroughly studied and demonstrated, it makes sense to believe that Entrepreneurship Education (EE) may very well benefit from focusing on the power of this metacompetence, particularly when entrepreneurship can be fostered by improving awareness on people's metacognitive abilities (Ustav, 2016). This would eventually help to address the problem seen with Entrepreneurship courses having a rather ambiguous effect on students; their impact on people's attitudes and behaviour is not yet clear because depending on the research, they may have positive or negative results (Nabi et al. 2016) - these programs tend to be either too general or poorly focused (Rideout & Gray, 2013).

Therefore, the aim of this research is to assess the effect of metacognitive oriented EE intervention among students belonging to different faculties, from different Estonian universities, by answering 11 research questions (RQ):

- RQ1: do all average general MC variables increase after EE intervention?
- RQ2: do all average MC variables increase regardless of the age range?
- RQ3: do all average MC variables increase for both genders?
- RQ4: do all average MC variables increase regardless of nationality?

- RQ5: do all average MC variables increase irrespective of the school?
- RQ6: do all average MC variables increase notwithstanding the field of study?
- RQ7: do all average MC variables increase regardless of degree of study?
- RQ8: do all average MC variables increase irrespective of the labor situation?
- RQ9: do all average MC variables increase regardless of self-employment status?
- RQ10: do all average MC variables increase regardless of having previously partaken of an entrepreneurship course?
- RQ11: do average entrepreneurial intention increases after EE intervention?

The study involves technical, bachelor and master level students from different Estonian universities, taking part of an entrepreneurship course at their corresponding schools during autumn semester of 2018; the course was centrally coordinated by the Estonian Ministry of Education and Research.

A survey instrument was compiled based on empirically tested constructs for metacognition and adopted to the context of entrepreneurship (Ustav, 2019).

The survey was web-based and deployed at the beginning and end of the entrepreneurship course. In the process, students (N=824) were asked to self-assess their metacognition and entrepreneurial intention, before and after EE intervention.

Statistical analysis was then employed to look for correlations and dependencies. Preliminary results demonstrate positive changes in mostly all metacognitive variables, as the outcome from EE intervention.

1. LITERATURE REVIEW

In the next, an analysis of metacognition will be elaborated from a psychological and entrepreneurial perspective, based on available research literature; its relationship with entrepreneurship will be also discussed.

Learning intervention in the shape of Entrepreneurship Education (EE) and its impact at improving metacognition levels among students will then be reviewed, which will be followed by the research background of this study.

1.1. Metacognition

Cognition as a competence on its own is not powerful enough; something beyond cognition is therefore required among individuals. This is known as metacognition, which can be learned but not taught (Brown & McCartney, 1995) and symbiotically relates to cognition. Table 1 exemplifies this relationship.

Metacognition is the supra ability under which cognition shelters, the higher order ability dealing with being able to learn then adapt whilst anticipating and creating; it is the prerequisite for the development of capacities such as judgement, intuition and acumen upon which cognition is based and without which cognition cannot flourish (Brown & McCartney, 1995).

Table 1. Cognition vis-à-vis Metacognition – modified from (Boulay, et al., 2010, p. 18)

Cognition vis-à-vis Metacognition	
Cognition	Knowledge and understanding of the learner
Metacognition	Learner's knowledge, which can be regulated and articulated

Metacognition captures cognitive processes at a more general and abstract level than cognition; it is both self-regulating and self-monitoring, as it controls the cognitive outcome while monitoring the cognitive processes (Haynie, Gregorie, & Shepherd, 2004). Through metacognition one might mitigate the seemingly negative consequences that are normally associated with deficit of knowledge (Haynie, Shepherd, & Patzelt, 2012).

During the late 70's investigators already concluded metacognition's key role in improving cognitive skills such as oral and reading communication/comprehension, after comparing how well preschool and elementary (older) kids did when asked about recalling studied items; older kids were on average better than their younger counterparts at recalling the studied subjects (Flavell, 1979).

Older elementary students did better than their pre-scholar counterparts due to the first being more familiar with self-regulated learning (the essence of metacognition), which is an active process implying the ability to address and solve problems while relying on a set of skills (Wagener, 2016). Elementary scholars are more senior and therefore more acquainted with this set of skills (e.g. memorization techniques, learning through explaining, learning by asking) that had helped them to pass their school assignments; they understand what the system requires them to do to get a high qualification. Younger kids were naiver about the importance of monitoring their learning and therefore did worse.

In a simpler way, metacognition can be defined as a process that allows to monitor one's own actions, including psychic actions and even change of strategies if necessary (Efklides, 2009); it is not synonymous with self-analysis or reflection, since self-analysis could be described as thinking about oneself (Flavell, 1979).

Metacognition instead involves thinking about how one thinks, focusing not only on the thinking process but also on the content of thoughts (Brown & McCartney, 1995). It therefore includes observing and regulating one's thinking, both known metacognitive skills.

At its very core: Metacognition is a process through which individuals organize and formulate what they know – be it knowledge about people, tasks, situations - to allow cognitive sense-making and monitor cognitive performance. The cognitive adaptability that comes from well-developed metacognitive processes is a direct result of the individual's ability to disentangle what they know, from the context in which that knowledge was acquired (Haynie, Gregorie, & Shepherd, 2004).

1.1.1. Metacognition and Entrepreneurship

Entrepreneurship refers to the discovery, evaluation, and exploitation of opportunities to bring into existence future good and services (Shane & Venkataraman, 2000). It also involves acting "upon the possibility that one has identified an opportunity worth pursuing" (McMullen & Shepherd, 2006), despite entrepreneurship's fundamental assumption that the context is often high in novelty, uncertainty, and dynamism (Haynie J. M. et al. 2010).

It has been studied that entrepreneurs think and behave in ways that are unique (Corbett et al. 2018). Not in vain, metacognition or thinking of one's own thinking (Flavell, 1979) has been proposed as an entrepreneurial way of thinking (Mitchell et al. 2005).

Like the previous comparison between elementary and pre-scholar students, seasoned businessmen understand better what the system requires them to do in order to attract stakeholders' money to get a business going from scratch.

Weak metacognition in business can be exemplified by an entrepreneur who repeatedly makes similar mistakes, without analysing what in his (e.g. operational) strategy has led to failure. This is due to weak meta-thinking which doesn't allow to understand the importance of developing metacognitive awareness.

People with higher metacognitive awareness instead, e.g. prominent entrepreneurs, use more complex decision policies which by the way tend to be reinforced - or at least not misdirected - by learning intervention (Haynie, Gregorie, & Shepherd, 2004). Their metacognitive resources guide their behaviour and reactions when dealing with iterative decision tasks (e.g. entrepreneurial ventures); they will adapt their cognitive responses and develop strategies for responding to the dynamics of environmental changes (Earley, Connolly, & Ekegren, 1989).

This would suggest that entrepreneurial expertise is not necessarily an aptitude a prominent businessman was born with, but a skill that could be acquired by those wanting to become businessmen; the creation of entrepreneurs depends in a complex way "upon a process that is generally accessible to any individual who is willing to deliberately practice to create in themselves the required entrepreneurial cognitions" (Mitchell et al. 2005) which would be strengthened via metacognitive-based intervention. Therefore, appropriate expert behaviour in entrepreneurial situations could be taught and learned.

Those lower in metacognitive awareness use less complex decision policies, however they can be influenced through learning intervention to change or adapt their policies (Shepherd & Patzelt, 2018). This influence may still not be in a way consistent with the structural relationships communicated during the learning, because: the capacity they have to adapt their decision policy

consistently with the decision policies of expert entrepreneurs, will depend on their metacognitive ability to assimilate and integrate new information into new knowledge (Haynie et al. 2012).
For this reason, resorting to metacognitive-based learning intervention is of importance when trying to bridge the gap between those with lower metacognitive awareness and prominent entrepreneurs.

1.1.2. Entrepreneurship Education

Entrepreneurship Education (EE) is a competence-based approach of teaching and learning, aiming at promoting entrepreneurial intention and enterprising behaviour (Ustav, 2018) through e.g. business courses or start-up programs.
The effect of EE-based programs on students may sometimes be considered as rather ambiguous (Nabi et al., 2016). This is mainly due to:

- How some of these programs were designed; they were either too general, poorly focused or did not properly considered community's need. As a result, they came up short on their approach to deliver a desired outcome (Rideout & Gray, 2013).
- Not having yet found what works pedagogically to improve entrepreneurial potential among students (Nabi et al., 2010).
- No information on how students expressing entrepreneurial intention do years after finishing their programs, which would help to identify the percentage of individuals fulfilling an entrepreneurial path from those originally intending it (Nabi et al. 2010). EE-based programs' effect would then be less equivocal, since the productivity of an EE program cannot be properly evaluated by the number of students graduated, but by the social and economic impact that program produces on society (McMullan & Long, 1987).

Metacognitive-based EE would for instance account for the case of a poorly focused EE-based program, which makes sense especially when it has been proved that entrepreneurship students who engage in metacognitive exercises will be more likely to gain entrepreneurial expertise than students who don't (Mitchell et al., 2005). Through this focused type of intervention, it is possible to explore the relationship between metacognition and the formulation of cognitive strategies that would help individuals to compensate their limitations in decision-making, based on the novelty of the situation and the lack of metacognitive awareness (Haynie, Gregorie, & Shepherd, 2004).

Powered by a more focused intervention, in the shape of metacognitive-based EE, students will have the choice to alter their own thinking through thinking about that thinking (Mitchell et al., 2005); this will be beneficial specially for those individuals who aren't but want to become entrepreneurs and don't know how.

1.1.3. Research Background

This research is part of the Estonian Ministry of Education and Research initiated and supported program, to develop modules and assessment methods for entrepreneurship education at all educational levels in Estonia (Venesaar et al., 2018). The process is ongoing, and metacognition is one of fourteen concepts to be developed.

The study offers empirical contribution as well as conceptual validity to the above referred program.

2. METHODOLOGY

Survey research is a quantitative method used to analyze data from samples, by looking at connections among the data (Kraemer, 1991). It is done on a population's segment from which any conclusion can later be summed up back to the entire population. Since the data is collected from individuals, the information preserves at the same time a highly subjective character.
Additionally, descriptive statistics, Pearson's correlation, pivot tables, frequency tables as well as linear graphs were used to process and later analyze the collected data.

2.1. Study Design

This study is based on data collected from students' self-assessment of metacognition and entrepreneurial intention; it involved undergraduate students from different Estonian universities pursuing technical, bachelor and master's degree.
The students belong to four different Estonian universities, namely: TALTECH, TALTECH Meere Akadeemia, Eesti Ettevõtlus-Kõrgkool Mainor (EEK Mainor) and Estonian Business School (EBS).
All students were taking part of a centrally coordinated entrepreneurship course during autumn semester 2018, at their corresponding schools. The course focused on teaching the iterative nature of entrepreneurship, the role of an entrepreneur and essential business' principles such as planning, development and growth. The course also followed the logic of entrepreneurship, i.e.: Identification of a problem, recognition and generation of a business idea followed by its development and implementation.
The lectures were organized in theory and practical seminars while the learning process focused on action research, which included: Learning by doing, teamwork, mentoring, reflection and pitching.
The survey was web-based and deployed at the beginning and end of the entrepreneurship course. In the process, students (N=824) were asked to self-assess their metacognition and entrepreneurial intention, before and after EE intervention.

Filling questionnaires was managed by lecturers and included all students from mandatory entrepreneurship courses, notwithstanding their attitude and interest towards entrepreneurship. Respondents were all assured that their answers would be used only for academic purposes and therefore, kept private and confidential.

For this research, the survey consisted of 22 questions distributed in the following four groups:

- 6 Demographic related, to explore respondents' age, gender, nationality, school, study field and educational seniority.
- 5 Employment related, in order to explore respondents' labour status as well as self-employment status of their family, relatives and friends.
- 8 Metacognition (MC) related, whereby students were invited to rate their metacognitive abilities using measure of metacognitive abilities (MMA), a survey instrument developed by Haynie for use in the entrepreneurship context (Haynie, 2005) and adjusted for Estonian university students by Ling et al. (Ling, Kyrö, & Venesaar, 2013).

  Respondents rated each of the eight MC statements based on a 5-step Likert scale, each number representing: 1-totally disagree, 2-rather disagree, 3-neutral, 4-rather agree and 5-totally agree.
- 3 Entrepreneurial related, for the purpose of establishing changes on respondents' entrepreneurial intention before and after intervention.

Characteristics of all survey's inquiries were synthetized on Table 2 - refer to Appendix 1 for a full reference on each of the survey questions.

Table 2. Characteristics of survey's questions

Type of question	Amount of questions	Type of answer
Demographic related	6	Plain response, M/F, Yes/No
Employment related	5	Yes/No
Metacognition related	8	1 – 5 Likert scale
Entrepreneurial interest & Intention	3	1 – 5 Likert scale
TOTAL	22	

2.2. Summary Statistics

Frequency tables are shown below to summarize survey statistics related to respondent's universe. As seen on Table 3, age among survey participants ranges between 17 and 57 years with roughly 80% being on the 17 to 30-year-old range. Interestingly, less than 5% were older than 40 years of age.

Table 3. Age distribution

Age	Respondents' Frequency	Percentage
17 - 20	162	19,7%
21 - 30	491	59,6%
31 - 40	132	16,0%
41 - 50	35	4,2%
51 - 57	4	0,5%
TOTAL	824	

The female to male ratio was 0.98, which very much represents a 1:1 gender balance among respondents – see Table 4.

Table 4. Gender distribution

Gender	Respondents' Frequency	Percentage
Female	407	49,4%
Male	417	50,6%
TOTAL	824	

Sample's nationality was also mixed but predominantly Estonian, on a 2/3 ratio. As shown on Table 5, the remaining third was represented by Finnish, Lithuanians, Russians and Ukrainians.

Table 5. Nationality distribution

Nationality	Respondents' Frequency	Percentage
Estonian	556	67,5%
Russian	104	12,6%
Other (Finnish, Ukrainian, Lithuanian)	164	19,9%
TOTAL	824	

89% or very much 9 out of 10 respondents, were studying in Taltech (former Tallinna Tehnikaülikool, TTU). The remaining 11% were part of Taltech Meereakadeemia, EEK Mainor and EBS – see Table 6.

Table 6. School distribution

School	Respondents' Frequency	Percentage
Taltech	735	89,2%
Taltech Meereakadeemia	47	5,7%
EEK Mainor	20	2,4%
EBS	22	2,7%
TOTAL	824	

When students were asked to fill their field of study, the answers to this question were provided in a free-flowing manner due to the open format of this query. As a result, 232 subjects were found. For the sake of simplicity, respondents' fields of study were grouped into the following five categories (see Table 7):

- IT related, comprising all IT associated specializations (e.g. cyber security, informatics, info-technology, computer and system engineering).
- Social science related, comprising all business-related specializations including marketing, finance, accounting, law and logistics (e.g. MBA, economic accounting, business management, business, marketing and management).
- Natural science, i.e. all pure science specializations (e.g. physics, material science, earth science).
- Applied science, involving fields such as engineering, electronic, technology, to name a few (e.g. electrical engineering, environmental engineering and management, geotechnology, power engineering).
- Other, i.e. all that is not related to any of the above categories or can't be reproduced (e.g. maritime affairs, random, mwdwd).

107 out of 232 subjects of study were grouped as social science related, from which 50 were explicitly found to be a business topic; i.e. 22% of all subjects were explicitly business subjects.

Table 7. Subjects distribution, based on grouped field of study

Grouped Field of Study	Subjects' Frequency	Percentage
IT related	21	9,1%
Social Science related	107	46,1%
Natural Sciences	6	2,6%
Applied Sciences	83	35,8%
Other	15	6,5%
TOTAL	232	

Table 8 shows respondents' distribution based on grouped field of study; 56% of the respondents were studying a social science related subject while 29% were into applied sciences, both representing an 85% of the sample universe. The remaining 15% were studying IT, natural sciences and other topics.

Table 8. Respondents distribution, based on grouped field of study

Grouped Field of Study	Respondents' Frequency	Percentage
IT related	72	8,7%
Social Science related	465	56,4%
Natural Sciences	10	1,2%
Applied Sciences	240	29,1%
Other	37	4,5%
TOTAL	824	

465 out of 824 respondents were specializing in a social science related field, from which 201 were explicitly engaged in a business-related field; i.e., 24% of all students were explicitly pursuing a business degree.

Respondent's degree of study was found to be as shown on Table 9, with 64% of the students being at master level while bachelor and technical levels comprised the remaining 36%.

Table 9. Degree of study

Level of Study	Frequency	Percentage
Technical	28	3,4%
Bachelor	267	32,4%
Master	529	64,2%
TOTAL	824	

Labour situation of respondents showed that 517 or 63% were employed, while the remaining 307 were unemployed – see Table 10. Notice the number of employed students is very similar to the amount of respondents on a master level, 529 or 64% as shown on Table 9.

Table 10. Students' labour situation

Labour Situation	Frequency	Percentage
Employed	517	62,7%
Unemployed	307	37,3%
TOTAL	824	

Questions on the self-employed status of students' friends and relatives were also part of the survey. The results of this, are exposed on Table 11.

Table 11. Self-employed status of students' friends and relatives

Self-employed status of students'…	Frequency	Percentage
Mother - Yes	332	40,3%
No	492	59,7%
Father - Yes	168	20,4%
No	656	79,6%
Relatives - Yes	307	37,3%
No	517	62,7%
Friends - Yes	561	68,1%
No	263	31,9%
TOTAL	824	

Interestingly, 40% of students' mothers had a self-employed status which was twice the amount when compared to students' fathers. The difference implies that moms were self-employed roughly two times more than dads.

Finally, 75% of respondents has already taken part of an entrepreneurial course prior to autumn 2018, when the survey started to be implemented – see Table 12. The number differs by roughly three times when compared to the percentage of students explicitly pursuing a business degree, or 24%.

Table 12. Students previous entrepreneurial course exposure

Students' previous entrepreneurial course	Frequency	Percentage
Yes	619	75,1%
No	205	24,9%
TOTAL	824	

2.3. Descriptive Statistics

Descriptive statistics tables were created to complement survey's summary statistics. Notice this was done in two parts, to easily visualize the data.

As per Table 13 below, the survey's age mean was 23 with a frequency of 85 (19 was the second most frequent age, with 83); the age variance was the highest among all survey variables, which makes sense since it is the variable showing greater variation. Also, the school variable is showing a maximum of 7, but that is because the school variables were number as: 1 = Taltech, 2 = Taltech Meereakadeemia, 3 = EEK Mainor and 7 = EBS.

Table 13: Descriptive statistics, part 1

N=824	Age	Gender	Nationality	School	Field	Seniority
Mean	26,09	1,51	1,52	1,27	2,64	2,61
Standard Error	0,24	0,02	0,03	0,04	0,04	0,02
Median	24,00	2,00	1,00	1,00	2,00	3,00
Mode	23,00	2,00	1,00	1,00	2,00	3,00
Standard Deviation	6,79	0,50	0,81	1,02	1,12	0,55
Sample Variance	46,11	0,25	0,65	1,05	1,26	0,31
Skewness	1,41	-0,02	1,07	4,85	0,56	-1,04
Range	40,00	1,00	2,00	6,00	4,00	2,00
Minimum	17,00	1,00	1,00	1,00	1,00	1,00
Maximum	57,00	2,00	3,00	7,00	5,00	3,00
Confidence (95,0%)	0,46	0,03	0,06	0,07	0,08	0,04

Table 14 below shows, the descriptive statistics for the remaining survey variables. Worth noticing is that all variables from this table are related to the variables summarized on tables 10 to 12; the same applies to table 13, which relates to the summarized variables on tables 3 to 9.

Table 14. Descriptive statistics, part 2

N=824	Labour	Mother	Father	Family	Friend	Course
Mean	1,37	1,80	1,60	1,63	1,32	1,25
Standard Error	0,02	0,01	0,02	0,02	0,02	0,02
Median	1,00	2,00	2,00	2,00	1,00	1,00
Mode	1,00	2,00	2,00	2,00	1,00	1,00
Standard Deviation	0,48	0,40	0,49	0,48	0,47	0,43
Sample Variance	0,23	0,16	0,24	0,23	0,22	0,19
Skewness	0,53	-1,47	-0,40	-0,53	0,78	1,16
Range	1,00	1,00	1,00	1,00	1,00	1,00
Minimum	1,00	1,00	1,00	1,00	1,00	1,00
Maximum	2,00	2,00	2,00	2,00	2,00	2,00
Confidence (95,0%)	0,03	0,03	0,03	0,03	0,03	0,03

2.4. Survey's Summary

Survey's respondents' characteristics are summarized as follows:

- 80% of the population were in the 17 to 30-year-old range, with only around 5% in the 41 to 57-year-old range.
- Gender distribution was almost equal - 49% female and 51% male.
- In terms of nationalities, 68% or a bit more than two thirds were Estonians while the remaining 32% consisted of Finnish, Lithuanians, Russians and Ukrainians.
- Close to 95% of the students had a nexus with Taltech university; the remaining 5% were studying in EEK Mainor and EBS.
- Roughly one-quarter of the respondents were students pursuing a degree in business while the other 75% were mostly involved with Applied, Social and IT sciences.
- 64% of the degrees were at master level, bachelor and technical levels comprised the remaining 36%.
- 63% of the respondents were employed, which (coincidentally?) closely matches the 64% pursuing a master level. The other 37% were unemployed.
- More than two thirds of students' friends were self-employed whilst 40% of their mothers, 37% of their relatives and 20% of their fathers were also self-employed - notice mothers were self-employed twice more times than fathers.
- 75% of the respondents already had some sort of entrepreneurial training, prior to the entrepreneur course they took part of during autumn 2018.

3. RESULTS

Results of metacognition and entrepreneurial intention levels are shown in the next, pre and post intervention; they will contribute to answer the following research questions (RQ):

- RQ1: do all average general MC variables increase after EE intervention?
- RQ2: do all average MC variables increase regardless of the age range?
- RQ3: do all average MC variables increase for both genders?
- RQ4: do all average MC variables increase regardless of nationality?
- RQ5: do all average MC variables increase irrespective of the school?
- RQ6: do all average MC variables increase notwithstanding the field of study?
- RQ7: do all average MC variables increase regardless of degree of study?
- RQ8: do all average MC variables increase irrespective of the labor situation?
- RQ9: do all average MC variables increase regardless of self-employment status?
- RQ10: do all average MC variables increase regardless of having previously partaken of an entrepreneurship course?
- RQ11: do average entrepreneurial intention increases after EE intervention?

3.1 Metacognition Levels

Prior to and after EE intervention, respondents were asked to rate eight MC statements (variables) on a 5-point Likert scale, each offering answers on how students think and decide when facing life situations that have no simple solutions; see appendix 1, point 4.1. Average values for each of the MC variables were then computed and organized on tables.

3.1.1. General MC levels (RQ1)

Changes in student's general MC levels, before and after EE intervention, are shown on Table 15. As a whole, all eight MC variables increased their average values post intervention which possitively answers RQ1.

Table 15. General MC avg. values, pre & post EE intervention

MC	before	change	after
MC1	4,16	2,77%	4,28
MC2	3,73	5,21%	3,92
MC3	4,23	1,49%	4,29
MC4	3,94	3,82%	4,09
MC5	4,06	4,13%	4,22
MC6	4,09	3,62%	4,24
MC7	4,10	1,90%	4,18
MC8	3,67	3,54%	3,79

Changes on Table 15 were then sorted in decreasing order, as displayed on Figure 1. MC2 had the highest change followed by MC5, while MC3 presented the lowest positive change among all MC variables.

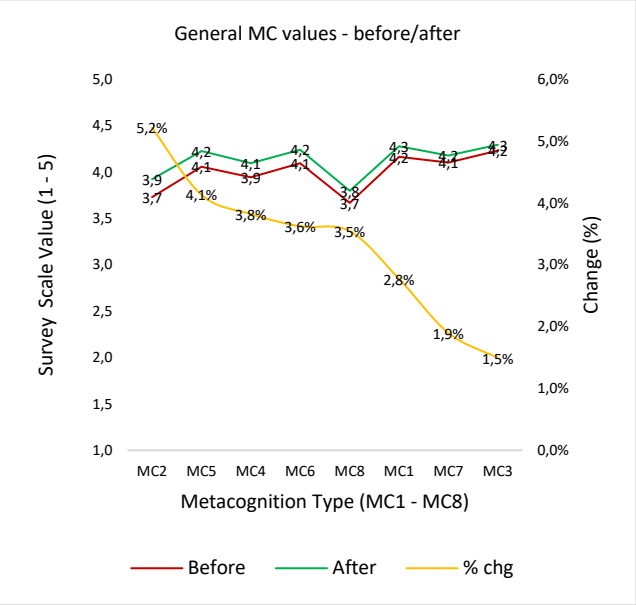

Figure 1: General MC avg. values, decr. ordered by change

Pearson's correlation among MC average values, before (MCi) and after (2MCi) the entrepreneurial course, are presented on Table 16. The correlation between all 16 MC variables (8 x MCi & 8 x 2MCi) is again positive and significant at the level of 0,01 or 99% confidence level. The strongest positive correlations are green highlighted on the table and corresponds to 2MC4 & 2MC3, 2MC6 & 2MC5, and 2MC7 & 2MC6; pre and post correlation values among MC variables were highlighted in yellow for reference purpose only.

Table 16. Pearson's correlation of MC avg. values, pre & post (MCi & 2MCi) intervention

	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	2MC1	2MC2	2MC3	2MC4	2MC5	2MC6	2MC7	2MC8
MC1	1,00															
MC2	0,35	1,00														
MC3	0,29	0,28	1,00													
MC4	0,30	0,25	0,36	1,00												
MC5	0,23	0,23	0,27	0,33	1,00											
MC6	0,29	0,23	0,33	0,38	0,40	1,00										
MC7	0,32	0,21	0,32	0,35	0,27	0,38	1,00									
MC8	0,16	0,22	0,14	0,23	0,20	0,29	0,28	1,00								
2MC1	0,23	0,12	0,16	0,18	0,14	0,19	0,17	0,03	1,00							
2MC2	0,11	0,29	0,15	0,21	0,10	0,14	0,13	0,06	0,43	1,00						
2MC3	0,11	0,10	0,28	0,17	0,07	0,16	0,14	0,02	0,43	0,35	1,00					
2MC4	0,13	0,11	0,18	0,34	0,14	0,18	0,18	0,07	0,42	0,35	0,53	1,00				
2MC5	0,14	0,07	0,08	0,18	0,23	0,27	0,16	0,04	0,37	0,29	0,38	0,45	1,00			
2MC6	0,13	0,09	0,09	0,17	0,16	0,33	0,19	0,09	0,39	0,30	0,40	0,41	0,55	1,00		
2MC7	0,16	0,08	0,12	0,20	0,15	0,18	0,29	0,07	0,44	0,29	0,41	0,47	0,47	0,52	1,00	
2MC8	0,13	0,13	0,05	0,12	0,14	0,19	0,14	0,31	0,27	0,24	0,23	0,28	0,24	0,28	0,37	1,00

3.1.2. Age MC levels (RQ2)

Pre and post intervention MC levels were analyzed based on age, after age was grouped into five different ranges.

Tables 17 through 19 show MC changes according to age range. Notice that for the 41-50 range, all MC levels decreased after intervention; the 17-20 also experienced negative changes in four of the eight MC variables, while the remaining two ranges experienced none to positive changes in all MC variables. These results negatively answer RQ2.

Table 17. Age MC avg. values, pre & post EE intervention – part 1

Age	MC1			MC2			MC3		
	before	change	after	before	change	after	before	change	after
17-20	4,44	5,95%	4,17	3,85	5,85%	3,62	4,16	4,95%	3,96
21-30	4,10	4,50%	4,29	3,68	7,95%	3,97	4,25	1,42%	4,31
31-40	4,27	2,92%	4,39	3,77	5,30%	3,96	4,33	2,05%	4,41
41-50	4,30	5,89%	4,05	3,81	5,19%	3,61	4,01	2,32%	3,92
51-57	3,75	20,00%	4,50	2,50	80,00%	4,50	3,75	20,00%	4,50

Table 18. Age MC avg. values, pre & post EE intervention – part 2

Age	MC4			MC5			MC6		
	before	change	after	before	change	after	before	change	after
17-20	3,85	7,38%	4,14	4,03	5,69%	4,26	3,84	10,25%	4,23
21-30	3,96	4,79%	4,15	4,06	4,81%	4,26	4,05	4,58%	4,24
31-40	4,19	3,66%	4,34	4,21	6,29%	4,47	4,19	5,29%	4,41
41-50	4,16	8,71%	3,80	4,12	9,25%	3,74	4,14	5,68%	3,91
51-57	4,00	6,25%	4,25	4,00	6,25%	4,25	4,00	0,00%	4,00

Table 19. Age MC avg. values, pre & post EE intervention – part 3

Age	MC7			MC8		
	before	change	after	before	change	after
17-20	4,04	6,87%	4,31	3,83	4,49%	3,66
21-30	4,11	2,89%	4,23	3,67	4,51%	3,83
31-40	4,29	0,08%	4,29	3,92	0,17%	3,92
41-50	4,07	0,52%	4,05	4,00	5,24%	3,79
51-57	4,00	0,00%	4,00	3,50	7,14%	3,75

Table 20 shows average percentage changes for each of the five age ranges, with the 41-50 range showing the lowest value followed by the 17-20 range. On the other hand, the highest average percentage change was seen on the 51-57 range, followed by the 21-30 range.

Table 20. Age MC - changes

Age	MC chg. (%)								Avg.
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	chg. (%)
17 - 20	-5,95	-5,85	-4,95	7,38	5,69	10,25	6,87	-4,49	1,12
21 - 30	4,50	7,95	1,42	4,79	4,81	4,58	2,89	4,51	4,43
31 - 40	2,92	5,30	2,05	3,66	6,29	5,29	0,08	0,17	3,22
41 - 50	-5,89	-5,19	-2,32	-8,71	-9,25	-5,68	-0,52	-5,24	-5,35
51 - 57	20,00	80,00	20,00	6,25	6,25	0,00	0,00	7,14	17,46

3.1.3. Gender MC levels (RQ3)

EE intervention effects on MC levels were analyzed based on gender, with all eight MC variables experiencing an increase in their average values, for both sexes - see Table 21. These results positively answer RQ3.

Notice that average change was significantly higher on females (4.67%) than males (1,99%), by a 2.3 factor - see Table 22.

Table 21. Gender MC avg. values, pre & post EE intervention

MC	Female			Male		
	before	change	after	before	change	after
MC1	4,17	3,59%	4,32	4,15	1,96%	4,23
MC2	3,67	6,50%	3,91	3,78	3,99%	3,93
MC3	4,18	2,82%	4,30	4,27	0,22%	4,28
MC4	3,95	4,79%	4,14	3,94	2,86%	4,05
MC5	4,05	5,34%	4,27	4,06	2,95%	4,18
MC6	4,06	5,38%	4,28	4,12	1,92%	4,20
MC7	4,13	3,21%	4,26	4,07	0,59%	4,09
MC8	3,67	5,76%	3,88	3,66	1,38%	3,71

Table 22. Gender MC - changes

Gender	MC chg. (%)								Avg
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	chg. (%)
Female	3,59	6,50	2,82	4,79	5,34	5,38	3,21	5,76	4,67
Male	1,96	3,99	0,22	2,86	2,95	1,95	0,59	1,38	1,99

Figure 2 shows gender-based MC level changes, decreasingly ordered by change. Interestingly, the variables experiencing the highest and lowest change were the same for both sexes, MC2 and MC3 respectively.

Figure 2. Gender MC avg. values, decr. ordered by change

3.1.4. Nationality MC levels (RQ4)

Pre and post EE intervention MC levels were analyzed, based on nationality. As shown on Table 23, almost all MC variables experienced an increase for all nationality groups which negatively answers RQ4.

Table 23. Nationality MC avg. values, pre & post EE intervention

MC	Estonian			Russian			Other		
	before	change	after	before	change	after	before	change	after
MC1	4,19	2,54%	4,29	4,18	0,92%	4,14	4,06	6,01%	4,30
MC2	3,71	4,79%	3,89	3,63	7,16%	3,88	3,83	5,41%	4,04
MC3	4,16	2,55%	4,27	4,24	2,49%	4,13	4,45	0,55%	4,47
MC4	3,93	3,61%	4,07	3,98	0,48%	3,96	3,95	7,25%	4,24
MC5	4,07	3,89%	4,23	4,03	2,63%	4,13	4,01	5,93%	4,25
MC6	4,12	3,23%	4,25	4,11	2,58%	4,21	3,99	5,66%	4,21
MC7	4,12	1,88%	4,20	3,86	4,74%	4,04	4,16	0,29%	4,18
MC8	3,75	3,31%	3,87	3,60	5,35%	3,79	3,43	3,20%	3,54

Table 24 shows that “Other” group of nationality (i.e. Finnish, Lithuanians and Ukrainians) had the highest average change, followed by Estonians and Russians.

Table 24. Nationality MC - changes

Nationality	MC chg. (%)								Avg.
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	chg. (%)
Estonian	2,54	4,79	2,55	3,61	3,89	3,23	1,88	3,31	3,23
Russian	-0,92	7,16	-2,49	-0,48	2,63	2,58	4,74	5,35	2,32
Other	6,01	5,41	0,55	7,25	5,93	5,66	0,29	3,20	4,29

Figures 3 and 4 show nationality-based MC level changes, decreasingly ordered by change, with MC2 showing the highest increasing change for Estonians and Russians while MC4 was it for the other group of nationalities. MC3 was the variable experiencing the lowest change among Russians.

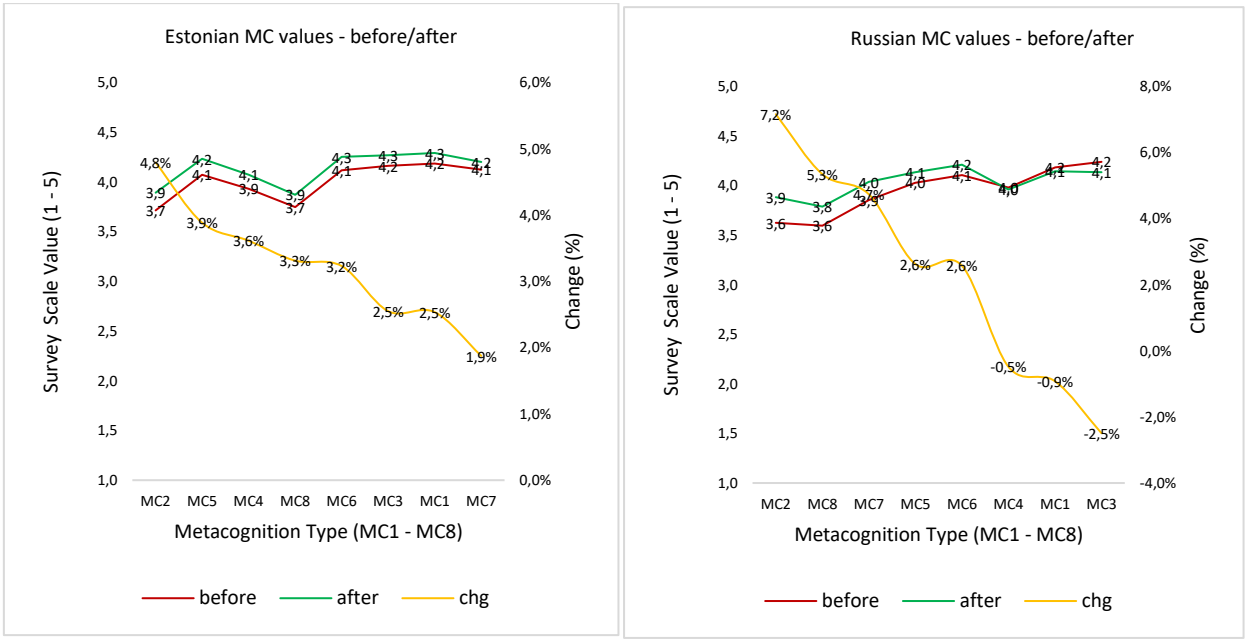

Figure 3. Nationality MC avg. values, decr. ordered by change – Estonian & Russian

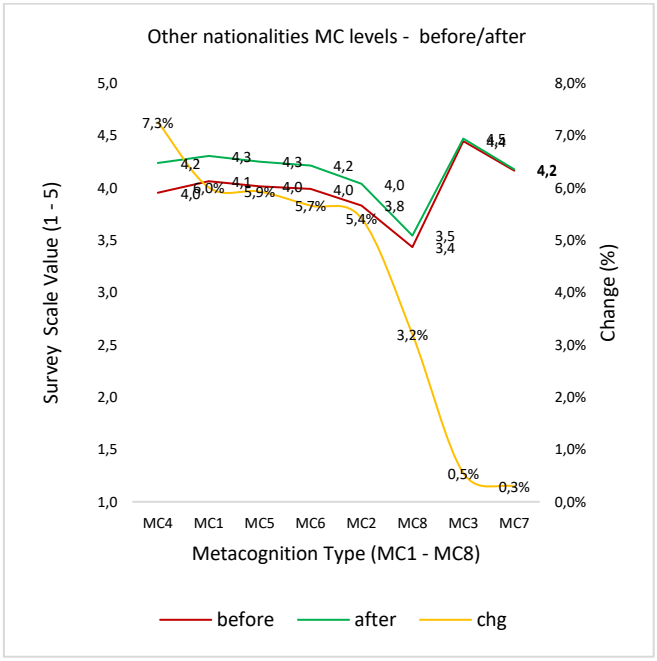

Figure 4. Nationality MC avg. values, decr. ordered by change – Other

3.1.5. School MC levels (RQ5)

Learning intervention effects on students' MC levels were analyzed based on their school of origin, with the majority to all of MC variables experiencing a positive change in three out of four

universities, as shown on Tables 25 and 26. Only EBS had most of their MC variables (five out of eight) decreasing after EE intervention. These results negatively answer RQ5.

Table 25. School MC avg. values, pre & post EE intervention – part 1

MC	Taltech			Taltech Meereakadeemia		
	before	change	after	before	change	after
MC1	4,18	3,09%	4,31	4,06	5,76%	3,83
MC2	3,73	5,21%	3,93	3,70	2,87%	3,81
MC3	4,24	1,61%	4,30	4,06	2,09%	3,98
MC4	3,95	3,99%	4,11	3,91	5,43%	3,70
MC5	4,07	4,28%	4,25	3,87	1,10%	3,91
MC6	4,09	3,86%	4,25	4,06	0,52%	4,09
MC7	4,11	2,02%	4,19	3,89	1,09%	3,94
MC8	3,66	4,31%	3,82	3,70	0,00%	3,70

Table 26. School MC avg. values, pre & post EE intervention – part 2

MC	EEK Mainor			EBS		
	before	change	after	before	change	after
MC1	3,75	16,00%	4,35	4,00	1,14%	3,95
MC2	3,45	17,39%	4,05	3,77	0,00%	3,77
MC3	4,35	9,20%	4,75	4,18	2,17%	4,09
MC4	4,00	12,50%	4,50	3,55	10,26%	3,91
MC5	4,00	6,25%	4,25	3,91	3,49%	4,05
MC6	4,00	10,00%	4,40	4,27	3,19%	4,14
MC7	4,10	6,10%	4,35	4,09	4,44%	3,91
MC8	3,45	2,90%	3,35	3,86	8,24%	3,55

Table 27 shows that EEK Mainor had the highest average change among all four schools, with double digit changes in four out of the eight MC variables; Taltech follows, with a 2.4 times lower average. Taltech Meereakadeemia had the lowest (negative) average, followed by EBS.

Table 27. School MC - changes

School	MC chg. (%)								Avg.
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	chg. (%)
Taltech	3,09	5,21	1,61	3,99	4,28	3,86	2,02	4,31	3,55
Taltech Meere.	-5,76	2,87	-2,09	-5,43	1,10	0,52	1,09	0,00	-0,96
EEK Mainor	16,00	17,39	9,20	12,50	6,25	10,00	-2,90	0,17	8,58
EBS	-1,14	0,00	-2,17	10,26	3,49	-3,19	-4,44	-8,24	-0,68

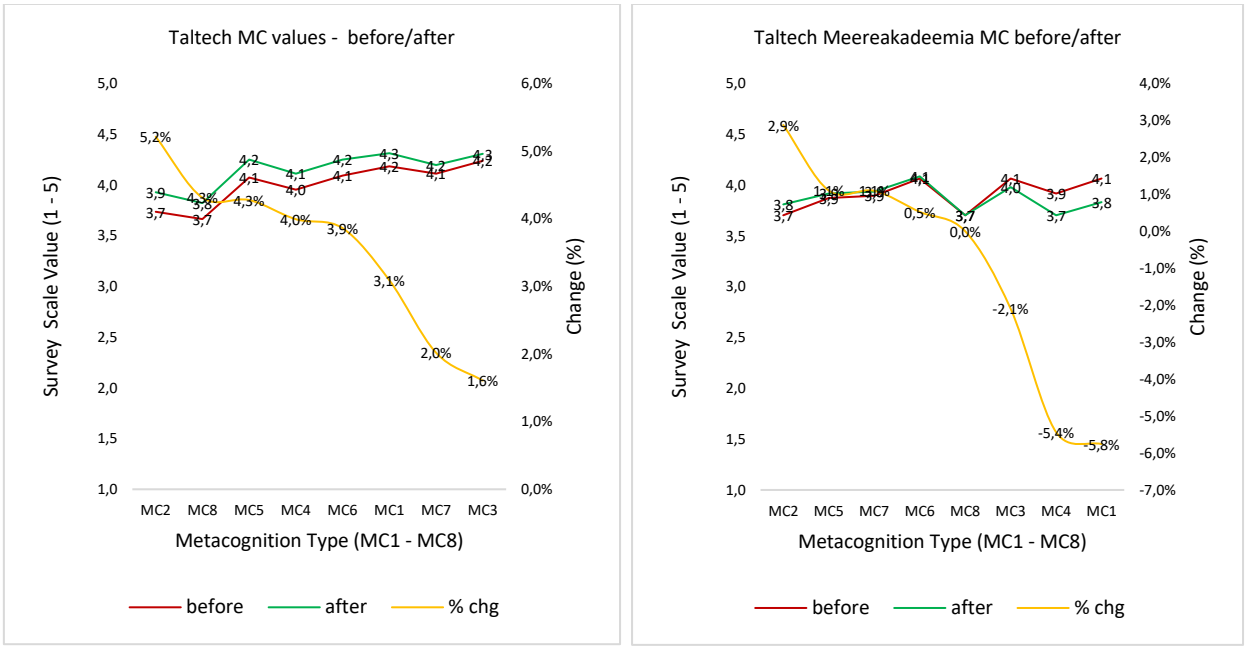

Figure 5. School MC avg. values decr. ordered by change – Taltech & Taltech M.

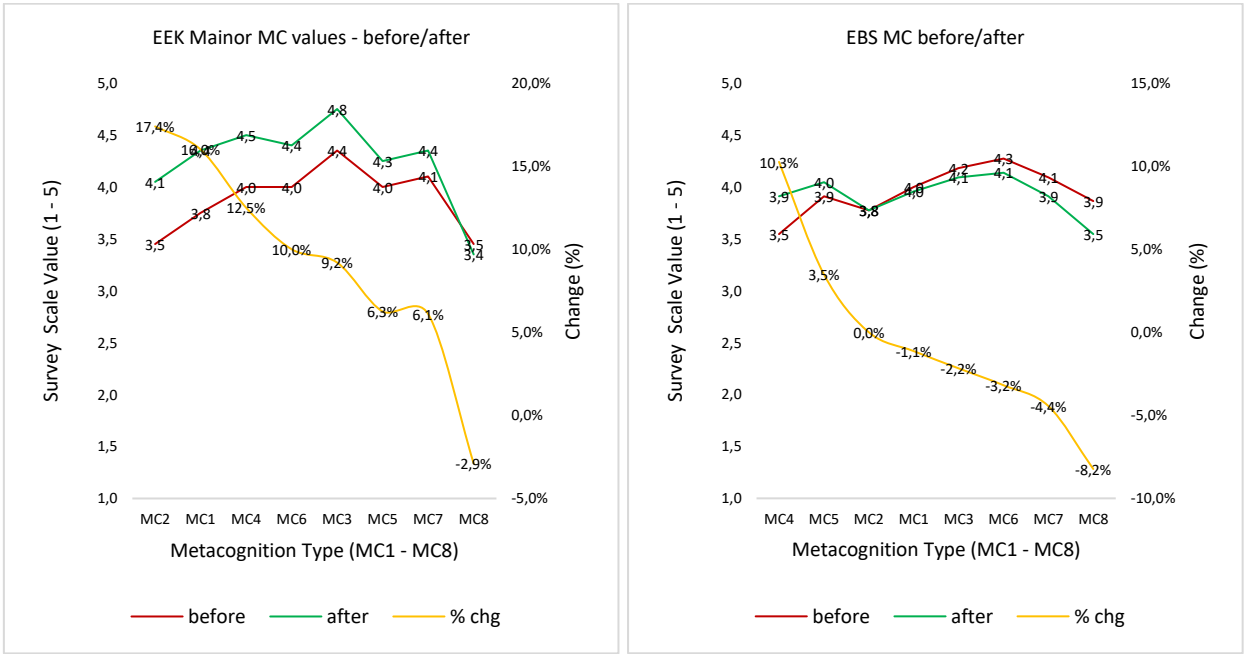

Figure 6. School MC avg. values, decr. ordered by change – EEK Mainor & EBS

Figures 5 and 6 show school-based MC level changes decreasingly ordered by percentage of change. Notice again the significantly positive effect EE intervention had on EEK Mainor students, compared to the other three schools.

3.1.6. Field of Study MC levels (RQ6)

MC levels were analyzed before/after intervention, based on student's field of study; all eight MC variables increased their average values post intervention, for each of the five groups as it can be viewed on Tables 28 & 29. These results positively answer RQ6.

Table 28. Field of study MC avg. values, pre & post EE intervention – part 1

MC	IT Science			Social Science			Natural Science		
	before	change	after	before	change	after	before	change	after
MC1	4,30	1,86%	4,38	4,12	3,07%	4,25	4,22	5,78%	4,46
MC2	3,70	7,13%	3,97	3,71	4,50%	3,88	3,68	5,30%	3,88
MC3	4,23	2,27%	4,33	4,24	0,38%	4,26	4,17	5,26%	4,39
MC4	3,91	3,07%	4,03	3,90	4,50%	4,07	3,98	4,91%	4,17
MC5	4,05	4,15%	4,22	4,08	3,30%	4,21	3,98	7,36%	4,27
MC6	4,10	2,34%	4,19	4,06	3,91%	4,22	4,24	2,30%	4,34
MC7	4,06	2,76%	4,17	4,09	1,32%	4,15	4,12	5,92%	4,37
MC8	3,76	4,26%	3,92	3,57	3,85%	3,71	3,71	7,24%	3,98

Table 29. Field of study MC avg. values, pre & post EE intervention – part 2

MC	Applied Science			Other		
	before	change	after	before	change	after
MC1	4,15	1,68%	4,22	3,87	15,52%	4,47
MC2	3,77	5,07%	3,96	3,87	9,43%	4,27
MC3	4,22	1,83%	4,30	3,93	6,56%	4,33
MC4	4,01	2,75%	4,13	3,53	10,34%	3,87
MC5	4,05	4,45%	4,23	3,93	10,17%	4,20
MC6	4,11	3,85%	4,27	4,07	6,78%	4,33
MC7	4,13	1,60%	4,19	3,73	3,28%	3,93
MC8	3,74	2,17%	3,82	4,07	5,36%	4,20

The "Other" field of study group (i.e. all topics non-related to any of the science groups) had the highest average change, followed by the natural science group. The remaining three science groups shared similar average change values – see Table 30.

Table 30. Field of study MC - changes

Field of Study	MC chg. (%)								Avg. chg. (%)
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	
IT Sc.	1,86%	7,13%	2,27%	3,07%	4,15%	2,34%	2,76%	4,26%	3,48%
Social Sc.	3,07%	4,50%	0,38%	4,50%	3,30%	3,91%	1,32%	3,85%	3,10%
Natural Sc.	5,78%	5,30%	5,26%	4,91%	7,36%	2,30%	5,92%	7,24%	5,51%
Applied Sc.	1,68%	5,07%	1,83%	2,75%	4,45%	3,85%	1,60%	2,17%	2,92%
Other	15,52%	9,43%	6,56%	10,34%	10,17%	6,78%	3,28%	5,36%	8,43%

Figures 7 to 9 show field of study MC level changes decreasingly ordered by change; MC2 was the variable that experienced the highest positive change in three out of the four science groups.

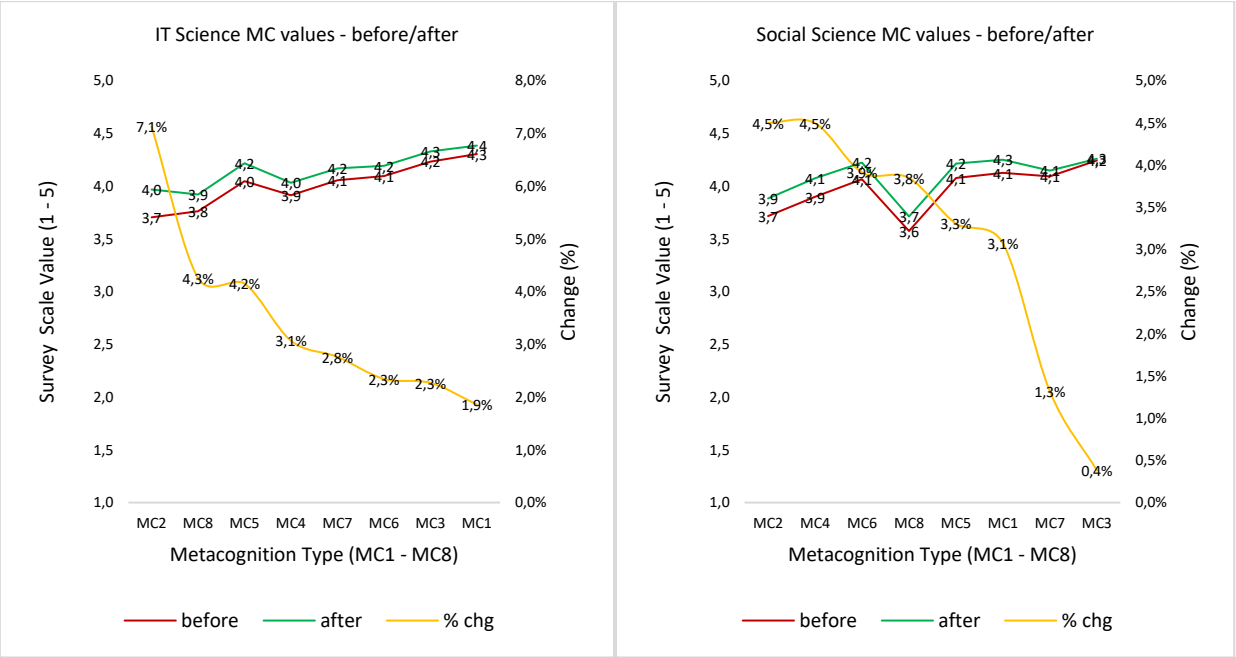

Figure 7. Field of study MC avg. values, decr. ordered by change – IT & Social Sc.

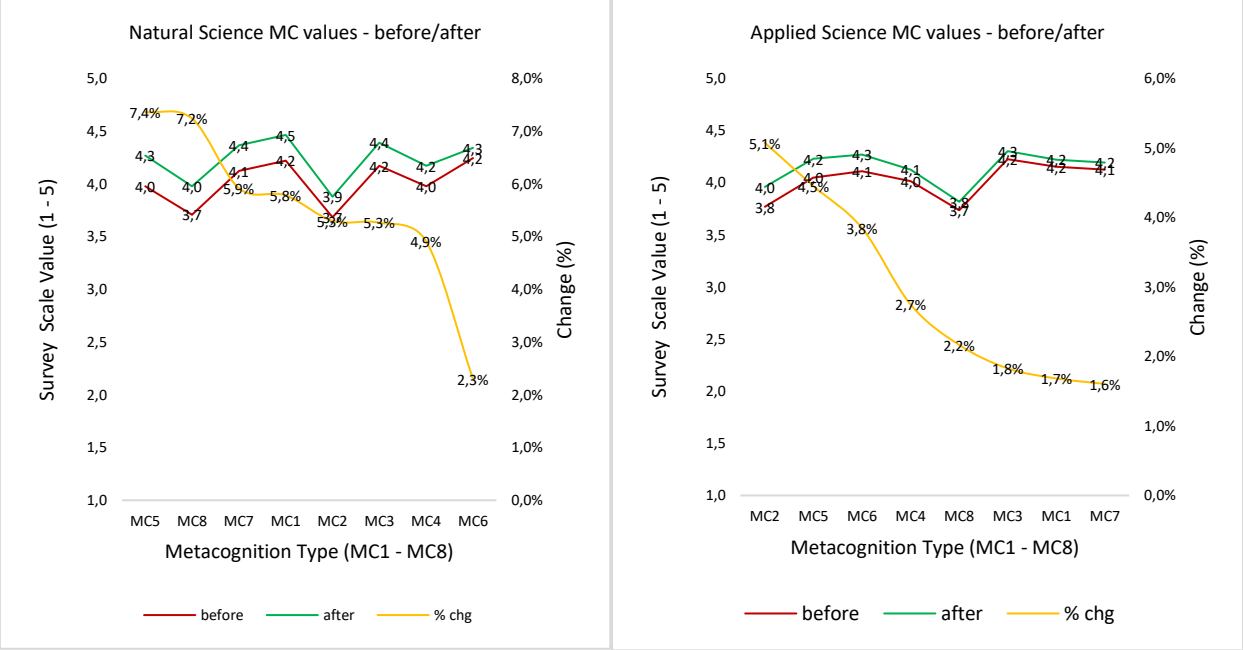

Figure 8. Field of study MC avg. values, decr. ordered by change – Natural & Applied Sc.

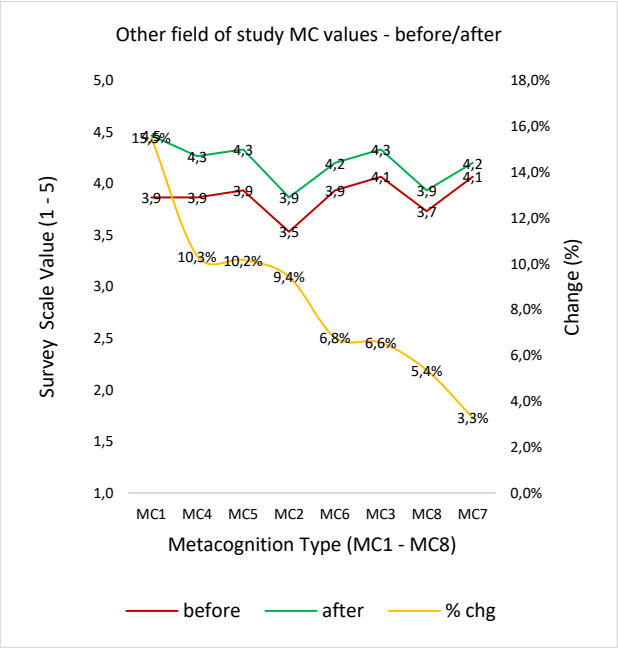

Figure 9. Field of study MC avg. values, decr. ordered by change – Other

3.1.7. Degree of Study MC levels (RQ7)

Pre/post intervention MC levels were analyzed, based on the degree of study. All eight MC variables experienced positive changes for bachelor and master's degree; for the technical, the majority (5 out of 8) experienced a decrease after intervention as seen on Table 31. This results negatively answer RQ7.

Table 31. Degree of study MC avg. values, pre & post EE intervention

MC	Technical			Bachelor			Master		
	before	change	after	before	change	after	before	change	after
MC1	3,96	2,70%	3,86	4,12	1,63%	4,19	4,19	3,61%	4,34
MC2	3,82	2,80%	3,93	3,75	3,40%	3,87	3,71	6,27%	3,94
MC3	4,14	0,86%	4,11	4,19	0,18%	4,20	4,25	2,27%	4,35
MC4	3,96	5,41%	3,75	3,76	4,79%	3,94	4,03	3,84%	4,19
MC5	3,96	1,80%	3,89	3,99	3,47%	4,13	4,09	4,76%	4,29
MC6	3,93	2,73%	4,04	4,01	4,38%	4,19	4,14	3,29%	4,27
MC7	4,04	2,65%	3,93	4,00	0,56%	4,03	4,15	2,78%	4,26
MC8	3,82	2,80%	3,93	3,49	3,11%	3,60	3,74	3,79%	3,89

The master study group got the highest average change, followed by bachelors. The technical group however, got a negative average change after intervention – see Table 32.

Table 32. Degree of study MC - changes

Degree of Study	MC chg. (%)								Avg. chg. (%)
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	
Technical	2,70%	2,80%	0,86%	5,41%	1,80%	2,73%	2,65%	2,80%	-0,64%
Bachelor	1,63%	3,40%	0,18%	4,79%	3,47%	4,38%	0,56%	3,11%	2,69%
Master	3,61%	6,27%	2,27%	3,84%	4,76%	3,29%	2,78%	3,79%	3,83%

Figures 10 & 11 show field of study MC level changes decreasingly ordered by change. On this opportunity, MC2 also experienced the highest positive change in two out of the three groups; MC4 did it in the remaining one.

Additionally, MC3 was the variable with lowest variation after intervention, in two out of the three graphs.

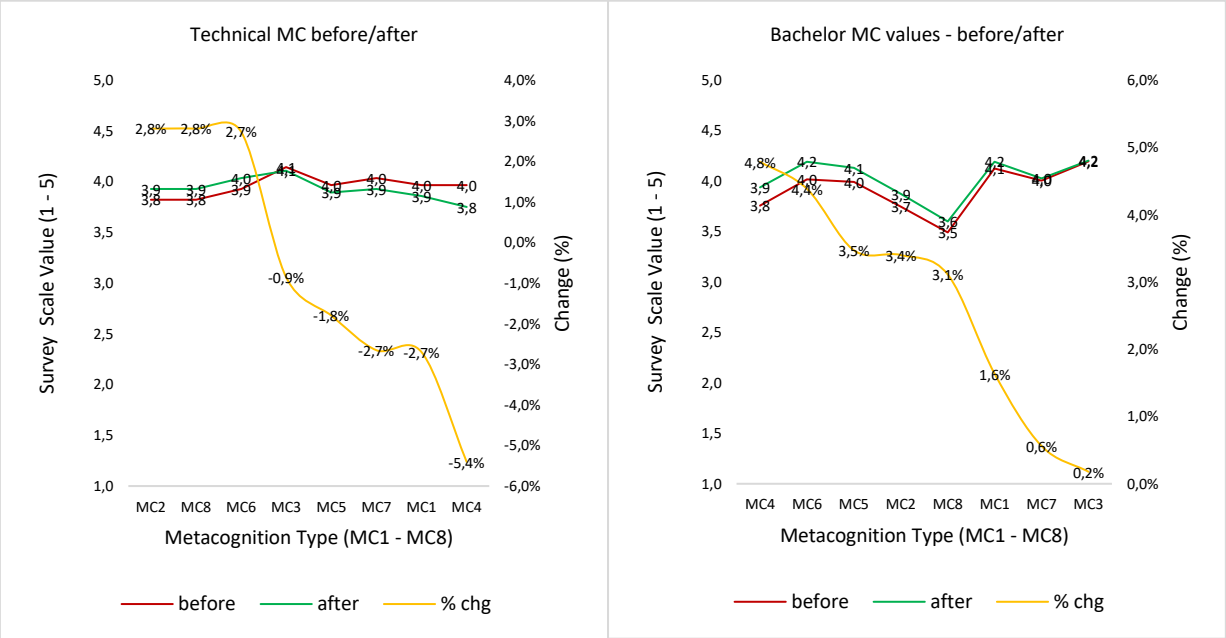

Figure 10. Degree of study MC avg. values, decr. ordered by change – Tech. & Bachelor

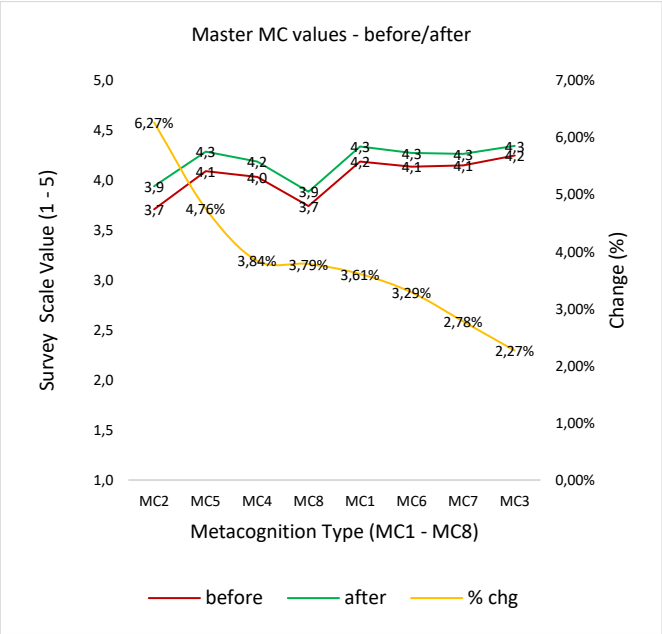

Figure 11. Degree of study MC avg. values, decr. ordered by change – Master

3.1.8. Labor situation MC levels (RQ8)

Labour situation MC level changes in students, before and after EE intervention, are shown on Table 33; all eight MC variables increased post intervention for both, employed and unemployed students, which positively answers RQ8.

Table 33. Labour situation MC avg. values, pre & post EE intervention

MC	Employed			Unemployed		
	before	change	after	before	change	after
MC1	4,16	2,88%	4,28	4,15	2,59%	4,26
MC2	3,68	6,31%	3,91	3,80	3,42%	3,93
MC3	4,22	1,51%	4,28	4,24	1,46%	4,30
MC4	3,97	3,60%	4,11	3,89	4,18%	4,06
MC5	4,11	4,19%	4,28	3,97	4,02%	4,13
MC6	4,14	3,55%	4,28	4,01	3,73%	4,16
MC7	4,10	2,93%	4,22	4,10	0,16%	4,11
MC8	3,70	4,02%	3,85	3,60	2,71%	3,70

When it comes to MC changes based on labor situation, it was found that employed students had a slightly higher increase in change after intervention than unemployed - see Table 34.
Figure 12 shows Labor situation MC level changes decreasingly ordered by change, whereby MC2 is showing the highest increase for the unemployed case.

Table 34. Labour situation MC - changes

Labour Situation	MC chg. (%)								Avg. chg. (%)
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	
Employed	2,88%	6,31%	1,51%	3,60%	4,19%	3,55%	2,93%	4,02%	3,62%
Unemployed	2,59%	3,42%	1,46%	4,18%	4,02%	3,73%	0,16%	2,71%	2,79%

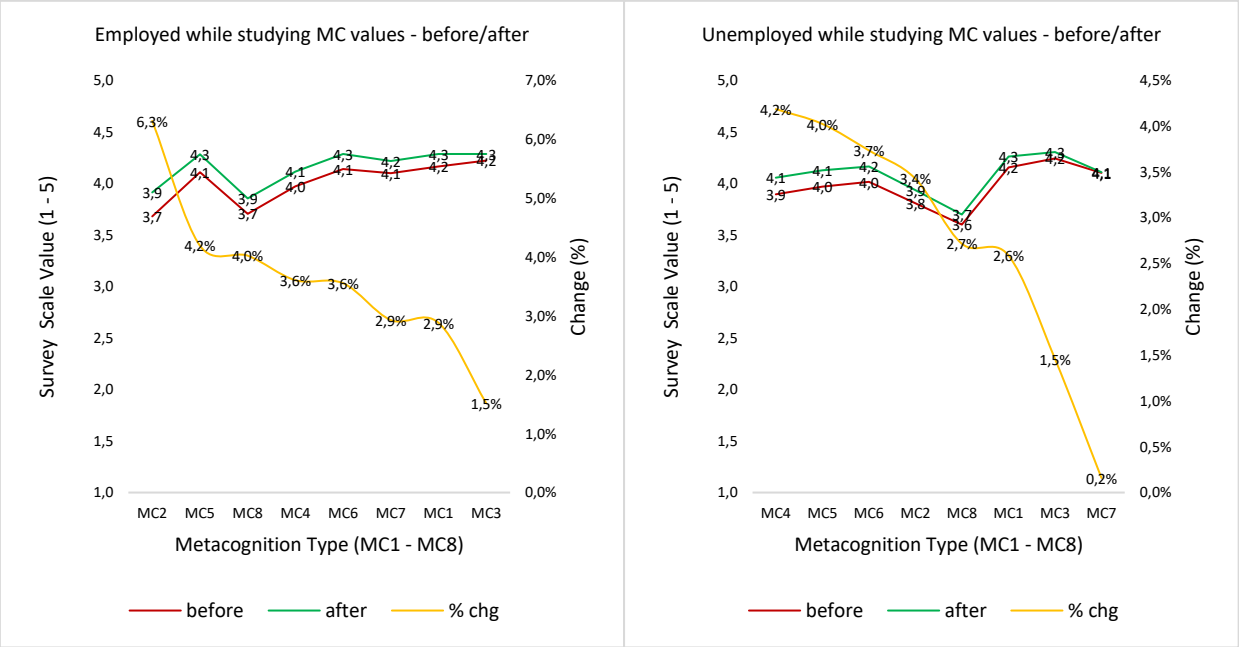

Figure 12. Labour situation MC avg. values, decr. ordered by change – Emp. & Unemp.

3.1.9. Self-employment MC levels (RQ9)

Self-employment MC level changes in students' friends, relatives, mother and father, are shown on Tables 35 through 38. Almost all MC variables increased post intervention, with the only exception of MC7 in "Not self-employed friends" – see Table 35. Therefore, RQ9 is negatively answered.

When referring to MC changes based on self-employment status, it was found that students' friend(s), relative(s), mother and father had all rather comparable increases in average percentage change after intervention, as reflected on Table 39.

Table 35. Self-employment MC avg. values, pre & post EE intervention – Friends

MC	Self-employed friends			Not self-employed friends		
	before	change	after	before	change	after
MC1	4,14	3,53%	4,29	4,19	1,18%	4,24
MC2	3,73	5,39%	3,94	3,71	4,82%	3,89
MC3	4,27	1,17%	4,32	4,14	2,20%	4,24
MC4	3,98	3,81%	4,13	3,87	3,83%	4,02
MC5	4,07	4,25%	4,24	4,03	3,87%	4,18
MC6	4,14	3,70%	4,29	3,98	3,44%	4,12
MC7	4,11	3,12%	4,24	4,07	-0,75%	4,04
MC8	3,68	3,48%	3,81	3,63	3,67%	3,76

Table 36. Self-employment MC avg. values, pre & post EE intervention – Relatives

MC	Self-employed relatives			Not self-employed relatives		
	before	change	after	before	change	after
MC1	4,17	2,19%	4,26	4,15	3,12%	4,28
MC2	3,76	4,33%	3,92	3,71	5,74%	3,92
MC3	4,27	1,07%	4,32	4,20	1,75%	4,28
MC4	4,01	3,25%	4,14	3,90	4,16%	4,06
MC5	4,03	4,44%	4,21	4,07	3,94%	4,23
MC6	4,09	3,43%	4,23	4,09	3,73%	4,25
MC7	4,16	1,17%	4,21	4,06	2,33%	4,15
MC8	3,72	3,24%	3,84	3,63	3,73%	3,77

Table 37. Self-employment MC avg. values, pre & post EE intervention – Mother

MC	Self-employed mother			Not self-employed mother		
	before	change	after	before	change	after
MC1	4,18	2,38%	4,28	4,15	3,04%	4,27
MC2	3,74	5,56%	3,95	3,72	4,98%	3,90
MC3	4,20	1,65%	4,27	4,25	1,39%	4,30
MC4	3,96	2,43%	4,06	3,93	4,76%	4,12
MC5	4,06	3,71%	4,21	4,05	4,41%	4,23
MC6	4,07	3,77%	4,23	4,10	3,52%	4,25
MC7	4,09	2,80%	4,20	4,11	1,29%	4,16
MC8	3,59	5,20%	3,78	3,72	2,46%	3,81

Students' friend(s), relative(s), mother and father self-employment MC level changes are shown, decreasingly ordered by change, on figures 13 through 16; on six out of the eight graphs, MC2 was the variable experiencing the highest percentage change while being the second on the other two graphs. MC3 on the other hand, was the variable with lowest change on five out the eight graphs.

Table 38. Self-employment MC avg. values, pre & post EE intervention – Father

MC	Self-employed father			Not self-employed father		
	before	change	after	before	change	after
MC1	4,24	0,70%	4,27	4,14	3,31%	4,28
MC2	3,76	4,43%	3,93	3,72	5,41%	3,92
MC3	4,27	2,79%	4,39	4,22	1,16%	4,27
MC4	4,03	3,25%	4,16	3,92	3,97%	4,07
MC5	4,08	3,50%	4,22	4,05	4,29%	4,22
MC6	4,13	6,05%	4,38	4,08	2,99%	4,20
MC7	4,23	1,13%	4,27	4,07	2,10%	4,15
MC8	3,69	2,10%	3,77	3,66	3,92%	3,80

Table 39. Self-employment MC - changes

Self Employed	MC % chg								Avg % chg
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	
Friend - yes	3,53%	5,39%	1,17%	3,81%	4,25%	3,70%	3,12%	3,48%	3,56%
Friend - no	1,18%	4,82%	2,20%	3,83%	3,87%	3,44%	-0,75%	3,67%	2,78%
Relative - yes	2,19%	4,33%	1,07%	3,25%	4,44%	3,43%	1,17%	3,24%	2,89%
Relative - no	3,12%	5,74%	1,75%	4,16%	3,94%	3,73%	2,33%	3,73%	3,56%
Mother - yes	2,38%	5,56%	1,65%	2,43%	3,71%	3,77%	2,80%	5,20%	3,44%
Mother - no	3,04%	4,98%	1,39%	4,76%	4,41%	3,52%	1,29%	2,46%	3,23%
Father - yes	0,70%	4,43%	2,79%	3,25%	3,50%	6,05%	1,13%	2,10%	2,99%
Father - no	3,31%	5,41%	1,16%	3,97%	4,29%	2,99%	2,10%	3,92%	3,39%

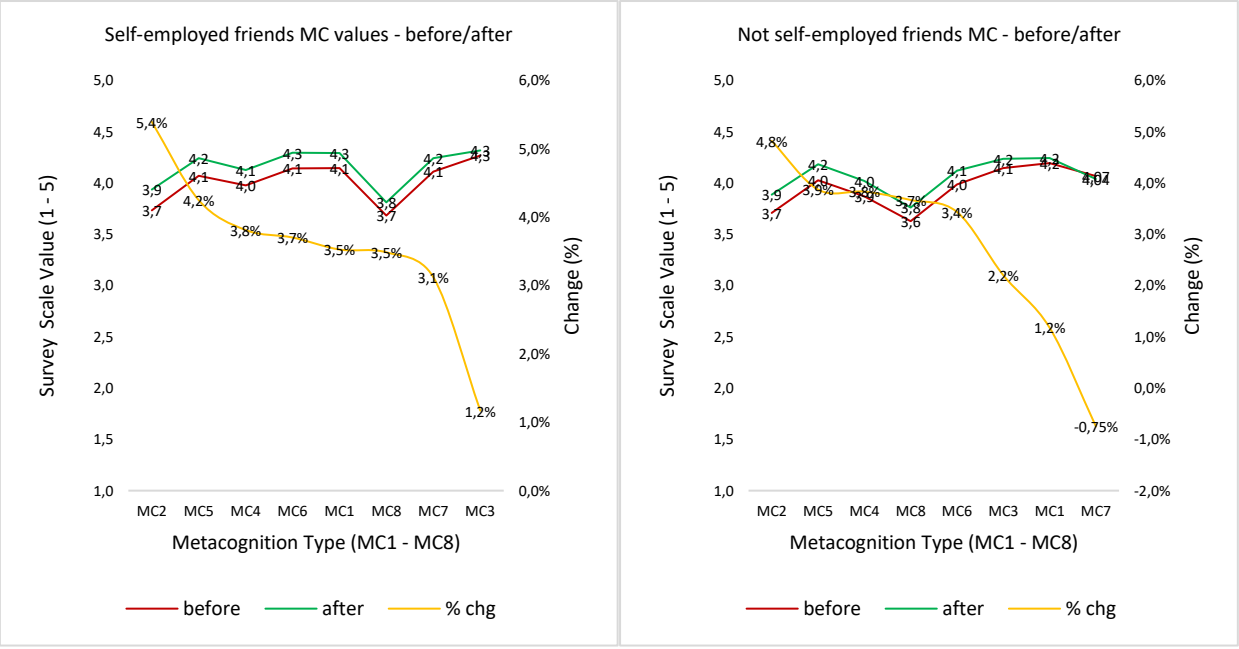

Figure 13. Self-employment MC avg. values, decr. ordered by change – Friends

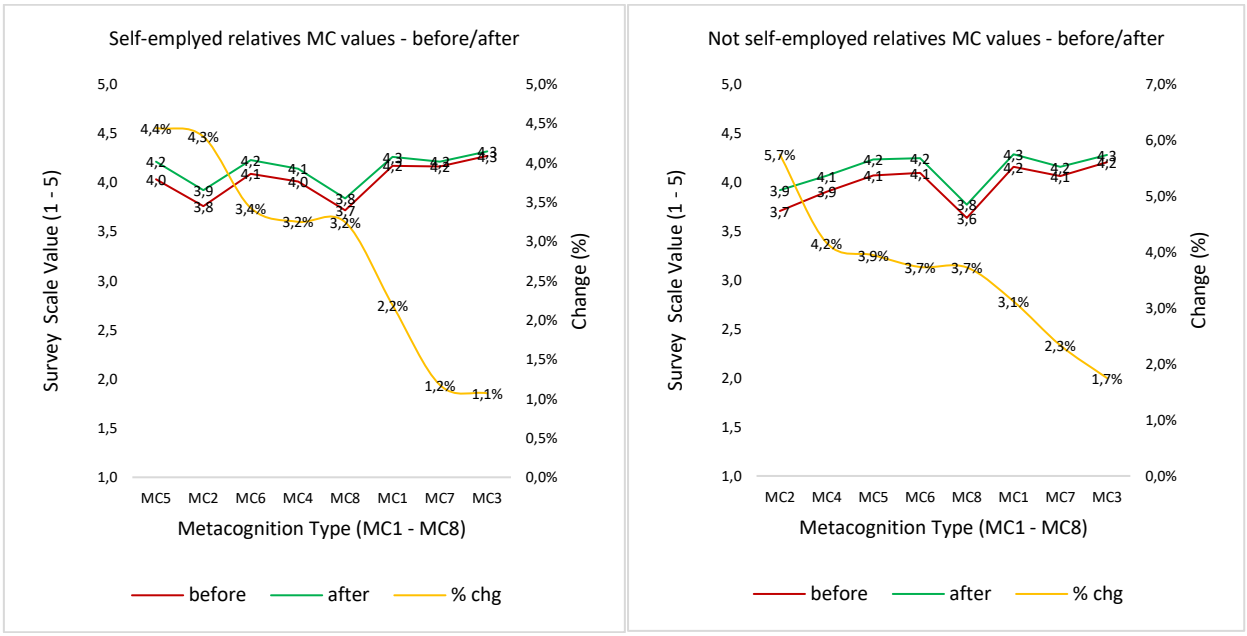

Figure 14. Self-employment MC avg. values, decr. ordered by change – Relatives

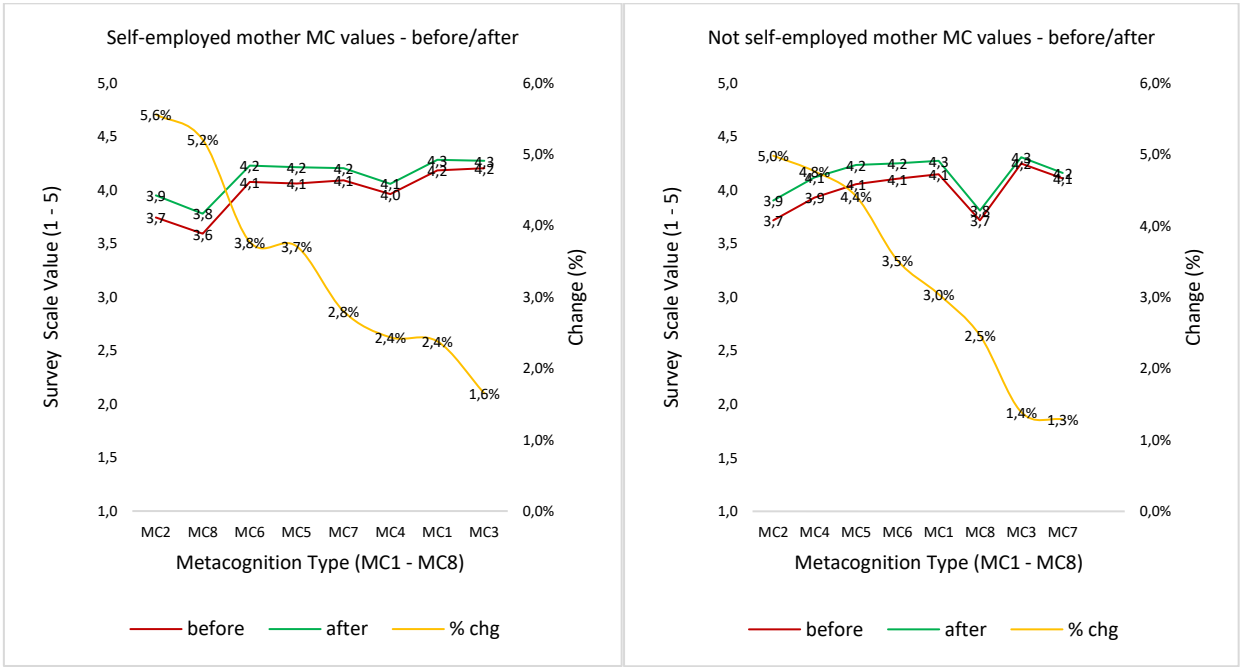

Figure 15. Self-employment MC avg. values, decr. ordered by change – Mother

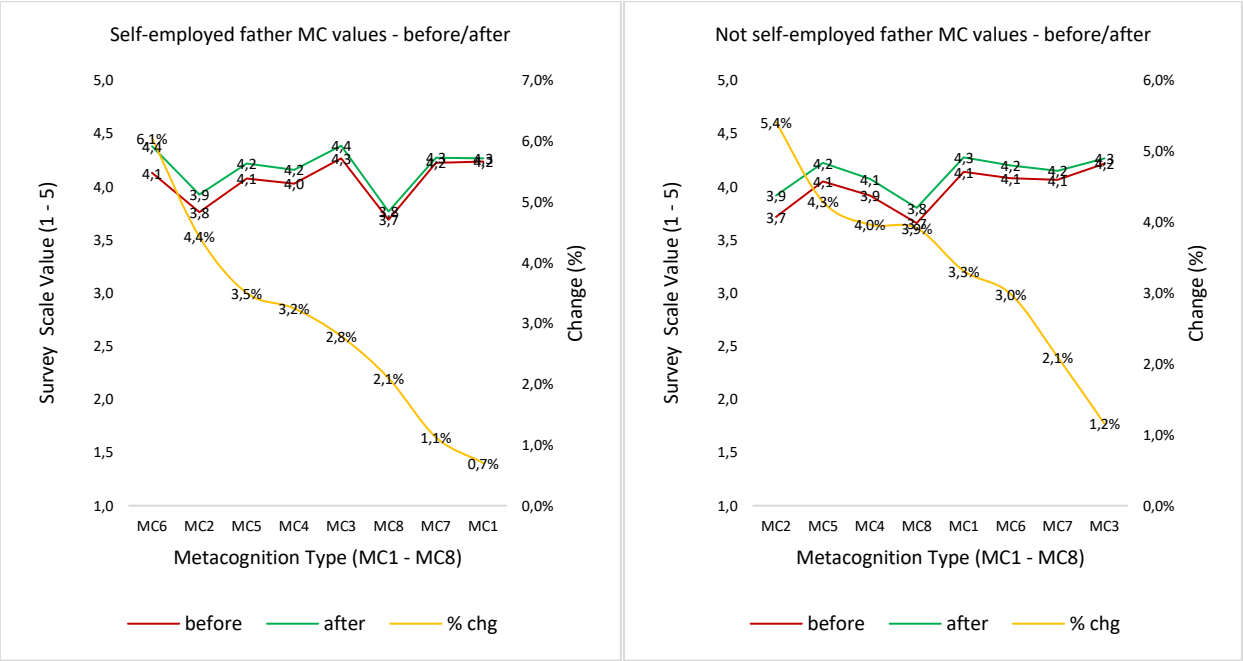

Figure 16. Self-employment MC avg. values, decr. ordered by change – Father

3.1.10. Previous entrepreneurial course MC levels (RQ10)

Intervention effects on students' MC levels were analyzed based on if they had taken part of an entrepreneurial course prior to autumn 2018. As seen on Table 40, all MC variables experienced an increase post intervention, which positively answers RQ10.

Table 40. Previous entrepreneurial course MC avg. values, pre & post EE intervention

MC	Have had entrepreneurial course			Haven't had entrepreneurial course		
	before	change	after	before	change	after
MC1	4,20	2,62%	4,31	4,05	3,25%	4,19
MC2	3,72	5,56%	3,93	3,74	4,17%	3,90
MC3	4,26	0,99%	4,30	4,13	3,07%	4,25
MC4	4,00	2,83%	4,11	3,78	6,97%	4,04
MC5	4,08	4,19%	4,25	3,98	3,93%	4,13
MC6	4,12	3,88%	4,28	4,01	2,80%	4,12
MC7	4,16	1,48%	4,22	3,91	3,24%	4,04
MC8	3,68	3,99%	3,83	3,62	2,16%	3,70

MC percentage changes based on previous entrepreneurial course were found to be comparable after intervention - see Table 41.

Table 41. Previous entrepreneurial course MC - changes

Prev. Ent. course	MC chg. (%)								Avg. chg. (%)
	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8	
Yes	2,62%	5,56%	0,99%	2,83%	4,19%	3,88%	1,48%	3,99%	3,19%
No	3,25%	4,17%	3,07%	6,97%	3,93%	2,80%	3,24%	2,16%	3,70%

Figure 17 shows students' previous entrepreneurial course MC level changes decreasingly ordered by change. Of all eight variables, MC2 and MC4 had the highest percentage increases in this case.

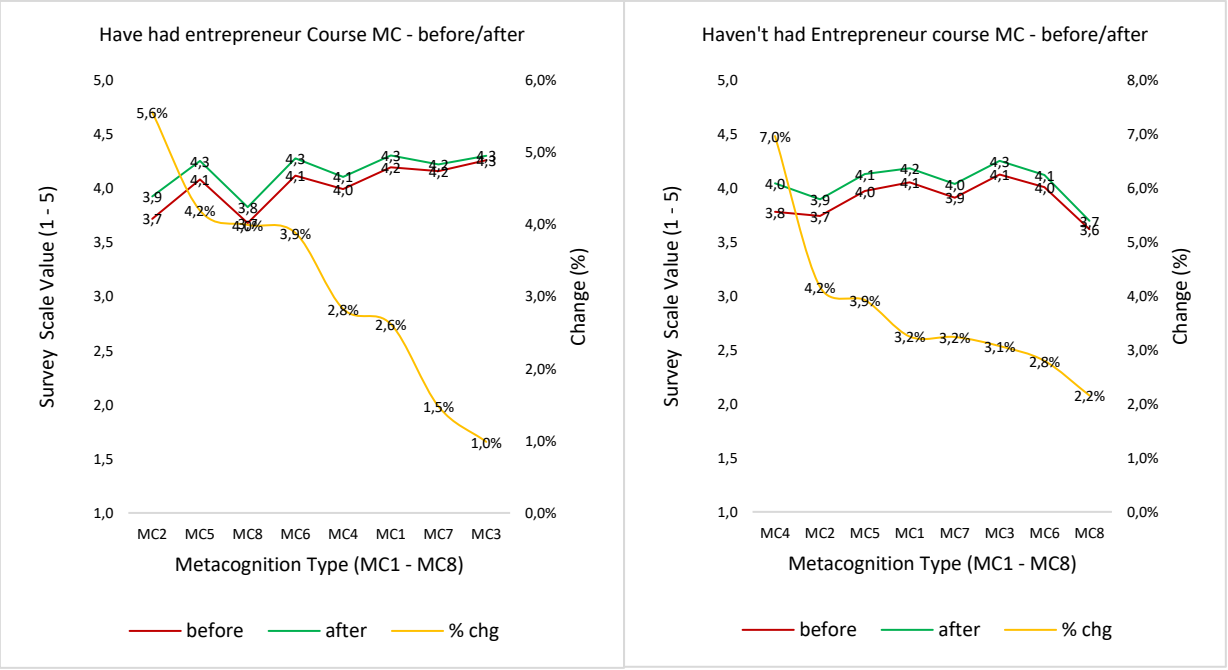

Figure 17. Entrepreneur course MC avg. values, decr. ordered by change

3.1.11. Entrepreneurial intention MC levels (RQ11)

Entrepreneurial intention was analyzed by asking students what would be their career choice after one (CC1) and five years (CC5); four choices were given to pick from, namely: employee, entrepreneur, work at family owned company and other. The results related to this inquiry are shown on Table 42.

Notice that after EE intervention, the percentage change of students intending to be entrepreneurs in one year (CC1) was less than 1%. This essentially suggests that the entrepreneurial course had very little impact on respondents' entrepreneurial intentions.

Furthermore, after EE intervention, the percentage change of students intending to be entrepreneurs in five years (CC5) decreased by more than 4%, which suggests that the entrepreneurial course may have had a negative impact on respondent's entrepreneurial intentions. It seems reasonable to say that the entrepreneurial course had a slightly discouraging effect on student's entrepreneurial intentions in the long term, with little effect in the short term. Consequently, RQ11 is negatively answered.

Table 42. Entrepreneurial intention - changes

N=824	CC1			CC5		
	before	change	after	before	change	after
Employee	550	5,45%	580	225	8,00%	243
Entrepreneur	127	0,79%	128	386	-4,40%	369
Family owned company	19	0,00%	19	34	-8,82%	31
Other	128	-24,22%	97	179	1,12%	181

Nevertheless, the percentage change of students intending to be employees as a career choice in the short and long term, did increase after the entrepreneurial course by 5% and 8% respectively. Additionally, respondents' intention of continuing as part of a family owned company did remain constant in the short term, while decreasing by close to 9% in the long term.

3.2 Results' Summary

Survey's results can be summarized as follows:

- Regardless of demographics, all general MC variables increased after the course; MC2 and MC3 experienced the highest and lowest positive changes, respectively. The entrepreneurial course had therefore a bigger impact on MC2 and a less positive effect on MC3.
- When grouping students based on their age, the highest positive influence on MC variables was seen on the 51 to 57-year-old range, with an average change of 17%. Contrarily, average MC values changed by -5% for the 41 to 50-year-old range after the course.
- Gender wise, all MC variables did increase after the course. Interestingly, average change was 2.3 times higher in females than males.
- Finnish, Lithuanians and Ukrainians as a group, had the highest average percentage change after the course. Estonians and Russians followed.

- EEK Mainor had the highest average change among schools, with MC variables sometimes experiencing double-digit increases. On the other hand, EBS had five out of eight MC variables with negative average change after the course.
- All five fields of study groups had their MC variables increasing after EE intervention. Degree wise, this was not the case with the Technical group having a negative change after the course, Master in contrast had the highest.
- Employed and unemployed students had all their MC variables increasing after the course, with comparable changes
- Excepting one, MC variables increased virtually for all students' self-employed friends, relatives and parents.
- Students that previously took part of an entrepreneurial course before autumn 2018, had all their MC variables increasing.
- After the course, students' near-term entrepreneurial intention remained essentially constant while decreasing by roughly 4% in the long term.

Table 43 summarizes all eleven answers related to the eleven research questions covered in this study, together with relevant observation(s).

Table 43. Research questions and answers

Research Questions	Increase of all MC variables	Observations
RQ1	Yes	MC2 experienced the highest change among all eight variables; MC3, the lowest.
RQ2	No	51 to 57-year-old range had the highest avg. change after the course, with 17%.
RQ3	Yes	MC average change was 2.3 times higher in females than males.
RQ4	No	Finnish, Lithuanians and Ukrainians as a group, had the highest average percentage change after the course.
RQ5	No	EEK Mainor had the highest average change among schools, with some MC variables having double-digit increase.
RQ6	Yes	MC2 experienced the highest change in three of the five fields of study.
RQ7	No	Master's degree had the highest MC change after the entrepreneurial course.
RQ8	Yes	Variable MC2 experienced the highest change among employed students.
RQ9	No	MC2 experienced the highest change in six of the eight graphs; MC3 was the lowest in five.
RQ10	Yes	MC2 experienced the highest change among those who took part of a business course before.
RQ11	No	Near-term entrepreneurial intention remained essentially constant while decreasing by roughly 4% in the long term

CONCLUSION

Five out the eleven (45%) research questions covered in this study were positively answered. In other words, the entrepreneurship course did positively impact all:

- General MC variables among students (RQ1).
- MC variables regardless of gender (RQ3).
- MC variables notwithstanding their field of study (RQ6).
- MC variables Irrespective of their labor situation (RQ8).
- MC variables regardless of if they had a course before (RQ10).

The remaining six questions where negatively answered because at least one MC variable experienced a decrease in value, after the course. Despite of this, the data has thoroughly shown that the entrepreneurship course evidently had a positive influence on practically all:

- MC variables regardless of nationality (RQ4).
- MC variables irrespective of school (RQ5).
- MC variables regardless of degree of study (RQ7).
- MC variables notwithstanding of self-employment status (RQ9).

When it comes to age range, the subject of RQ2, the data revealed that all MC variables for the 41 to 50-year-old range decreased after the course. The reason why this happened is not in the scope of this study but deserves to be further studied, in order to understand the negative impact Entrepreneurship Education had among these students.

Additionally, the entrepreneurship course had a rather discouraging effect on student's entrepreneurial intentions (the subject of RQ11) in the long term. This ought to be understood as it will offer hints on how to tweak the course, to more effectively encourage students to become entrepreneurs.

Answers to this study's research questions are based on a robust sample, comprising 824 participants with the only limitation that 95% of them are Taltech students.

This limitation can be surmounted by inviting more Estonian universities to be part of this research, in the future; that would also have the benefit of expanding the sample. Additionally, having more universities would also allow for comparison among them.

In conclusion, the effect of Entrepreneurship Education on metacognition among students of Estonian universities has been demonstrated as positive on mostly all the metacognitive variables involved in this research, notwithstanding demographics. EE's impact would therefore be enhanced by making it more metacognitive based.

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APPENDICES

Appendix 1. Online questionnaire for this research

Students were asked to rate 22 statements based on four factors being examined:

1.1 Factor Demographics, for which 6 statements were used to examine respondents' age, gender, nationality, university, field and level of study:

1.1.1 Age …….

1.1.2 Gender (F/M) …….

1.1.3 Nationality …….

1.1.4 School …….

1.1.5 Study field …….

1.1.6 In which educational level are you studying?

Bachelor	Yes/ No
Master	Yes/ No
Technical	Yes/ No

2.1 Factor Employment, for which 5 statements were used to analyze respondents' labor situation as well as self-employment situation of respondents' mother, father, relatives and friends:

2.1.1 Do you have a regular job next to your studies? Yes/ No

2.1.2 Is your Father currently self-employed? Yes/ No

2.1.3 Is your Mother currently self-employed? Yes/ No

2.1.4 Do you have other family who are self-employed? Yes/ No

2.1.5 Do you have close friends who are self-employed? Yes/ No

3.1 Factor Entrepreneurial Interest, for which 3 statements were formulated: 1 to analyze respondents' exposure to entrepreneurship courses; the other 2, to study respondents' career choice in 1 and 5 years:

3.1.1 Have you attended entrepreneurship education courses before (it is possible to choose multiple answers)?

I am currently participating at the entrepreneurship course and fulfilling the questionnaire	
I have not attended entrepreneurship education courses before.	
I have attended at least one entrepreneurship education course, which was an elective.	
I have attended at least one entrepreneurship education course, which was a compulsory part of my studies.	
I study according to a special entrepreneurship education program.	
I chose this university mainly for its good entrepreneurial reputation.	

3.1.2 Please indicate your career choice intentions right after graduation (CC1). Please choose 1 answer.

employee	
entrepreneur (founder of an enterprise)	
successor of family business	
other (do not know)	

3.1.3 Please indicate your career choice intentions 5 years after graduation. (CC5). Please choose 1 answer.

Employee	
entrepreneur (founder of an enterprise)	
successor of family business	
other (do not know)	

4.1 Factor Metacognition, for which 8 statements measured on a 5-point Likert scale[1] were formulated as a possible answer to the question "There are still situations in life that do not have simple solutions. How do you usually think and decide in such situations? Please indicate your acceptance or disagreement with the following statements":

	1	2	3	4	5
MC1: I usually analyze what I already know about this situation					
MC2: Normally, I realize how I am thinking of this situation (prejudices, etc.)					
MC3: If one way of thinking does not help me to understand the situation I think of alternatives.					
MC4: I ask myself questions to make sure I understand the situation					
MC5: I try to give sense to the new information using my own words					
MC6: I try to split up information into meaningful parts					
MC7: I try to determine which concepts I don´t understand well					
MC8: I admit that I might miss much of the new information					

[1] *5-point Likert scale: 1-totally disagree; 2-rather disagree; 3-neutral; 4-rather agree; 5-totally agree.*

Appendix 2. Description Statistics – General Metacognition Levels

Table 15. Metacognition levels descriptive statistics before (MC) and after (2MC) the course

N=824	MC1	MC2	MC3	MC4	MC5	MC6	MC7	MC8
Mean	4,16	3,73	4,23	3,94	4,06	4,09	4,10	3,67
Standard Error	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
Median	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
Mode	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
Standard Deviation	0,78	0,83	0,80	0,94	0,91	0,88	0,83	0,99
Sample Variance	0,61	0,69	0,64	0,88	0,83	0,78	0,68	0,99
Skewness	-1,15	-0,55	-1,01	-0,75	-0,75	-0,88	-0,83	-0,41
Range	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
Minimum	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Maximum	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00
Confidence (95%)	0,05	0,06	0,05	0,06	0,06	0,06	0,06	0,07
N=824	2MC1	2MC2	2MC3	2MC4	2MC5	2MC6	2MC7	2MC8
Mean	4,28	3,92	4,29	4,09	4,22	4,24	4,18	3,79
Standard Error	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
Median	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
Mode	4,00	4,00	5,00	4,00	5,00	5,00	4,00	4,00
Standard Deviation	0,76	0,76	0,78	0,84	0,83	0,80	0,83	0,94
Sample Variance	0,57	0,58	0,60	0,71	0,68	0,65	0,69	0,89
Skewness	-1,31	-0,58	-1,03	-0,80	-0,94	-0,97	-1,12	-0,57
Range	4,00	4,00	4,00	4,00	4,00	4,00	4,00	4,00
Minimum	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Maximum	5,00	5,00	5,00	5,00	5,00	5,00	5,00	5,00
Confidence (95%)	0,05	0,05	0,05	0,06	0,06	0,05	0,06	0,06

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