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"Understanding pupils' attitudes to e-learning in secondary schools: example of Moodle application in Tartu schools"

Master's thesis

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This thesis conforms to the requirements for a Master's thesis

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The thesis is 20.387 words in length excluding Bibliography and Appendix. I have written this Master's thesis independently. Any ideas or data taken from other authors or other sources have been fully referenced. I agree to publish my thesis on the DSpace at University of Tartu (digital archive) and on the webpage of the Centre for Baltic Studies, UT

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Abstract

This thesis aims to provide complex understanding of pupils' attitudes to Moodle in Tartu schools. With application of Theory of Diffusion of Innovations attributes of Moodle are defined and factors that might influence pupils' perception of Moodle are elaborated. It also aims to find out whether Moodle is used as collaborative or blended learning environment in Tartu schools. With the application of statistical package SPSS analysis is provided and the main results reveal that Moodle in Tartu is still on its initial stage of adoption. Teachers mostly use this learning management system for managing the course not for facilitating the study process. Thus, consequently, pupils don't deal with Moodle at the extent it should be dealt with and attitudes among them to Moodle are not formed. Attitudes to Moodle are formed only to that Moodle characteristics that teacher uses in classroom. Thus, investigating existed attitudes it becomes visible, that they all are positive, but weak. Negative attitudes are not revealed in study.

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I.   Introduction and Literature review

The rapid growth of development of information and communication technology (ICT) lead to introduction of e-learning environment into study process both in high schools and universities. The European Commission defines e-learning in the context of its E-learning Initiative as "the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration" (Straub, p.47). It covers set of technology based applications like computer-based learning, web-based learning, virtual collaboration and etc. The e-learning is viewed by Badrul as innovative approach for delivering well-designed, learner-centered, interactive and facilitating learning environment to anyone, anyplace, anytime by utilizing the attributes and resources of various digital technologies along with other forms of learning materials suited for open, flexible and distributed learning environment (Bardul, p.3) In support to this approach Eric Parks explains what the letter "e" means in the word "e-learning". He emphasizes "everything" – in the meanings, that e-learning implies not only online courses, but it also includes online assessments, instructions, learning materials, feedback, frequently asked questions and etc. "Everyone" is still underdeveloped, because access to e-learning is available through computers, internet and other devices, that are already widespread all over the world, but not available to everyone, who needs it. "Engaging" is another characteristic, that describes the learner's inspiration to get knowledge and new ideas and to share it with the others. "Easy" is referred to the necessity of developing of number of available tools for getting easy access to e-learning process, such as ReadyGo, for instance (Parks, 2009). Many educational institutions (universities, vocational schools, secondary schools, etc) incorporate e-learning in curriculum to facilitate students' learning process and enhance learning progress and final outcomes.

With implementation of e-learning, new challenges are faced by students and teachers on the way of learning process. Transition from traditional learning to

collaborative learning changes relationships between teachers and students – teachers become learners as well as students. Teachers face new technology; they are responsible for its proper utility in the classroom. Often it causes difficulties with its implementation, because of lack of knowledge. Sometimes digital division also happens among students – some of them know, some of them don't know how to use technology. Some teachers continue to use traditional pedagogy implementing it into e-learning, some of them change their roles as facilitators in introduction of e-learning, adapting and designing new educational environment. Implementation of e-learning into regular teaching causes blended environment, where face-to-face interaction between students and teachers are supported with learning management system. Teachers are also responsible for developing of effective and well-designed online course. In order to meet these challenges Learning Management Systems are applied.

There is no universal definition for the Learning Management System (LMS), but the most typical one claims, that it is a software application, that automates administration, tracking and reporting of training events (Ellis, p.1). LMS is usually web-based software for facilitation of the access to learning content. It is used not only by the educational institutions to support classroom teaching, but also in corporations and different organizations through courses, that offer compliance training to their staff. LMS is environment that contains all the aspects of learning process – learning instructions, assessments, evaluation of progress. It delivers content and handles course registration. According to Watson (2007), the general characteristics of LMS are following: instructional objectives are tied to individual lessons; lessons are incorporated into the standardized curriculum; courseware extends several grade levels in a consistent manner; management system collects the results of students' performance; lessons are provided based on the individual student's learning progress (Watson, 2007:28). The main functions of LMS are following: student registration and administration; training event managing (scheduling, WBT (web-based training) delivery); on-line assessment; curriculum management; skills management; reporting; training resource management (instructions, equipment, facilities); courseware authoring. (Kerschenbaum, p.5)

LMS also provides collaboration among the participants of learning process with chats, forums or wikis in order to ensure interaction between students, or other

participants. Student may also have possibility to contact with the course instructor whether via e-mail or chat room (Iqbal, 209). It also allows students possibility to upload their assignments. These assignments have to be assessed and evaluated according to special mechanisms, provided by LMS. Additionally, LMS provides possibility to maintain students profiles, with their personal data, their grades, attendance lists, grades, assignments (Iqbal, 210). One of the most effective, modern and widely applied Learning Management System is Moodle.

Estonia is considered to be the leading country in development and adoption of new technologies. "From Estonian point of view, where you have this existential angst about your small size – we were at that time 1,4 million people – I said that it is exactly what we need. We need to really computerise, in every possible way, to massively increase our functional size" – quotes the president Toomas Hendirk Ilves the journalist T. Mansel (2013). In educational sphere application of new technologies also took place. Online schools were established through the mediation of Tiger Leap Foundation – organisation, that aimed to increase of Estonia's education system through use of ICT (Designing the future classroom, 2012). It was founded in 1996 and its initial aim was directed on establishment of hardware for using ICT, thus to the end of 1990s all Estonian schools were provided with computers (Mansel, 2013). Later on, the shift of TLF changed to software and educational programs. As Mansel claims, specialists from TLF started to teach programming in secondary schools and there is evidence of it in school in Ladegi, where 10 years old pupils are able to design computer games (Mansel, 2013).

In 2014 Ministry of Education and Research of Estonia launched The Lifelong Learning Strategy 2020. The main goal of this strategy is to provide moving towards knowledge and innovation-based society. Within this strategy digital focus is highlighted. The main tasks are to incorporate digital culture into the learning process, to support digital learning resources in schools, to provide access to modern digital infrastructure for learning and to create assessment models for digital competence (Estonian Lifelong Learning Strategy 2020, p 14-15). In order to achieve these tasks such activities will be provided: ICT studies in primary schools, secondary schools and vocational schools will be updated; training courses will be launched in order to enhance teachers' digital competence; The Ministry of Education and Research will

define the quality requirements for digital learning resources and will provide conditions for authors of digital learning resources to compile instructions; opportunities for using modern technologies will be created in the classroom; existing learning systems will be modified and applied; pupils' digital skills will be examined at the end of 3 (15-17 years old or 7-10th form)and 4 (17-19 years old or 11-12th form) stages of school. The strategy was launched in February 13 2014 and all these activities are planning to be introduced into life until 2020 (Estonian Lifelong Learning Strategy 2020, p 2). As far as a lot of work is planned to be implemented during this period the present research may assist at the starting point Tartu County government, local government or supervisory bodies of schools in Tartu to take into account the results on pupil's attitudes and take arrangements on the way of implementation of the Strategy. It also may contribute to steering committee, that every two years will observe implementation of the strategy and if necessary make corrections and revision of the strategy (Estonian Lifelong Learning Strategy 2020, p. 20). Additionally, every separate teacher who uses Moodle in his class can take into account what children like and dislike about Moodle and improve his course or methods of teaching. These implications make present study relevance and significant. The research is conducted in Tartu, because this town has a reputation of a center of Education in Estonia. Since 2001 Ministry of Education and Research of Estonia is situated in Tartu. Additionally, more than 60% of Estonian research is concentrated in Tartu (Business Tartu). According to the Plan for Tartu Development 2013-2020 outstanding and professional teachers and scientific researchers from all over the world are working in educational institutions in Tartu. Tartu has international open educational network that links different levels of education and creates competitive education (Tartu linna arengukava, p.40). These facts lead to conclusion, that Moodle should be actively used in educational institutions, and in schools, particularly. My personal interest of this research lays in the possibility to apply Moodle in Ukrainian schools. If it works out in Estonia, Ukrainian governmental bodies responsible for reformation of education system in Ukraine could use this study and adopt experience of Tartu schools in promotion e-learning in schools in Ukraine. Originality of the research is explained by its contribution to Moodle research in Tartu, and Estonia, particularly. Not so many studies where done in this particular sphere – understanding pupils' attitudes to Moodle.

Research among attitudes to Moodle in Estonia was conducted among the pupils of Järvamaa vocational school by Viive Karusion in 2013 (Karusion, 2013). The results of research showed that, generally, attitudes to Moodle were positive. The author specified that to that moment 1/10 of pupils didn't have computer and Internet access and were dependent on school allowances. More than half of pupils preferred e-learning in combination with traditional learning and ¼ of them didn't express willing to continue to use e-learning for educational purposes. Additionally, pupils who felt uncomfortable to use Moodle expressed their negative attitude to it. The most complicated interaction in Mooodle was in courses, related to use of numbers, the courses where teachers' explanation of material in class was needed. It was also highlighted, that attitudes were better among girls rather than boys. Generally, pupils expressed their willingness to use Moodle further with application of graphs, tables, pictures and etc. As a conclusion the author mentions that usage of Moodle in vocational schools is justified, because pupils are open and ready to new learning environment (Karusion, 2013)

Among university students attitudes to Moodle were observed by the student of the University of Tartu Kadri Hendla within the framework of her research project "E-learning: Study with one course and two environments" (Hendla, 2007). Students' attitudes were measured in the context of comparison between using of Moodle and WebCT. The main implications of this study are also positive. Students from University of Tartu found Moodle attractive learning environment, user-friendly and well structured. Although, in comparison to WebCT Moodle concedes, because to that moment students were more familiar with WebCT, rather than with Moodle.

Taking into account studies about Moodle in Estonia and the positive outcomes of these researches this particular study is aimed to provide complex investigation of pupil's attitudes to Moodle within framework of secondary schools in Tartu.

Research questions

Based on popularity of Moodle among students worldwide and their generally positive attitudes to it the present research will also concentrate on attitudes to Moodle. Research questions are generated in compliance with theoretical approach applied in

this study. The first research question "What are the factors that form pupils' attitudes to Moodle?" aims to find out possible factors that form pupils' attitude to present technology. Second research question "Which of the factors cause positive and negative attitudes?" aims to find out what pupils like and dislike about Moode. Third research question "Whether attitudes between younger and older students towards Moodle are different or not?" aims to compare attitudes between pupils who have been using Moodle for a long time and those pupils who recently started to use it. Fourth research question "Whether more experienced pupils have better attitudes, than less experienced"? Within frameworks of this question it is planned to determine the level of innovativeness of pupils, in accordance with theoretical approach. Fifth question "What Moodle collaborative characteristics are needed to pay attention?" aims to investigate what attributes of Moodle are not properly used. Broader explanation of research question is provided in methodology section.

The main research method of the study is quantitative cross-sectional correlational analysis. Research provides examination of the same variables among groups of pupils, in classrooms, at the same period of time. Quantitative correlational analysis is conducted in SPSS – software package for statistical analysis in social sciences with application of Pearson's correlation coefficient, chi-square test, cross-tabulation, comparing means and frequency distributions.

The structure of the study consists of introduction, that overviews introduction to the topic, significance and originality of research, presents brief overview of research questions , research aim and research methods, presents literature review and background sub-chapter, that explains the relevance of Moodle; theoretical approach, that overviews existing popular theories in related field of study, explains the reasons they are not suitable for preset study and justifies the choice of theory applied in the study; methodology section, that presents the steps undertaken during the research conduction and provides broader explanation of research question; empirical data section that describes findings collected for provision of research; discussion section that provides analysis of data on the basis of presented methodology and theoretical approach; conclusions, that summarizes the outcome of analysis in study.

Limitations of the study are related to small sample size that was created in accordance with necessary techniques to make it statistically significant and to make it

possible to rely on it while making generalization about the whole population. This limitation is caused by the difficulty to reach respondents and provide them with questionnaires. Another limitation is caused by the insignificant use of Moodle in schools that consequently doesn't lead to formation of attitudes, thus doesn't give possibility to provide overwhelming analysis on attitudes. Additionally, dependent variables, that were elaborated to find out factors that influence attitudes might not be enough, and another variable might be determined and tested.

Background sub-chapter

What is Moodle and Why Moodle?

Moodle is e-learning platform designed to provide educators, administrators and learners with a single robust, secure and integrated system to create personalized learning environment (About Moodle). It was created by Martin Dougiamas, Phd student from Curtin University of technology in Australia (Dougiamas). Moodle is easy to use – it has simple interface that facilitates usage of Moodle. It is translated into 95 languages that facilitates its localization; it is free – there is no need to pay license fees, it is provided as Open source software, under GNU General Public License; it is constantly reviewed and modified in order to comply with users needs (About Moodle). When looking at the official Moodle web-site, the first statement, that strike one's eyes is "Welcome to the Moodle community and discover the value of an open, collaborative effort by one of the largest open-source teams in the world" (Moodle). According to the latest statistics presented in Moodle official web-site, it is being already used in 232 countries with overall 7, 445, 474 registered courses in which 69, 918,972 users are participating (Moodle Statistics). It constantly develops and improves and number of users increases.

Moodle was created in compliance with "social constructionist pedagogy". It can be explained by four main concepts: constructivism, constructionism, social constructivism and connected and separate behavior. Constructivism occurs when learners get new knowledge while they tackle with their environment. Everything that person can read,

see or feel can be tested through his mentality and create a new knowledge for him. It becomes more relevant when person can use this knowledge in practice. Constructionism implies creating knowledge, that is useful to the others. For instance, it can be retelling of the text, explained by the own words, or creating a slide presentation. It is useful not only to the peers, for whom it is done, but also to the person who does it himself. Social constructivism occurs when constructivism is applied within social environment, when culture of shared values emerges. Separate behavior occurs when the person tries to defend his own ideas and point of view while he faces his opponent's ides. Oppositely, connected behavior occurs when the learner tries to understand the opponent's point of view through asking questions and listening to him. Sometimes mixed, constructed behavior occurs, when person is flexible to both types of behavior and applies that one suitable for situation (Pedagogy, Moodle).

There are collaborative activities in Moodle, such as forums, wikis, glossaries that facilitate interaction between participants of the learning process. It gives possibility for them to share their experience with the others and it makes the borders between teacher and students more transparent – it is possible to allow students to maintain forums, to create quiz question, etc. To the issue of creating something for the peers in Moodle forums and wikis are also suitable – they provide space for discussion, sharing the documents and media. There are also glossaries and databases, that are collaboratively built and can be edited and expanded later during the studying process. Moodle also allows for participants to observe activity of their peers. There are Online User blocks, that give possibility to watch who is in the system in the very moment or a time ago. It is impossible to see the others' grades, but it can encourage students to do their assignments or tests, when they see, that their peers were on-line and, admittedly had already done their tests. Moodle gives possibility to learn more about peers or instructors through their user profiles, where they can post their data about previous experience and background; individual blogs, where they can express their opinions and view in better way they do in forums and chats – there is also possibility to comment such posts. It is also possible to connect Moodle with social media accounts or other web-sites (Pedagogy, Moodle).

Both teachers and students can easily include video, audio files or images into the lesson.

Moodle activities

There are number of features in Moodle that facilitate pupils' interaction with classmates and teachers. They are: assignments, wiki, chat, choice, database, lesson, glossary, survey, workshop, feedback, quiz, forum.

1) Assignments allow pupils to submit their final papers, essays and another tasks within this module. It is visible only for teacher and not to the other pupils, unless it is a group assignment. Through "assignment" teacher also can provide review and feedback, to correct mistakes. It is possible to submit an assignment of different format or just type it in Moodle, if needed (Assignment module, Moodle).

2) Chat module is used for real-time discussions, that leads for better understanding the topic. It is possible to manage and review topics (Chat module).

3) Choice module is used by teacher in order to define the direction of the course or the topic. To obtain this purpose teacher creates multiple-choice questions in order to get responses (Choice module, Moodle).

4) Database activity allows to create a bank of record entries on specific topics ir entire course, that may consist of files of different formats – images, videos, audio files, web-pages, text documents (Database module, Moodle).

5) Survey module allows to gather information to assess the course. Questions for conduction of the survey are already generated in Moodle (Survey module, Moodle).

6) Feedback module is also conducted to collect data about the course. In comparison to Survey it's possible to create own questions, rather tan use generated by Moodle questions, as well as to use non-graded questions (Feedback module, Moodle).

7) Forum module is the space where pupils and teacher communicate through posting the comments on different topics. Every participant can manage forum and create new topic (Forum module, Moodle).

8) Glossary module allows to create lists of terms and definitions, like vocabulary or dictionary. It can be managed by the teacher as well as by pupils themselves (Glossary module, Moodle).

9) Lesson module is represented by the HTML pages with definite content on the topic, under which questions are presented. Depending on the choice of questions pupil makes Lesson promotes him further to the next pages. Teachers comments and following feedback differ depending on pupils choice of questions (Lesson module, Moodle).

10) Quiz allows teacher to create questions for assessment of pupils knowledge on the course or topic. It can contain different type of questions: open-ended questions, true-false questions, multiple choice questions and etc. It also can be introduced with possibility to take multiple attempts (Quiz module, Moodle).

11) Wiki - is a collection of web-documents, developed to create content on the definite topic or course. Every pupil can manage Wiki page and create his own page or together with the whole class (Wiki module, Moodle).

12) Workshop module is a collaborative tool, that gives possibilities to assess peers. Pupils submit their papers (texts and attachments) online and module randomly chooses peers' works to evaluate. Pupil gets one grade for his own work and another grade for assessment of his peers. This module implies training beforehand in order to be familiar with steps necessary to be taking for evaluation (Workshop module, Moodle).

With all above described characteristics of Moodle's collaborative activities it becomes obvious that Moodle is suitable platform for application in schools in order to develop necessary skills among pupils. Using Moodle pupils learn how to communicate with people, they learn to talk in front of public while they share their opinion, make presentation, work in group discussion; they develop their technical skills; they learn skills for critical analysis and reasoning; they learn assessment skills, they learn to be responsible for building new knowledge. That is the reason why present research is conducted in schools, not universities, where most of adult students already gained these skills and where Moodle is mostly applied as software for access to learning content. Additionally, in 2014 Moodle was ranked 12 place in Top 100 Tools for Learning. Research was made among 1,038 participants from 61 countries. Such a high

recognition of Moodle on the global scale leaves no room for doubts whether Moodle is appropriate learning tool or not (Top 100 Tools for Learning 2014).

A number of studies were done in different angles related to Moodle, and attitudes of users were also investigated in different countries. One of such researches was done in Malaysia by Ghani (2011). In that study students' experience in using Moodle was examined and the factors, that influenced attitudes to Moodle were revealed on the basis of Rogers's theory of diffusion of innovations, that is disclosed in chapter with theoretical framework. As it appeared students had positive attitudes towards Moodle and were enthusiastic to use it further. Attitudes of teachers were also mentioned in study – they had less positive impression towards Moodle. The main reason is time consuming work to implement the course and to keep in touch with students' needs, because they could reach teacher through Moodle at any time. (Ghani, 2011). Another research was done in the United Kingdom by J.Osgerby "Students' perceptions of the introduction of a blended learning environment: an exploratory case study" (Osgerby, 2012). The study was done by means of focus groups, that participated in accounting and financial management course, that was established through blended learning approach using Moodle. Students shared their opinions towards use of Moodle and generally, they found this learning management system useful and skills developing – they were satisfied with accessibility of learning materials and ability to fulfil assignments online. All the students confirmed their technical skills improved. But the obstacles were also faced. Students faced difficulties with use of spreadsheets and were disappointed with lack of exploitation of ICT by university as well as some teachers were hard-to-reach. They also didn't find Moodle useful in organisation of collaboration between students, as they contacted each others via mobile or social media. Some of them were suspicious about use of Wikis, because many of them associated it with Wikipedia, that is not academic resource and the validity of Wikis made by others was also mistrustful. (Osgerby, 2012) Another study done in UK, that highlights students' attitudes to Moodle was carried out by students themselves, from Cass Business School "The use of Moodle at Cass Business School: a student perspective" (L. Norris, L. Sporre, D.Svendsen, 2013). The study was done among the final-years students, who had experienced usage of Moodle environment during three years. The main implications of study were generally positive, but recommendations how to improve

Moodle functionality were also done. With the help of questionnaires, distributed among the participants the authors found out, that students were willing to integrate their timetable with Moodle in order not to look for it on the other sites. But directly in Moodle. They also made recommendations to academic staff to give them minimum requirements on how and what to upload in forums and calendar. In the regard of assessment and feedback Moodle was recommended to be obligatory for students in order to improve the course further. Forums should also be compulsory for interaction between students on the course related topics. The authors also came to conclusion, that as a collaboration tool Moodle would still have competitors in social media, like Facebook or Google+, that's why they recommended to create a link between them (L.Norris, L. Sporre, D.Svendsen, 2013). Very few studies were done in the sphere of pupils' attitudes to Moodle. The one that deserves attention was done also in the UK, Haslemere in St. Ives School "A virtual learning environment in primary education" (Berry, 2005). The research was done by the Maths teacher through pilot study in the 5th and 6th forms. During the study pupils were involved in forum discussions and making assignments together. The teacher provided immediate answer, thus they learned both from teacher and their peers and could review those assignments at home before they did home assignments. They also built their own Wiki together. The teacher installed the links to general Internet resources – Google search, math dictionaries and Wikipedia. During their work with Moodle pupils improved their typing and computing skills and also learned the basics of software development. When the questionnaire was provided to pupils, they defined that they did their homework with Moodle faster and easier, than without it; they also found out, that using Moodle is fun and many of them were willing to use it in other subjects. Due to positive results of the study, the teacher continued to use Moodle in his courses and shared his experience and knowledge with other teachers (Berry, 2005).

I.   Theoretical framework

Research studies made on measurement of attitude towards e-learning and its adoption/non-adoption in schools and universities in different countries and period of times were conducted under different theoretical approaches. One among the most popular theory applied is Technology Acceptance Model – TAM. It was developed by Roger Davis in 1986 (Rao, p.63). This model claims that attitudes to innovation depend on such factors as Perceived Ease of Use and Perceived Usefulness. Perceived Usefulness is a degree to which a person believes that using of particular technology would improve his job performance. Perceived Ease of Use is the degree to which a person believes that using of particular technology would be of effort (Rao, p 63). According to this model ease of use of innovation and its usefulness will lead to positive attitude to it. Notwithstanding this model is widely applied to study adoption of e-learning it's not very suitable in present research due to the reason that it doesn't take into account influence from leader's opinion and importance of time, that are important factors when we talk about Moodle. Additionally, only two factors – ease of use and usefulness will not provide complex understanding of attitudes.

Another theoretical model that is often applied to technology research is Theory of Reasoned Action. It served as the basis for the TAM. The main implication of the theory is that individual's actual behaviour is defined by person's intention to perform the behaviour and this behaviour is influenced by individual's attitude (Rao, p.63). This model is not very suitable to apply to pupil's attitudes measurement, because pupils' behaviour – usage of Moodle doesn't depend on their attitude to it. It is obligatory for them within their social system and they will use it anyway, whether their attitude to Moodle is positive or negative.

The most suitable approach to study pupil's attitudes to Moodle is Theory of Diffusion of Innovations (DOI). One of the most peculiar character that diverse this

theory from another approaches is that it takes into account the process of diffusion of technology and not only it's adoption. As it was mentioned already, in Estonia Lifelong Strategy was adopted and according to this strategy e-learning will be implemented into study process during the period until 2020. Thus, it becomes obvious that process of Moodle diffusion is still ongoing in Estonia and this approach is most suitable to apply. Additionally, there is criticism among researches who applies DOI to study attitudes to technology that is already adopted. It leads them to choose successful innovations and consequently, the final outcome of the results is positive attitude to innovation. (Rogers, p.95) It refers to so called pro-innovation bias – implication, that research should be done when innovation is successfully diffused and adopted within social system participants. (Rogers, p. 92) Implication that innovation can be rejected or re-invented is not taken into account. Individual-blame bias also exists. It refers to research that mainly concentrates on those agencies that provide innovation, rather than the audience for whom innovation is provided (Rogers,p.103). It also makes research irrelevant and this bias is also avoided in present research. The main audience is pupils for whom Moodle is provided. Problems in measuring time of adoption exist. As it is considered that diffusion occurs through time, the researchers are dependent on recall data from adopters of innovation as the first date when innovation was adopted by them. (Rogers, p. 112) And often this data can be wrong that also undermines its relevance. Such problem is also avoided in present research, because Moodle is new innovation and pupils remember the day they started to use it. Additionally, they started to use it all together at the same day, for instance, on the 1st of September when they proceeded to the 8th form. Damsgaard and Lyytinen in their study "What's wrong with the diffusion of innovations theory?" by the example of Electronic Data Interchange (EDI) proved that Diffusion of Innovation Theory is not appropriate to analyse adoption of complex and networked technologies. Such technologies at the same time may consist of electrical supply systems, chemical industries and transportation systems (Damsgaard, p. 3). They are messy and difficult to control. They may have different regulative bodies and may diffuse through different social systems at the same time. Thus, multi-level approach to analyse such technology is needed. Moodle is not complex and networked innovation and this approach is suitable to apply.

The theory of Diffusion of Innovations

The theory of diffusion and innovation by Rogers is the framework for measuring pupils' attitudes towards e-learning. As Rogers notes, diffusion itself is the process by which an innovation is communicated through channels over time among the members of social system. (Rogers, p.5). It is perceived, that communication is realised through interaction between, at least, two people in order to exchange new ideas and, in present case, exchange of technologies and innovation. The term "diffusion" is used in order to underline that the process of exchange of technologies can be both spontaneous and also planned (Rogers, p.7) There are four elements of the theory, that Rogers provides in the definition: innovation, communication channels, time and social system.

1.1 Innovation

An innovation is an idea, practice or object, that is perceived as new by an individual or another unit of adoption (Rogers, p.11). It doesn't mater if the idea was discovered recently or a long time ago, if it is new to the individual, it is innovation for him. The innovation can also create some feeling of uncertainty among the potential adopters. The reason lays in their incertitude and doubts if they really need this innovation and reliance on the efficiency of previous practices. On the other hand, new innovation may reduce uncertainty to use it when they start to seek information about its advantages and disadvantages and confirmation on its capability to solve their problems. When information on innovation is collected and analysed, uncertainty reduces and decisions whether to adopt new technology or reject it is made.

In the present study innovation is Moodle. The analysis of pupils attitudes will show whether Moodle creates uncertainty or not.

1.2 Communication Channels

Communication channel is inalienable part of innovation diffusion process, because it implies process of exchange of information, new ideas between two or more participants. When we speak about communication we tackle with the idea or innovation we communicate; an individual, who has knowledge and experience about it

and exercises this communication; an individual, who doesn't have knowledge about it; and communication channel that connects these two individuals (Rogers, p.17). Communication channel is the tool, that is used to transfer the message. The most typical communication channel is mass media channels. Such channels involve radio, television, newspapers, which enable a source of one or few individuals to reach an audience of many (Rogers, 18). Another channel is interpersonal, that implies face-to face exchange of information. This type of communication channels is more effective in persuasion to adopt new technology, because it is direct interaction between two and more individuals.

In theory, Rogers points out that the basis of effective communication between individuals lays in their similarity: social status, rank, education, religious beliefs and etc. It allows individuals to be on the same "wave" and to avoid contradictions between them on the basis of different technical awareness. At the same time, when people are alike no diffusion of innovation occurs, because there is no new information to exchange between these people. That's why effective innovation diffusion can be held, when people are different in their social status, education and beliefs (Rogers, p.19) In the present research the main communication channel between teachers and learners is face-to-face interaction. Pupils don't decide to use Moodle because they hear about it on the radio or read about it in newspapers, they use Moodle, because the teacher insists on using it. Teacher explains to pupils how to use this technology. Also pupils, who better understand how to use it explain it to pupils who have difficulties with using it.

1.3 Time

The time dimension is also important when we speak about diffusion of innovations. To be more discrete, it involves innovation-decision process and innovativeness.

1.3.1 The innovation-decision process

The innovation-decision process is the process through which an individual passes from the first knowledge of innovation to forming an attitude toward an innovation, to a decision to adopt or to reject, to implementation to the new idea, and to

confirmation of this decision. (Rogers, 20) At the first step, individual gains knowledge about innovation and its functions. The next step implies persuasion, when individual forms attitude towards this innovation – whether it is favourable or not. Later, decision whether to adopt it or reject occurs, when the person directly involves with the innovation and has the notion how it works. The next stage is implementation, when individual adopts innovation and starts to use it and the last one is confirmation when he seeks reinforcement of an innovation decision, that he has already made. (Rogers, p.21) These stages are consistent and it takes definite period of time for individual to move from one stage to another. In this sense the concept of time is important. In the context of present research not all the stages of innovation-decision process is suitable for pupils. Pupils gain knowledge from teacher how to use Moodle, they form their attitudes to it when they start to work with it, but the decision whether to implement it or not is under teachers' responsibility. But this aspect doesn't matter a lot due to the reason, that this study aims to measure attitudes and not motivation to use technology.

1.3.2. Innovativeness

Innovativeness is a degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas, than the other members of the system. (22) There are several categories of innovativeness, that define whether the person is familiar with innovation or not. The innovators is the first category and they are probably, the most relevant elements in this line of adopters, due to their risk while dealing with innovation. They are those persons who launch the new ideas and spread them among the social system, thus launching the diffusion of innovation. Innovators often tackle with high degree of uncertainty and sometimes, financial losses, in case of failure of new idea (Rogers, p. 248). The next category is early adopters. In comparison to innovators, who are cosmopolites in social system, early adopters are relevant in the local scale. Usually, potential adopters apply to early adopters in order to gain support and information about innovation. They often hold leadership positions in society and are respected by their peers. Early adopters are also involved in evaluation of innovation and they speed the diffusion process. The early majority is that category, who adopt

innovation before the average member of social system does it (Rogers, p. 249). These people usually adopt new innovation after the time-consuming process of testing it. They are connection link between the innovators and the late majority. The late majority is that category of people who adopts innovation after the average member of society does it. These people are sceptical about new technologies and adopt it in case of necessity and pressure from society. They need guarantees, that innovation adoption is safe and favourable for them. Laggards are the last who adopt innovation. Such individuals are attached to their traditional views and the practice they had experienced before. Their resistance to adopt new innovation can be explained by the lack resources, either financial or intellectual, and they need to be sure in reliability of innovation (Rogers, 250). According to this classification pupils will be allocated to the category they correspond to in accordance with their attitudes and period of using Moodle. Such mapping out will help to see the general picture of attitudes to Moodle in schools. Although , again, in this case not all categories can be applied to pupils due to the framework of social system where diffusion occurs – classroom, where teacher is leader and makes decisions and is considered to be innovator.

1.4. Social System

The last element of the diffusion of innovation is social system. This system includes individuals, organizations, subsystems, groups of individuals – they all are unified by the necessity to solve the common problems. The social system is relevant in the process of innovation diffusion, because it creates conditions and circumstances within which the diffusion occurs. When social system is applied to innovation we need to understand how social norms affect diffusion, what is the role of opinion leaders and what the types of innovation decisions are made. In present research social system is classroom. Getzels defined classroom as a unique social environment unlike most others. The learning is the main objective, mandatory participation of its members is regulated by the law (Getzels). It's a network of interrelationships between group members within classroom, that creates link between them. Teacher-pupil and pupil-pupil interactions exist in this social system. This is how traditional classroom looks like. Moodle pedagogy, as it was mentioned, is based on social constructivist

philosophy, where the roles of teachers and pupils change and both become participants of learning process. Such collaborative learning allows pupils to create new knowledge through community interaction. This research will observe whether Moodle in Tartu schools indeed replaces traditional learning with collaborative learning and thus creates new collaborative community.

1.4.1. Systems Norms

Systems norms also play crucial role in innovations adoption. Norms are established behavior patterns for the member of society (Rogers, p.26) They define an acceptable way of behavior, that is appropriate for social system. They emphasize the type of behavior expected from each member of the system. In different social systems, systems norms may rather facilitate or harden the diffusion of innovation. It may be related to religious or cultural beliefs, that don't accept innovation, if it contradicts to their systems norms. Systems norm may influence attitudes to innovation. Attitude is organization of beliefs, feelings and behavioral tendencies towards socially significant objects, groups, events or symbols. It is a general feeling and evaluation, positive or negative, about some person, object or issue. (Hogg, p. 148) Formation of attitudes is influenced by person's experience, whether it is personal experience or just observation. TV advertisement may significantly influence person's attitudes. While he watches an attractive picture on TV he can get positive attitude towards this product. Very often attitudes are formed though experience of people surrounding the person. Their attitudes towards object lead to adoption of the same attitudes of the person. It is visible in relation of children and their parents. Most often children copy their attitudes and behavior (Cherry). Regarding the classroom norms are also established by teachers. Traditionally, members of class have no control over composition of the group and they don't participate in assessment and revision of goals and methods of instruction (Getzels). In the context of Moodle, teacher decides what modules (Moodle activities) to use in his course, thus integrating e-learning into study process as much as teacher wants. Depending on what activities teacher uses participants' roles may change and they can assess the course and change its content. The attitudes of pupils to Moodle

within the framework of classroom are formed through the extent the teacher uses Moodle. Moreover, one teacher can use Moodle more actively, than another one, that will affect formation of different attitudes to Moodle within the same classroom. That's why each aspect of Moodle is measured separately in the present research – Wiki and Database maybe used by geography teacher, but may be not used by the Math teacher. Thus, consequently, if teacher doesn't implement some Moodle activities, pupils don't experience them and thereby attitudes are not shaped towards them.

1.4.2. Opinion leaders and change agents

Opinion leaders and change agents are the next in the link. It is hard to overestimate the role of opinion-leaders – they are influential individuals, who provide information about innovation and innovation itself to the society. Opinion leaders can influence other members of society whether to adopt or reject the innovation. Usually, they are more innovative than the others and they are of higher social status. Their behavior is copied by the other members. But, opinion leaders are expected to respect the norms of social system. Such leadership can be lost by the individual depending on how far from the norms he deviates. (Rogers, p 27) Sometimes opinion leaders lose their leadership because of change agents' decision. Change agents in some social systems can be opinion leaders. They are professionals, with university degree, that represent change agency in order to influence peoples' decision whether or not to adopt the technology. Usually, they have different social status from the clients, that's why it may cause misunderstandings. For such cases the aide are employed, of the same status and rank for communication with average clients. Aides link clients with change agents. (Rogers, p.28) As it was mentioned, the opinion leader in the classroom is the teacher. He decides to what extent to use Moodle, what modules to include and whether to use it as collaborative environment or just to keep learning content in Moodle. This consequently comes to the next element of social system – type of innovation-decision process.

1.4.3. Types of innovation-decisions

Diffusion of innovation occurs in different social systems according to the type of innovation-decisions, that is applied. It can be optional innovation-decisions, collective innovation-decisions or authority innovation-decision.

Optional innovation-decisions type is applied by an individual. He decides whether to adopt or reject the innovation independently from the society. For instance, such type can be applied by farmer or consumer, when the consequences of adoption of new idea would affect mostly this individual.

Collective innovation-decisions type is adopted by the members of the system, made by consensus. When such decision is made all units of the society need to conform to such decision.

Authority innovation-decisions type is made by few individuals in a system who possess power, status or technical expertise (Rogers, p.29) Such type of decisions and collective decisions are typical in organizations like schools or factories. It is considered, that the fastest rate of adoption is more typical for authority decisions. According to Roger's classification, within the classroom social system authority innovation-decision type is applied. That's why children's motivation and implementation of Moodle is not studied, only their attitudes. They use it, even if they have negative attitude to it.

1.5. Attributes of Innovation

There are five attributes of innovation, that explain the adoption of Moodle: relative advantage, compatibility, observability, trialability and complexity. These attributes are factors that influence pupil's attitudes towards Moodle.

1.5.1. Relative Advantage

Relative advantage of the innovation is a degree to which an innovation is perceived to be better, than the innovation it supersedes (Rogers, 212) To define the relative advantage a number of factors are needed to be taken into account. These very factors depend on innovation itself, social system and the individual who adopts it. Generally

speaking, it can be an economic factors – the price of the innovation, economic benefits of innovation; social status factors – the factors that mostly relate to the clothes industry and luxury industry, that motivates individuals to adopt his innovation in order to emphasize their social status. In his research Rogers makes generalization, referring to the recent diffusion scholars, that the relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption (Rogers, p. 216) It is perceived, that the relative advantage is the best predictor of rate of adoption, as it indicates results – benefits, profitability, costs in relation to technologies that were used previously. As far as decision to use Moodle is made not by pupils the economic benefits and social status factors doesn't matter. The question is do pupils find Moodle better e-learning than one they used before? Or in case they didn't use anything before Moodle do they think Moodle is justified to be used in their classrooms. With all above mentioned Moodle characteristics and modules it is assumed Moodle should be perceived as better learning system: it's free of charge in comparison to WebCT, it has understandable and easy interface, it contains messages, forums and blogs, that may reduce pupil's need to communicate with their peers and teachers via e-mail or social networks. Moodle also contains activities pupils may not have used in the past, for instance possibility to pass exams and tests in Moodle, possibility to upload their own materials, possibility to follow their study progress with teachers' comments and grades.

1.5.2. Compatibility

Compatibility is the next important attribute of innovation, that helps to understand the rate of adoption of innovation. This term means the degree to which innovation is perceived consistent with existing values and beliefs, with ideas, that were introduced previously and with the need of individuals in this innovation (Rogers, p. 224). That is also an issue of uncertainty – the more new innovation is compatible, the less uncertainty it poses to individual when he adopts it. Compatibility with cultural values and, in some cases, religious beliefs directly affects the diffusion of innovation. Sometimes, innovation, that gained popularity and high rates of adoption among population of European countries or the USA is hard to implement into Asiatic states, because it doesn't correspond to their every day practices and religious beliefs. In

regard to previously adopted technologies, the new innovation is needed to be consistent with due to speeding up of the new technology. Obviously, innovation has not to be 100% compatible with previous idea, because it would be no innovation any more, but it has to be so called bridge between the previous practices and the new ideas in future, that for the moment are much less compatible. Such gradual transition from customary innovation to the new sophisticated innovation, that is compatible with the previous one leads to positive rates of adoption of this innovation. Sometimes innovation negativism occurs when innovation failures, thus preventing individuals from future innovations' adoption. Consistency with needs is the next aspect of compatibility. That is mainly the task of the change agents who provide the innovation. They have to make the research in order to define consumers' needs and then to offer the appropriate innovation. Very often individuals don't recognize that they have needs for innovation before they are aware of this innovation (Rogers, p228). Moodle activities are also elaborated to meet pupils' needs. For instance possibility to pass exams in Moodle and to discuss issues in forum reduces their feel of stress. They can look through course materials before the class if they need. Pupils can understand teacher and their peers better, if they use slide presentations, pictures, video files during lectures. On the other hand, Moodle may not meet pupils' needs if they don't have access to it, because of low Internet speed, absence of Internet or computer.

1.5.3.Complexity

Complexity – degree to which an innovation is perceived as relatively difficult to understand (Rogers, p.242). There are innovations clear to understand, the others are not. As in previous cases, Rogers also makes generalization about complexity – complexity of innovation, as perceived by members of social system, is negatively related to its rate of adoption (Rogers, p. 242) Complexity creates uncertainty to use innovation, thus it hardens its adoption or rejects its adoption. Moodle has accessible and well-designed interface. It's easy to find section with course materials, with participation activity, with blog and forum.

1.5.4.Trialability

Trialability is the degree to which an innovation can be experimented on the limited basis. (Rogers, 243) Generalization: The trialability of innovation, as perceived by members of social system, is positively related to its rate of adoption. The possibility of experimenting the innovation helps individuals to acquire the necessary knowledge about it, to watch how it works – in such a way uncertainty reduces significantly. As usual, trialability is much more important for the earlier adopters, rather than to the late adopters or laggards. That is because to the moment the late adopters decide to adopt an innovation, the earlier adopted have already trialed it – the results are known, uncertainty reduced, that gives possibility for them to adopt new innovation without any risks and loses. The degree of trialability of Moodle will not be taken into account, because Moodle was not experimented on pupils from Tartu schools. They use because their teachers implemented it.

1.5.5.Observability

Observability – degree to which the results of an innovation are visible to others (Rogers, p. 244). Generalization: The observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption (Rogers, p. 244) Some innovations are easy to observe, another are not. Rogers gives the example of technology, that consists of hardware and software – computer. The software part is untouchable and indivisible, so it is difficult to measure. It is also hard to measure observability of Moodle. In order to do it the pupils will be asked if they think their study progress is better than progress of their peers who don't use Moodle.

II.   Methodology

The study was completed on the basis of Moodle primary web-source, that was appealed to during the creation framework of the study, under which the main components and features, that pupils deal with were revealed. The Rogers's theory of diffusion of innovations under which the study was conducted was appealed to in order to define the dependent variables, that comprise attitudes of pupils and helped to define the main factors – independent variables, that influenced pupils' attitudes towards innovation. The work also relies on secondary source analysis, that include similar case studies provided in different states and places, that dealt mainly with attitudes of university students not only to Moodle, but also to another types of innovations, used for educational purposed including WebCT, PC, e-mail, etc. On this basis, but with its own peculiarities and features, the study was applied to pupils in Tartu schools.

Research method

Research method that is implied in present work is quantitative cross-sectional correlational analysis. Cross-sectional analysis is most suitable research design for this particular study. It is conducted in order to gather information from the entire population or set of population. It's called cross-sectional as many subjects are measured in specific point of time. That means that data is gathered once without further repetition of gathering data after particular period of time. In present research the observed population is group of pupils comprised of 96 people and questions in numerous subjects were asked: their attitudes to Moodle, age, gender, period of using Moodle, school they studied. Quantitative correlational analysis was provided through statistical package SPSS in order to determine relationships between presented variables. Questionnaire is the most typical instrument for conduction of cross-sectional study.

1. Questionnaire

In order to find out what factors influence students' attitudes, questionnaire was designed. The study, conducted in Malaysian university inspired the direction of questions and few of them were adopted in present study, although different tools were applied to analyse questionnaires – Malaysian study questionnaires were subjected to content analysis, while the present study is based on statistical analysis (Ghani, 2011). The questionnaire was created in on-line survey generator in two languages: Estonian and English languages in order to meet needs of every pupil. Initially it was compiled in English language and later, with the help of my supervisor translated into Estonian language. Printed versions of questionnaires were also done in two languages and during the research pupils were proposed to choose what language questionnaire they would prefer. As it appeared mainly questionnaires in Estonian language were used by pupils. But English version was used by me, when it came to coding and analysis of gathered data. Questionnaire consisted out of 58 items generally, comprising statements and general information about the pupils. Questions about pupils' age, gender, the class and the school they study in, the period they have been using Moodle and frequency they use Moodle were asked.

In order to evaluate pupils' answers Likert scale was applied as a tool of assessment. It was five-point scale and pupils were offered to choose the following variants: "Strongly agree", "Agree", "Undecided", "Disagree" and "Strongly disagree" in order to express the degree of their attitude to definite item. Five point-scale was chosen as an assessment tool, as it presents the most preferable variants to express pupils feelings without any conglomeration of possible variants – otherwise pupils could feel lost whether to choose point "6" or point "7" on 10 scale point, for instance. Thereby, the more a pupil agreed with the statement the more positive attitude he expressed to it. As there were 56 questions, in order not to get pupils bored and automatically choose one of the variants all the time and to make them think few questions were subjected to reverse answers, where pupils had to choose opposite variant. For instance, the statement "I don't like Moodle design" maked pupil choose variant "strongly disagree" in order to express the most positive attitude and vice versa – "strongly agree", when he expressed the most negative attitude.

1.1. Variables

The questionnaire was visually divided into 4 sets. Pupils didn't know about such division in order not to impel them to mark the similar answers about definite item, but in different sets. Thus, in accordance with theory of Diffusion of Innovations each set corresponded to attribute of innovation. And attribute of innovation was a dependent variable, that was influenced by numerous factors, independent variables, in different ways – that was one of the research questions of the study: to find out the most influential of factors.

1.1.1. Variable 1 – Relative Advantage

The first set of statements conformed with relative advantage of Moodle over technology they had used previously. In this set the questions were aimed to find out what advantages and disadvantages Moodle had. Consequently, the first question in this set of questions was aimed to find out if pupils consider Moodle to be better technology that they had used before. After that following questions were aimed to find out detailed information about specific characteristics, that define Moodle's advantage over another technologies and pupils' attitude to them. And, further correlation analysis between dependent and independent variables reflects if relationship between variables exists.

Thus, relative advantage is dependent variable. Independent variables, that influence it are the following: forums – variable, that ascertains the degree of pupil's familiarity with forums; individual blog – variable, that ascertains the degree of pupil's familiarity with individual blog; Moodle account – variable, that determines the degree of pupil's ability to manage his Moodle account; activity report – variable, that determines pupil's awareness with ability to follow his activity report; messages – variable, that determines pupil's awareness with possibility to use messages in Moodle; loading documents – variable, that reveals the degree of pupil's ability to upload documents in Moodle; exams – variable, that determines pupil's awareness with possibility to take exams in Moodle; loading content – variable, that determines the degree of pupil's ability to upload audio- and videofiles, pictures.

1.1.2. Variable 2 - Compatibility

The second set of questions is dealing with compatibility of Moodle with students' needs. In this section questions mainly tackle with necessity of Moodle in classes. Like in the previous section the first question is asked if pupils think Moodle corresponds to their needs and the following questions are aimed to find out attitudes of pupils to detailed characteristics of Moodle, that make it compatible with their needs. Thus, independent variables, that influence compatibility (dependent variable) are following: opinion – variable, that determines the degree of pupil's comfort, when he expresses his opinion through Moodle facilities; studies before class – variable, that defines the degree of pupil's willingness to look through study materials before the class; independent study – variable, that defines the degree to which pupil feels he learned how to use Moodle himself, without anyone's help; Internet access – variable, that defines the degree of accessibility of Moodle; Easy exams in Moodle – variable, that defines degree to which pupil fells comfort taking exam in Moodle; stress – variable, that reveals the degree pupil fells stress during taking exam in Moodle; presentations – variable, that determines the degree pupil understands the lecturer or classmates, who uses presentations; content – variable, that determines the degree pupil understands the lecturer or classmates, who uses audio, video files or pictures.

1.1.3. Variable 3 - Complexity

The third set of questions finds out the factors, that make usage of Moodle easy – complexity. Questions are mainly directed to reveal which Moodle's features are easy and which ones are difficult for pupils; whether they can deal with them themselves or do they need help. The first question is asked if pupils think Moodle is easy to use and following questions are aimed to find out pupils' attitudes to detailed characteristics that make Moodle easy. Thus, independent variables, that influence complexity (dependent variable) are following: loading difficulties – variable, that determines the degree pupil feels difficulties with uploading materials in Moodle; Internet speed – variable, that defines the degree pupil feels if the speed is high or not; assessment section – variable, that determines the degree pupil feels it's easy to find section with grades; statistics –

variable, that defines the degree pupil feels it's easy to find section with statistics of his activity in Moodle; study materials – variable, that reveals the degree pupil feels it's easy to find section with study materials; profile changes – variable, that determines the degree pupil feels it's easy to change his profile in Moodle; Moodle design – variable, that defines the degree pupil is satisfied with Moodle's design; Moodle convenience – variable, that determines the degree pupil considers it as convenient as social media like Facebook or Google+; e-mail – variable, that determines the degree pupil prefers to use Moodle facilities for communication with classmates and teachers to e-mails.

1.1.4. Variable 4 - Observability

The next set is related to Moodle's observability and aimed to find out if pupils consider Moodle should be applied in every school by every teacher. The first question is asked to find out if pupils think Moodle is justified to be used in another schools and by other teachers. Followng questions are aimed to find out attitudes among pupils to detailed characteristics of Moodle that make it compatible. Thus, independent variables are following: Moodle's friends – variable that determines the degree pupil is aware he has friends, that don't use Moodle; friends results – variable, that defines the degree pupil feels his results are better, than results of his friends, because he uses Moodle.

According to Rogers' theory there is one more attribute of innovations – trialability - possibility to experiment Moodle. But it is not relevant in this study, because Moodle as innovation was already adopted in schools and no experiments involving Moodle were conducted over pupils.

2. The sample

The sample of the present study is simple random sample, in which every representative of the population can be included in the sample. The observed population is pupils in schools that use Moodle in their educational practices. As it appeared, there are such courses in Moodle, provided in Minna Härma Gümnaasium: „Maths 12form", „Research and practical work", „Estonian language", „Computer Science", „Geography", „Geoinformatics", „School newspaper" and „Human and Law". [1] In Hugo Treffneri Gümnaasium such courses are provided: "Research and practical work", "Computer Science", "Estonian language", "History", "History of Arts", "Physics", "Biology", "Geography", "Math", "Social sciences", "Psychology", "French language", "English language", "German language", "Swedish language".[2]   Jaan Poska Gümnaasium's web-site doesn't provide information about courses tought in Moodle. It's only mentioned that Moodle is used in school. Population of interviewed schools is overall 1333 in total. The number of pupils in Minna Härma Gümnaasium is following: 9a form – 26 pupils, 9b form – 29 pupils, 10a form – 36, 10b – 36, 10c – 36, 11a – 26, 11b – 34, 11c – 36, 11dp – 19, 12a – 29, 12b – 30, 12c – 27, 12dp – 9. In Hugo Treffneri Gümnaasium the population is following: 10a – 37, 10b – 38, 10c – 36, 10d – 37, 10e – 37, 11a – 36, 11b – 34, 11c – 37, 11d – 37, 11e – 35, 12a – 36, 12b – 36, 12 c – 34; 12d – 29, 12e – 34. In Tartu Jaan Poska Gümnaasium the population is following: 10a – 32, 10b – 32, 10c – 34, 10d – 31, 10e – 35, 11a – 32, 11b – 23, 11c – 30, 11d – 30, 11e – 26, 12a – 30, 12b – 28, 12c – 31, 12e – 33. In order to build the sample margin of error of 5% was taken into account – it is positive and negative deviation of population that is allowed to be counted in order to make generalizations applied to this sample about the whole population (Dessel, 2013). The minimum confidence level of 90%, that shows how often the true percentage of the population who would chose the answer lies within the margin of error. There is a formula, that calculates the sample size: Sample size =

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1 Moodle courses in Minna Härma Gümnaasium//https://mhg.tartu.ee/moodle2/

2 Moodle courses in Hugo Treffner Gümnaasium// http://net.htg.tartu.ee/moodle/

$$\frac{\dfrac{z^2 \times p(1-p)}{e^2}}{1+\left(\dfrac{z^2 \times p(1-p)}{e^2 \times N}\right)}$$, where N is population size, p is proportion estimator, e is margin

of error, z is z-score − is number of standard deviations given sample is away from mean. But to make life easier online sample size calculators come to the aid and calculate sample size on the basis of my parameters. Thus, according to calculations made with help of one of such calculators (Sample size calculator), the sample size for the population of 1333 people, with margin error of 5% and with minimum level of confidence 90%   should consist of 224 respondents. In order to meet needed requirements the questionanaire was sent approximately to 380 pupils. But overall only 96 pupils participated in study, that involved 9,64% of margin of error. Notwithstanding, the sample size is smaller than expected, I claim, that it is possible to rely on the results received from this sample and make generalizations about the whole pupils' population. There are 5 10th forms, 5 11th forms and 5 12th forms in Hugo Treffneri Gümnaasium. Pupils from all 5 forms among 10th forms have the same courses in Moodle with the same teachers, operate within the same social system, fulfill the same assignments and meet the same requirements. Thus, there should be no significant differences in attitudes to Moodle among 185 pupils from the 10th forms in this particular school and it is possible to rely on opinion of 36 pupils from 10c form. The same logic is applied to the 11th and 12th forms. Additionally, there is no significant differences between replies to the questions among pupils from 10th and 12th forms in Hugo Treffneri Gümnaasium. Similar logic can be applied to Minna Härma Gümnaasium. There are 2 9th forms and 4 11th forms in this school, that are even less than in Hugo Treffneri Gümnaasium. Situation is complicated in case with Tartu Jaan Poska Gümnaasium. Only 8 people from the 12th form replied to questionnaire, but we should keep in mind the 5% of margin error that allows not to include 5% (67 pupils) of population, and these pupils might be from Tartu Jaan Poska Gümnaasium. Thus,on the basis of highlighted assumptions the present sample is justified to make conclusions about attitudes to Moodle among pupils from Tartu schools. There are 29 boys and 67 girls, aged from 14 to 19 who participated in research. As shown in the histogram below, pupils from six classes answered the offered questionnaire – pupils from the 10th and 12th forms and

one pupil from 11th form from Hugo Treffneri Gümnaasium (HTG), pupils from12th form from Tartu Jaan Poska Gümnaasium (TJPG), pupils from 9th and 11th forms from Minna Härma Gümnaasium (MHG). The number of participants diverses from 36 pupils from 10-c form in Hugo Treffneri Gümnaasium to 1 pupil from 11th form of the same school. Such heterogenity is explained by the way of questionnairies distribution to

pupils.
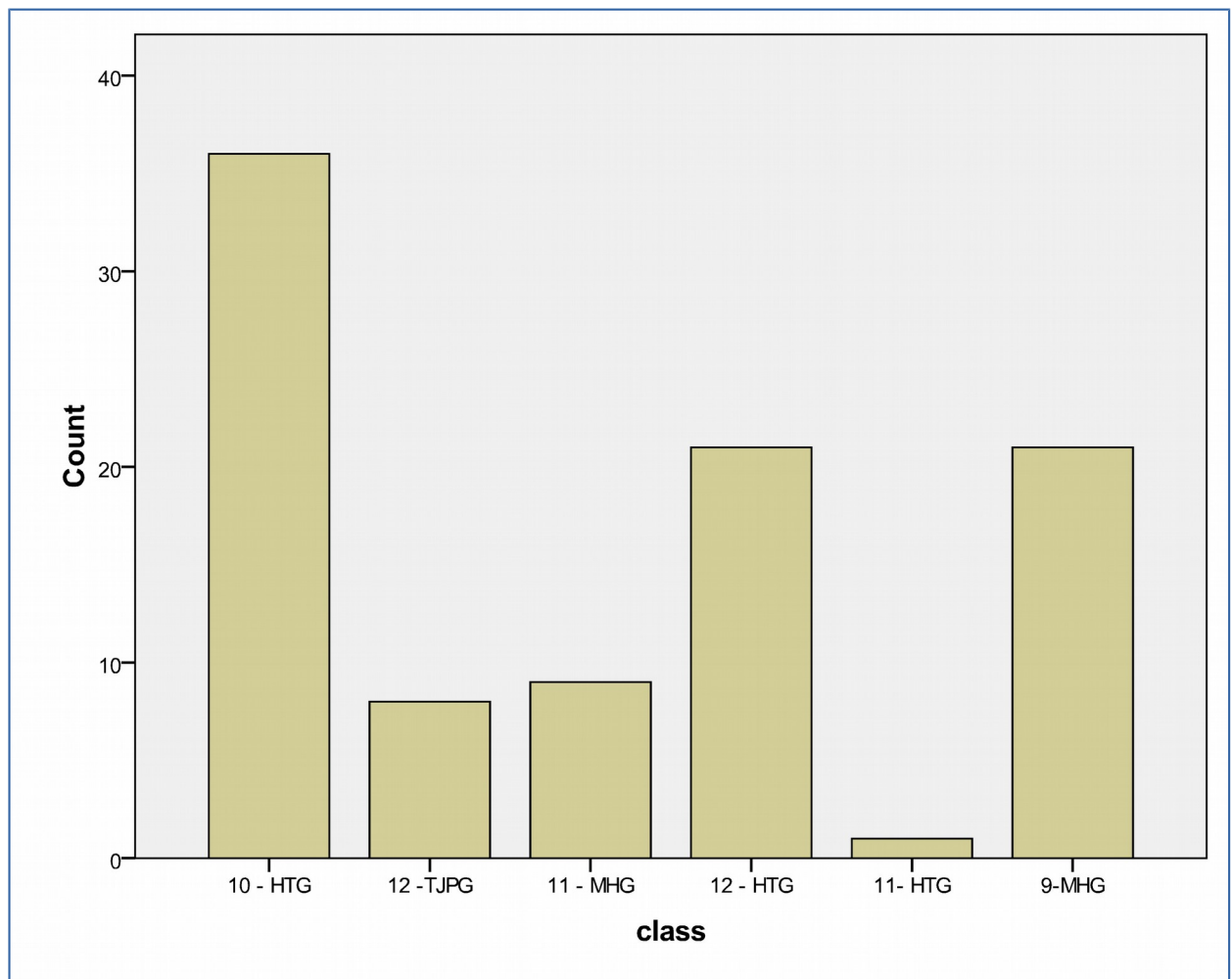
3.The process of conducting a research

The very first step I undertook in order to start the research was looking through the web-sites of schools in Tartu. It was always mentioned on the web-site that in this particular school Moodle was used. Thus, it appeared that in Tartu Jaan Poska Gümnaasium (TJPG), Minna Härma Gümnaasium (MHG) and Hugo Treffneri Gümnaasium (HTG) Moodle was used by teachers. After the schools were chosen I started to takle Geography, Biology and Physics teachers (as the initial idea of the research was to provide understanding of pupils' attitudes to Moodle within the framework of Natural science courses in schools) via e-mail. In the e-mails I explained what my research was related to, what kind of questionnaire I was doing and how much time it took.The teachers didn't reply and it lead me to change scope of the research and to extend its framework. I decided to take into account all pupils that might had courses in Moodle and not only those who had Geography or Biology or Physics. Further, I looked at the web-sites of the schools what courses were taght in Moodle and looked for the teachers who were providing those courses. Then, on the web-site of the school I found the teachers' e-mails and started to takle them. Additionally, I also sent e-mails to class managers. As it appeared, tackling class managers worked out better, than other ways to reach teachers. But after the teachers started to reply to my request the new problem was faced. It took 15-20 minutes to fill in the questionnaire and most of teachers prefered me to send them electronical version of the questionnaire and only two teachers allowed to visit schools and provide children with paper-based

questionnaires – class manager of the 9th form from Minna Härma Gümnaasium and class manager of the 10 th form from Hugo Treffneri Gümnaasium. Other teachers provided web-based link to their pupils via e-mails, but they didn't promise the pupils would reply. As it appeared the most effective way of gathering information was done through provision of paper-based questionnaires. Many pupils who got web-based link ignored it, 16 of them remained questionnaire unfinished. During provision of paper-based questionnaires I noticed that pupils faced difficulties when they came to the section with Moodle activities. Many pupils looked at their neighbours' replies. Some of them confused „Wiki" with Wikipedia and I needed to explain them what is Wiki in Moodle. But still after explanation when I started to code answers in SPSS I found some replies in the section with „Wiki" „Mis on Wiki?", that is translated as „What is Wiki?". The same issue raised with another Moodle activities. That's why after that, I provided further description about Moodle activities in Moodle in web-based questionnaires, because when pupil would fill it nobody would explain him that „Wiki" was not Wikipedia. Additionaly, I made questions about Moodle activities not obligatory to fill in if person didn't know what was the question about. I put off asterisk and mentioned, that it was possible to leave the question unfilled. It was done in order not to discourage pupils to continue further filling of the questionnaire. But still, many of them remained questionnaire unfilled and impossible to use for further analysis.

4. SPSS Analysis

In order to evaluate results of the study statistical software package SPSS 17 was applied. Answers were coded from 1 to 5. Thus, "Strongly agree" point matches value of "5", "agree" – value of "4", "undecided" – value of "3", "disagree" – value of "2" and "strongly disagree" – value of "1". Reverse coding was applied to the answers, which positive attitude corresponded to the negative response. In the statement "I don't like Moodle design" the negative reply "strongly disagree" corresponded to the strongest positive attitude, thus it was coded as "5". At the same time the positive reply "strongly agree" corresponded to the most negative attitude and was coded as "1". Gender was coded as "1" for male and "2" for female. The missing value was coded as "99". For age the missing value was coded as "999". Period of using Moodle was coded as "1" for less than a year, "2" for 1 year, "3" for 2 years, "4" for 3 years, "5" for 4 years, "6" for 5 years, "7" for more than 5 years. The missing value for period of using Moodle is 999. Class was coded as "1" for 10th form in Hugo Treffneri Gümnaasium, "2" for 12th form in Tartu Jaan Poska Gümnaasium, "3" for 11th form in Minna Härma Gümnaasium, "4" for 12th form in Hugo Treffneri Gümnaasium, "5" for 11th form in Hugo Treffneri Gümnaasium, "6" for 9th form in Minna Härma Gümnaasium. The missing value was coded as "99". "Frequency of using Moodle" was coded as "1" for never, "2" for rarely, "3" for once a week, "4" for few times a week, "5" for every day. After all variables were coded in the SPSS the data cleaning was provided through the *Frequences* procedure. Thus, the coding errors were corrected and missing values were properly coded. Bivariate correlation was provided in order to find out if relationship between dependent and independent variables exists. Correlation analysis was provided

between: 1) dependent variable "Relative advantage" and independent variables "forum usage", "possibility to upload materials", "individual blog", "Moodle account", "activity report", "messages", "taking exams", "uploading the content"; 2) dependent variable "Compatibility" and independent variables "opinion", "studies before class", "independent study", "Internet access", "easy exams in Moodle", "stress-time", "presentations", "content"; 3) dependent variable "Complexity" and independent variables "loading difficulties", "Internet speed", "assessment section", "statistics", "study materials", "profile changes", "Moodle design", "Moodle convenience", "e-mail"; 4) dependent variable "Observability" and independent variables "Moodle's friends", "my results". Pearson's R coefficient - a coefficient of correlation and it helped to determine the degree of existed correlation between variables. Additionally, chi-square test was conducted in order to determine if there were significant difference between observed and expected value of the variable that gives possibility to reject null-hypothesis – assumption, that both variables are independent from each other and no relationship exists between them. In comparison to correlation analysis, where correlation between dependent variable and its independent variables was made in few steps but within one operation, chi-square test was done separately for each independent variable and correspondent dependent variable. Comparing means procedure was computed to compare means of replies among different age population and find out if there are differences about attitudes among different age groups. Cross-tabulation was computed in order to find out if there are significant differences among attitudes to Moodle between more experienced and less experienced pupils.

5.Research questions

All these above mentioned procedures, variables, relationships between them will help to answer the research questions:

-what are the factors that form pupils' attitudes to Moodle? Dependent variables, described above, are attributes of Moodle, its' main characteristics that distinguish Moodle from other technologies. They may be adopted or rejected by pupils and in order to find it out questions about their attitudes to these attributes are asked. But it is not enough just to ask whether pupil think if Moodle is easy or Moodle is useful and make generalization that Moodle is easy and useful, because pupil thinks so. The issue is to determine the factors that cause such positive or negative attitude. That's why for this reason a number of independent variables for each dependent variable is comprised. Each independent variable is related to dependent variable it was created for. For example, independent variable "easy exams in Moodle" is created to determine if it is easy for pupil to make exams in Moodle and then to examine relationship between this variable and variable "complexity" for which pupil is asked if he thinks Moodle is easy or not. Pupil may unconsciously think that Moodle is easy for him and at the same time he might not know some basic principles of how Moodle works. Relationship between variables will measure attitudes to Moodle;

-which of the factors cause positive and negative attitudes? After variables that influence pupils' attitudes will be determined the next step will be undertaken – to define which of these factors cause positive and which of them cause negative attitudes to particular attributes of Moodle;

-whether attitudes between younger and older students towards Moodle are different or not? In order to answer this question comparing means procedure is applied. It is provided between variables "age" and variables "relative advantage", "compatibility", "complexity" and "observability". It reflects the average score of pupils' replies in different age categories. The higher the mean is the better is attitude;

-another research question aimed to find out if there are differences in attitudes to Moodle between students who are experienced in using Moodle for several years and pupils who has been used it for period less than a year. This research question also implies distribution of pupils within innovativeness classification provided by Rogers in his theory. For these purposes I've chosen the factors, that were statistically supported as factors that have relationship with dependent variables, the attributes of technology about which attitudes were formed. Further, I've chosen variable answers which were presented with all possible variations (from the most negative and most positive) and on this basis pupils were distributed to the categories of innovativeness. Additionally correlation analysis was provided between independent variables and variable "frequency" of using Moodle in order to find out appropriate variable to provide classification for. More frequently the person uses Moodle more experienced he is. Additionally, correlation between variables "age" and "frequency of using Moodle" is computed in order to find out if there is relationship between age and frequency of using Moodle;

-what Moodle collaborative characteristics are needed to pay attention?

In order to understand pupils' attitudes to Moodle deeply and to find out whether Moodle is used as collaborative instrument to build new learning environment where everyone contributes from learning process or it only supports learning process with online course management questions regarding different Moodle activities were asked. Pupils were proposed to determine in which subjects they use such activities as Wiki, Lesson, Glossary, Assignments, Choice, Survey, Workshop and Feedback and to define the level of satisfaction with proposed Moodle possibilities. The replies to this section mapped out the general picture of usage of Moodle's collaborative facilities in classroom and its influence on social system in which Moodle is provided.

III. Empirical data

To define factors, that influence pupils' attitudes to Moodle the pupils initially were asked if they consider Moodle to be better learning environment than other technologies they had used before. Most of them agreed to this statement. But will independent variables correlate with Relative advantage? Figure 2 below reflects distribution of

replies to this question as following:
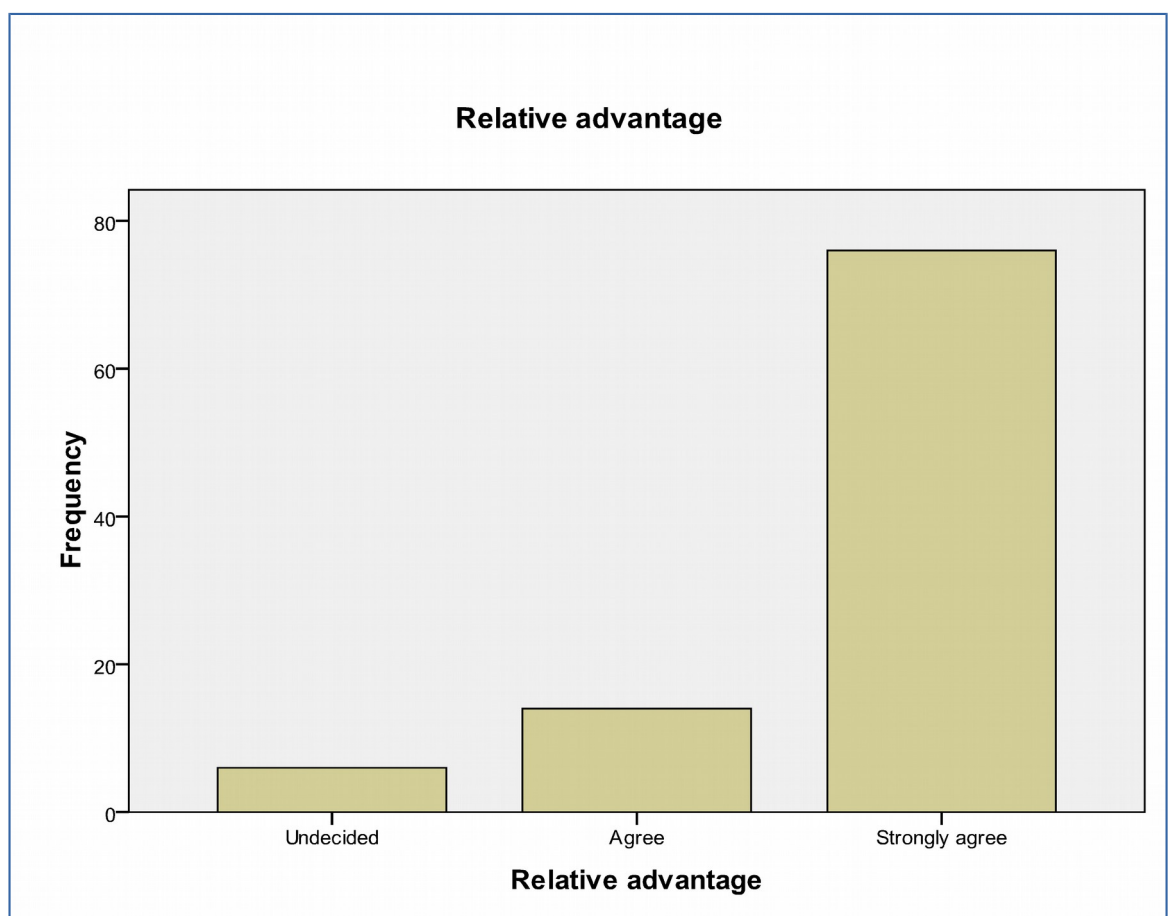
Figure 2. "I would prefer Moodle to another e-learning technology (e-mail, WebCT, SlideShare, PowerPoint, etc)". N=96

6 people remain undecided, 14 agreed and 76 strongly agreed.

Relative advantage (See correlation analysis in Appendix, figure 38)

46

The implications of the results are following:

1) The variable "Forum usage" has weak relationship with Relative advantage as the Pearson's R is 0.15. Additionally, the significance meaning is 0,14 that is higher than admissible 0.05, that means there is no statistically significant correlation between these two variables. (See figure in appendix) It worth to mention, that on the question of pupils utility of forum in Moodle the larger part replied they don't use it. Their replies' distribution is following: Strongly disagree – 51, Disagree - 39, Undecided - 2, Agree – 4. See Figure 3 below:
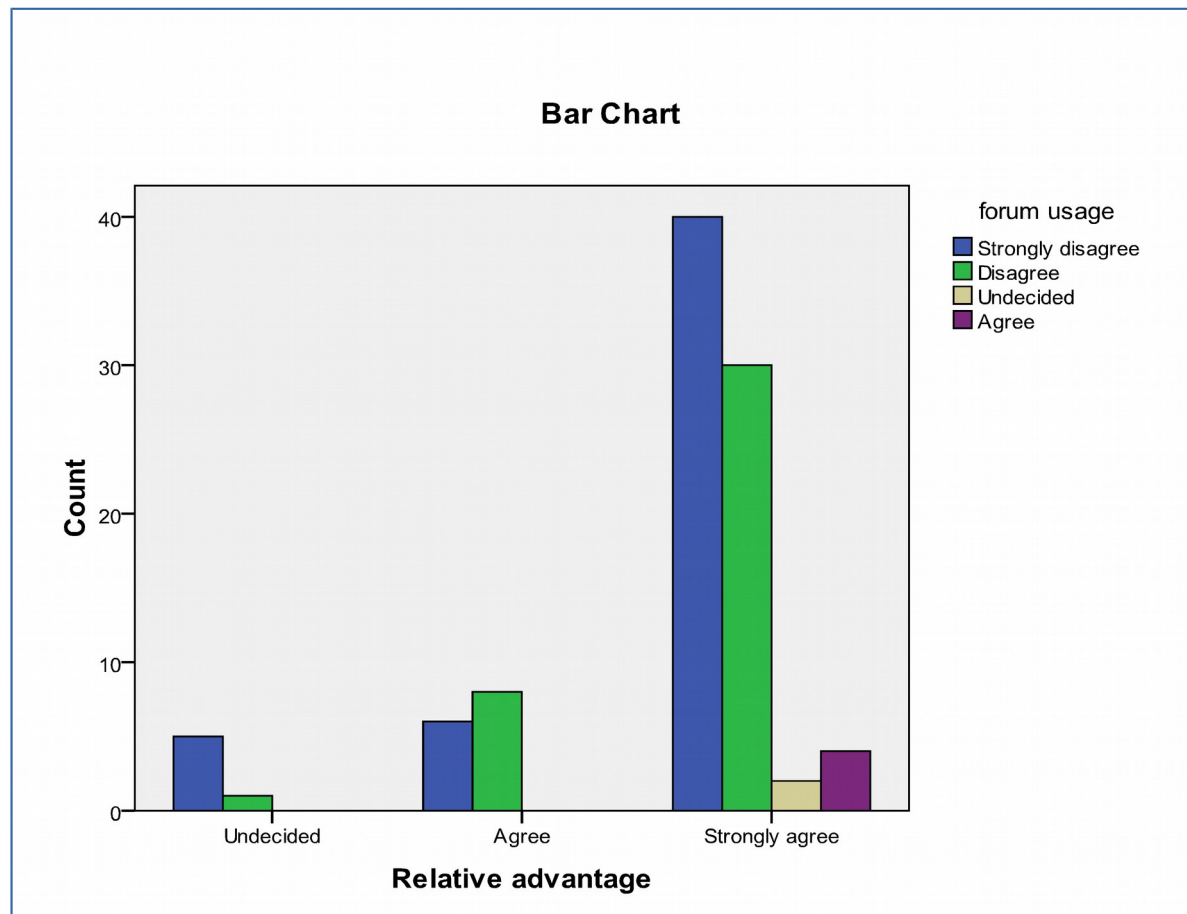
Figure 3. "I use forums to discuss issues with teachers and classmates". N=96

Chi-square test for independence confirms the assumption that there is little correlation between these two variables. The p-value of significance is 0,58, that indicates that there is no strong evidence of relationship. It means that if p-value is low we can't reject null-hypothesis – assumption, that there is no relationship between relative advantage and forum usage. In chi-square test we calculate observed (counted) frequencies, that are actual frequencies and expected

frequencies, that are expected in case if null-hypothesis is true. The closer expected frequencies to observed frequencies, the more probability that null-hypothesis is true. It is visible in the clustered bar chart, that the majority of pupils agrees that Moodle has advantage over another technologies and at the same time this majority rejects that it uses forum in Moodle.

2) The variable "Possibility to upload materials" has moderate correlation with Relative advantage with coefficient of correlation 0.4 and statistical significance is low 0.69, that testifies weak relationship between these variables. Pupils' responses to the question related their ability to upload documents distributed the following way: Strongly disagree, - 9; disagree-19, undecided-13, agree-41, strongly agree – 14.
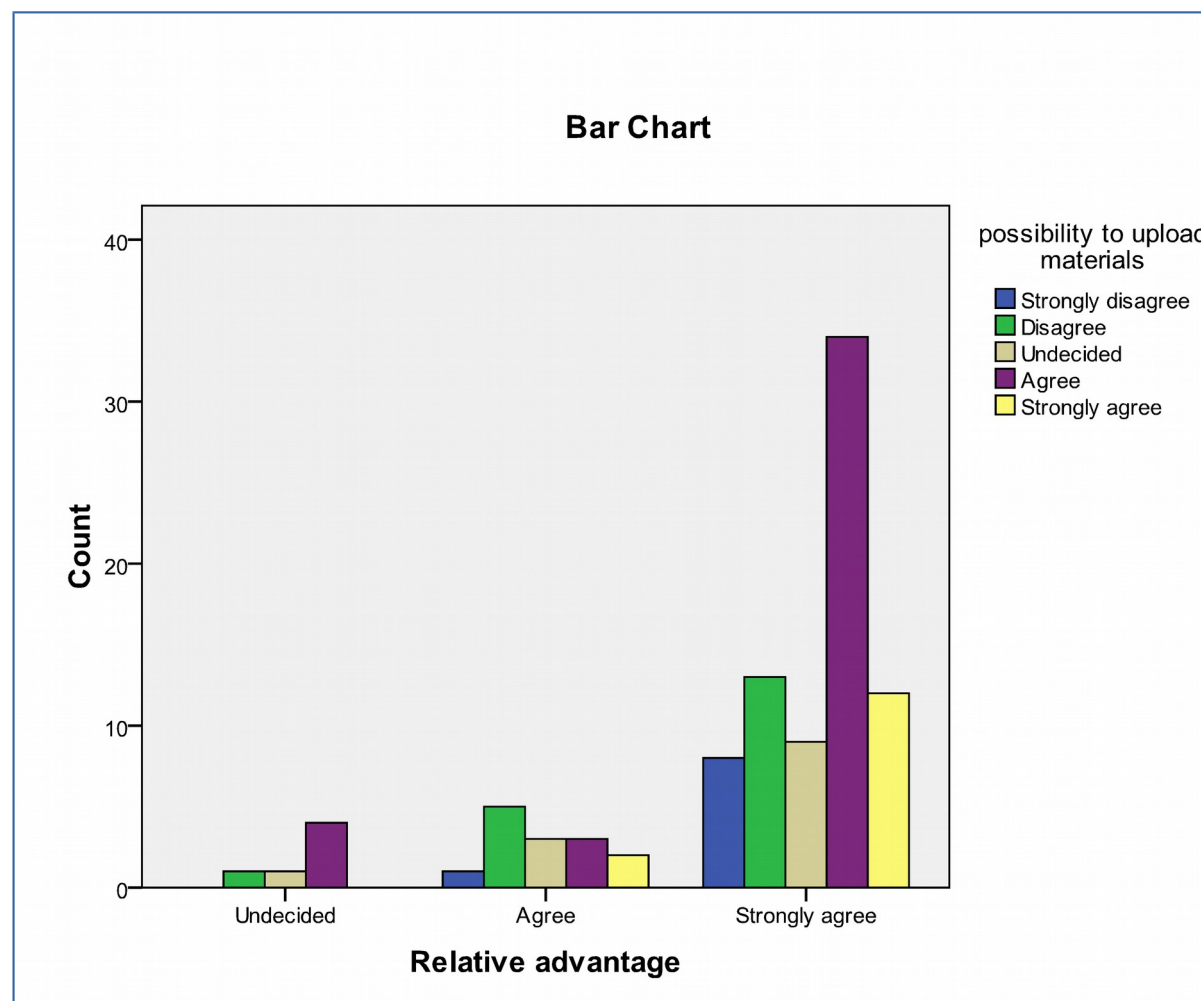
Figure 4. "I have possibility to upload materials."

The p-value of significance in chi-square test is 0,53 that means there is no strong evidence of relationship. At the same time the expected frequencies are different from observed frequencies in the cells that indicate pupils' confirmation, that they consider Moodle to have advantage over another technologies and their confirmation, that they have possibility to upload learning materials. That allows to reject null-hypothesis – assumption, that there is no relationship between relative advantage of Moodle and possibility to upload learning materials. The clustered bar chart shows that majority of pupils who agree that they have possibility to upload learning materials strongly agree, that Moodle has advantage over another technology.

3) The variable "Individual blog" has negative correlation with Relative advantage with the meaning Pearson's R -0.13. Insignificant statistical meaning is 0,329. It can be assumed with the following distribution of pupils' answers to the question of their attitude to individual blog – almost all of them chose negative replies: strongly disagree - 77, disagree - 15, undecided - 1, agree - 2, strongly agree – 1.
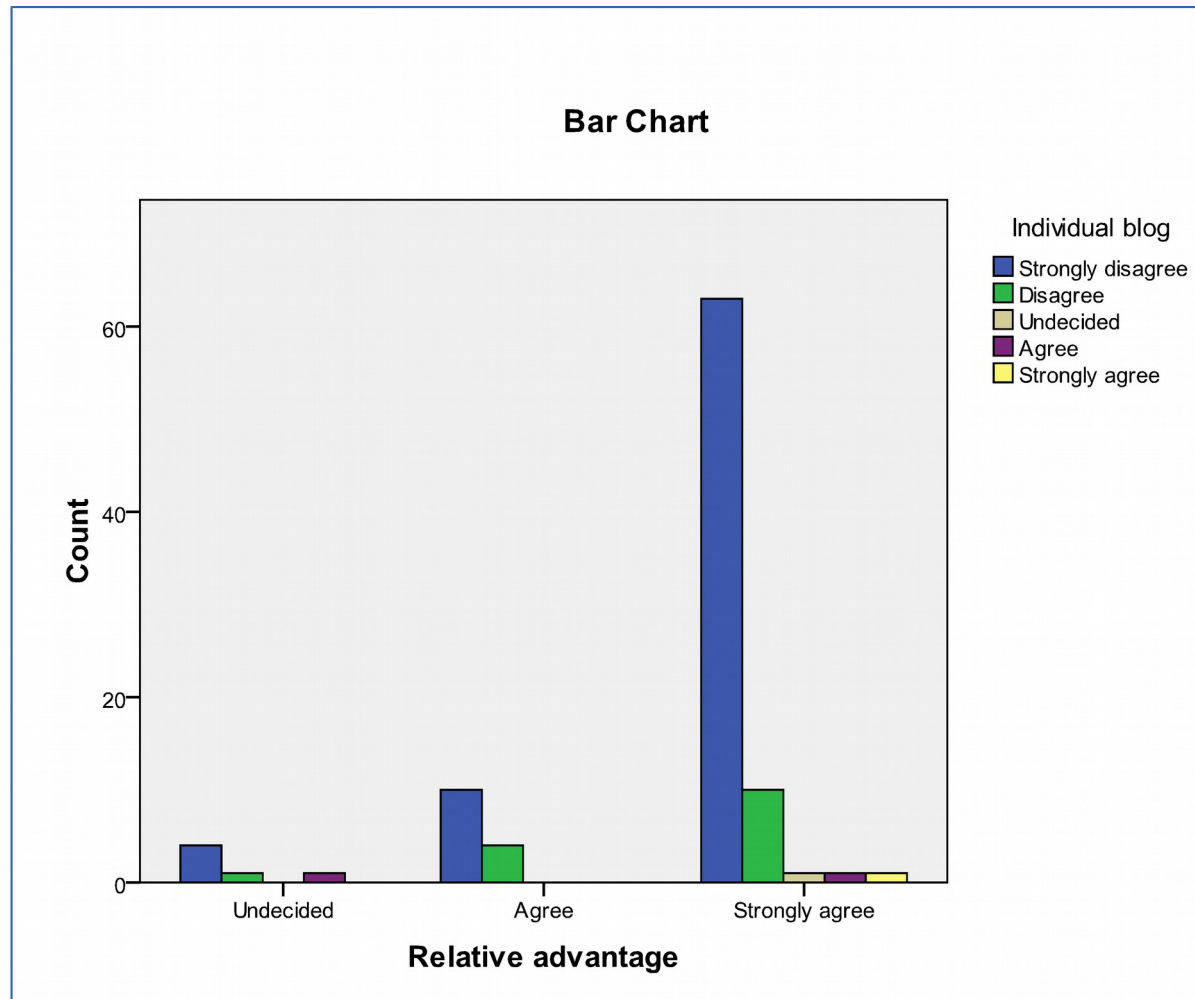
Figure 5. "I have my individual blog in Moodle".

The chi-square test confirms absence of evidence of relationship between relative advantage and individual blog by the meaning of p-value 0,31. Additionally, the difference between expected and observed frequencies is very small, thus it leads confirmation of null-hypothesis that claims there is no relationship between two variables. The clustered bar-chart also reflects absence of correlation: the majority of pupils indicated Moodle as being advantageous over another technology and at the same rejected they use individual blog in Moodle.

4) Variable "Moodle account" also has weak Pearson's coefficient of 0.17 and insignificant statistical meaning 0.09. On the question about pupils' Moodle account only few of them gave positive answers: strongly disagree - 36, disagree

- 38, undecided - 12, agree - 9, strongly agree – 1. (
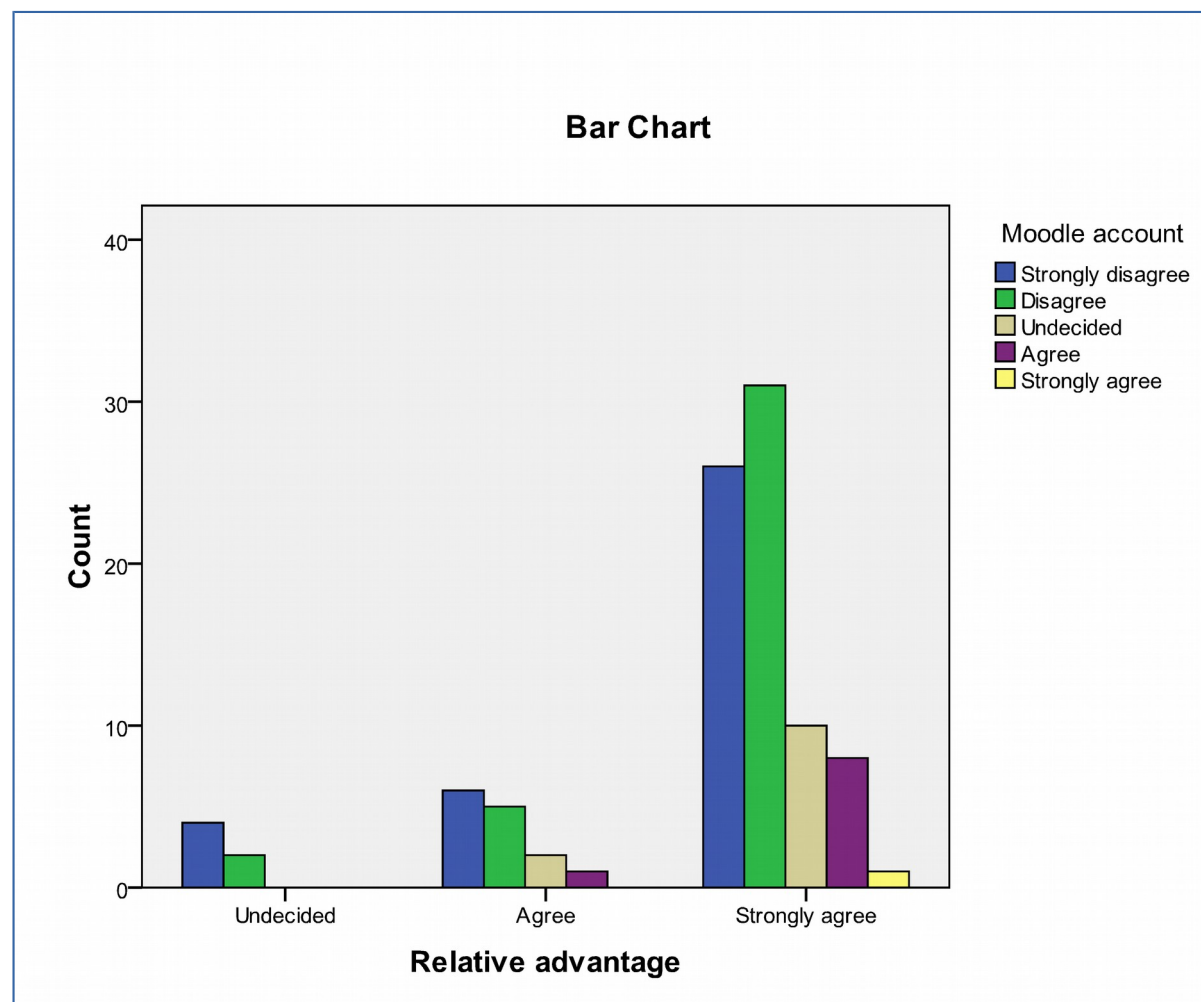
Figure 6. "I have filled profile in Moodle (with my photo, and information about me, interests)."

The chi-square test like in the case with previous variable doesn't support the evidence of relationship between variables. The significance value is low 0,88 and the difference between expected and observed frequencies is also low, that

doesn't allow to reject null-hypothesis – assumption, that there is no relationship between variables. In addition, the clustered bar chart reflects that the majority of pupil strongly agrees that Moodle has advantage above another technology and disagrees that it holds personal account in Moodle .

5) Variable "Activity report" as above mentioned variables has weak correlation with relative advantage with Pearson's R 0.15 and insignificant statistical value of 0.14 that implies weak interdependence with dependent variable. Pupils' answers on the question of their regular following their activity report in Moodle are following: strongly disagree – 50; disagree - 25, undecided - 8, agree - 12,

strongly   agree   –   1.

Figure 7. "I regularly check activity report to follow my study progress".

The value of significance in chi-square test is low 0,90 and expected and observed frequencies are close to each other that doesn't allow to reject the null-hypothesis – assumption that there is no relationship between relative advantage
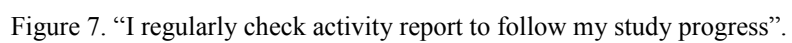
of Moodle and awareness of possibility to check activity report. The clustered bar chart displays that majority of pupils agrees that Moodle has relative advantage and at the same time denies it check activity report in Moodle

6) Variable "Messages" has correlation with Relative advantage by means of Pearson's R 0.03 and insignificant statistical value of 0.75. As it appeared, no one of pupils uses messages in Moodle: strongly disagree - 64, disagree - 27,

undecided – 5.
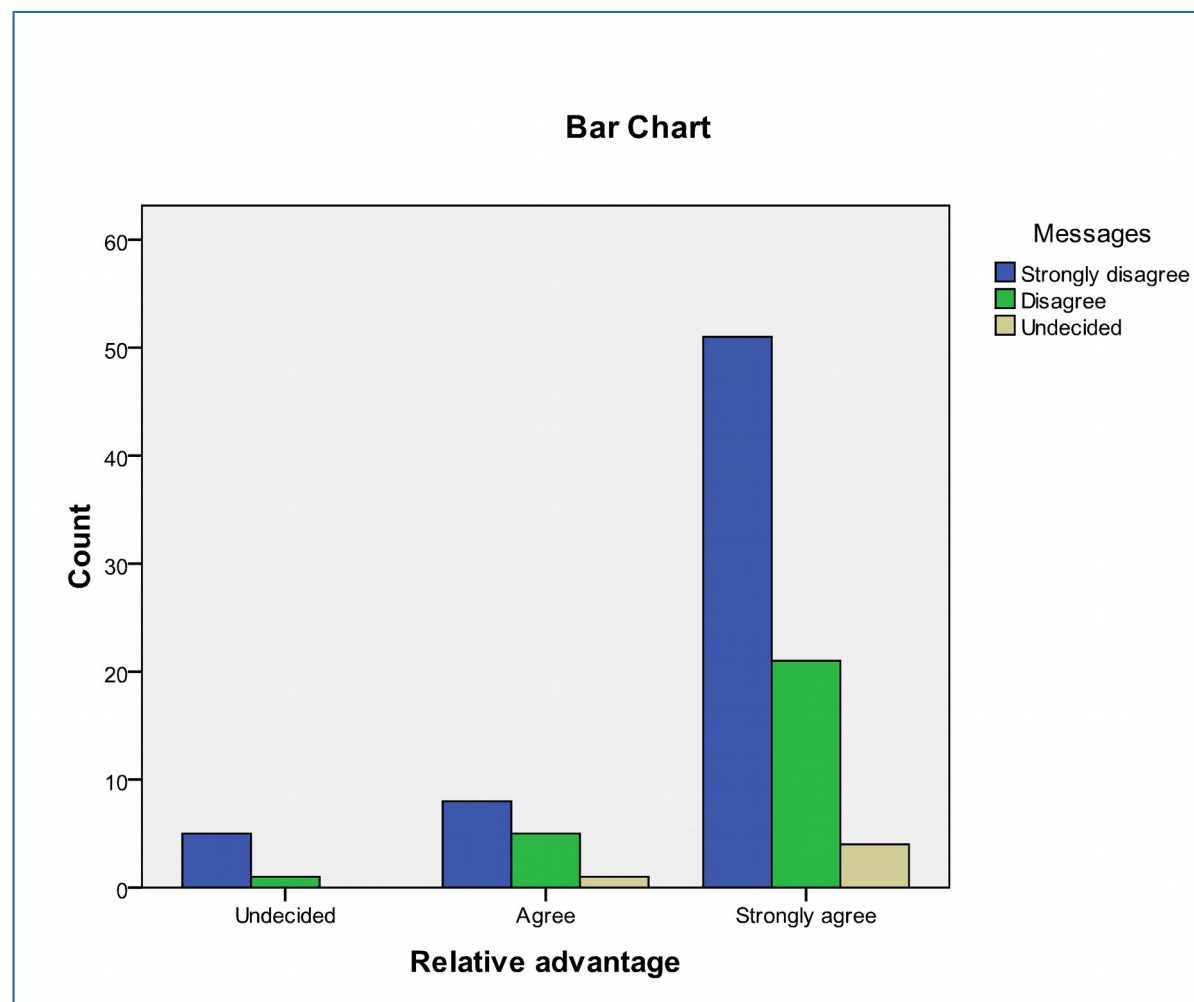
Figure 8. "I use messages to communicate with my classmates." N=96

The chi-square test in this case also confirms absence of evidence of relationship between variables and the difference between expected and observed frequencies is insignificant, that doesn't allow to reject null-hypothesis, that there is no relationship

between Moodle advantage and using of messages in Moodle. The clustered bar chart shows that pupils who strongly agree that Moodle has advantages strongly disagree, that they use messages in Moodle. Negative correlation with Relative advantage has variable "Taking exams". Correlation coefficient is -0.05 and p-value of 0.6 still indicates there is no statistically significant correlation between two variables. But there are pupils who confirm possibility to take exams in Moodle. Answers are following: strongly disagree-32, disagree-14, undecided - 31, agree - 14, strongly agree – 5.
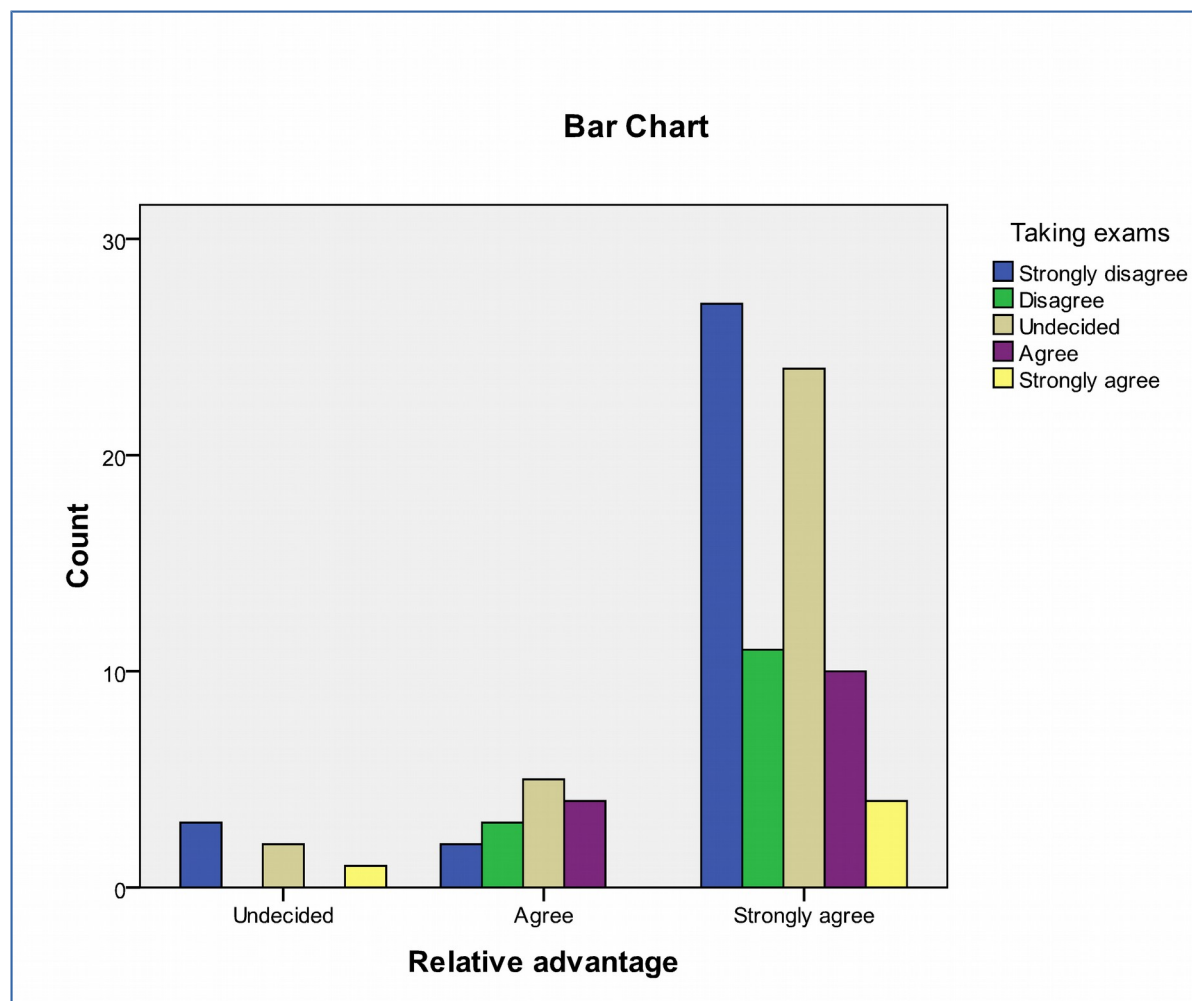
Figure 9. "I have possibility to take tests and exams in Moodle." N=96

Chi-square test also confirms insignificant p-value 0,37 and almost similar expected and observed frequencies, that confirms null-hypothesis. The clustered bar chart reflects that the majority of those who consider Moodle to be in advantage over another technology doesn't know about possibility to take exams in Moodle.

7) Variable "Uploading the content" has also negative correlation of -0.04 Pearson's coefficient and insignificant statistical value of 0.7. The answers towards pupils' ability to upload audio and video-content into Moodle are following: strongly disagree - 32, disagree - 19, undecided - 26, agree - 13, strongly agree - 6.
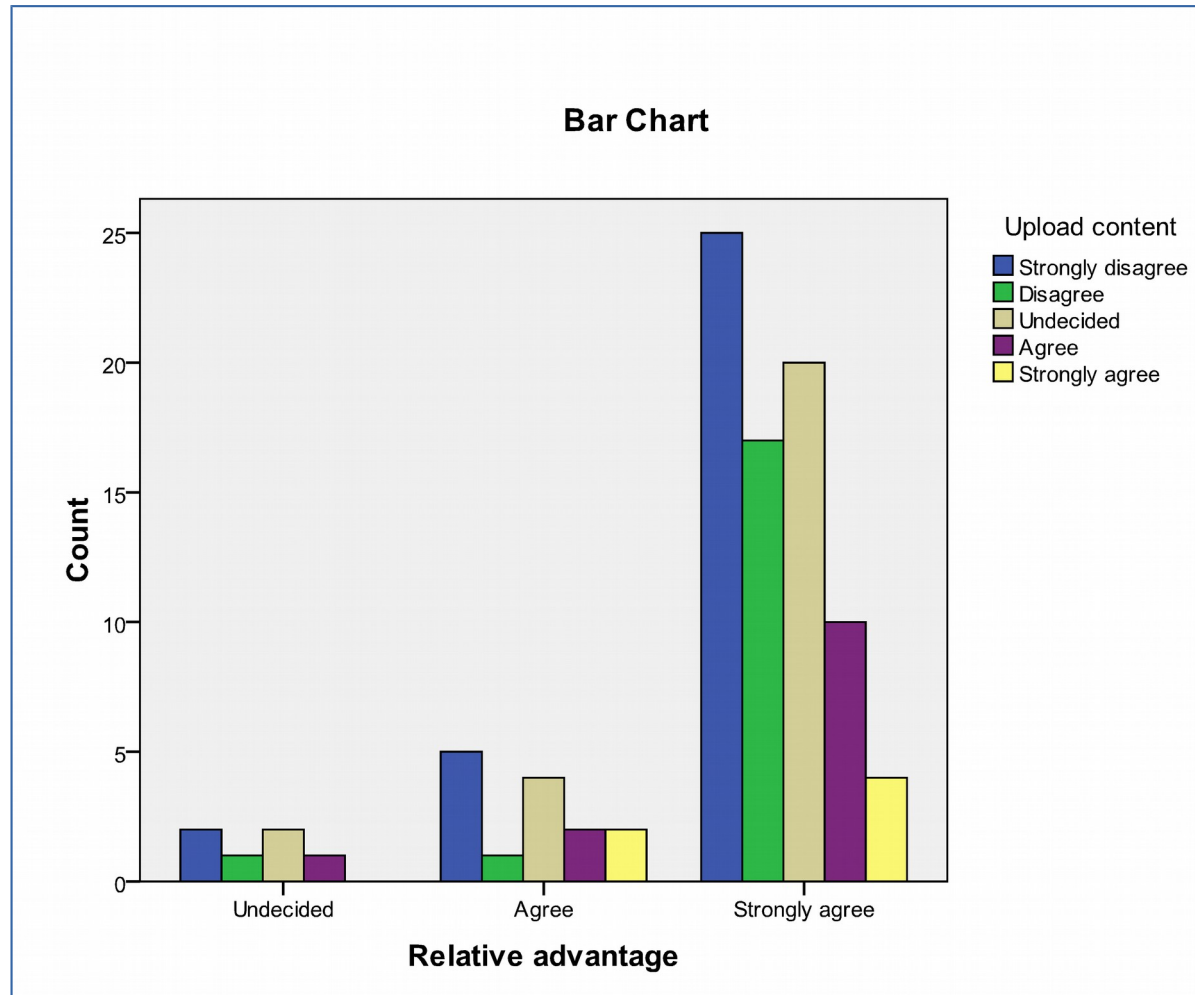
Figure 10. "I have possibility to upload audio, video content, images." N=96

The chi-square test also confirms low evidence of relationship between two variables with p-value of 0.89 and small distance between expected and observed frequencies. Null hypothesis is also supported. The clustered bar chart shows that majority of people who think Moodle has advantage over another technology is not aware of possibility to upload video and audio files, pictures and etc .

Compatibility (See correlation analisys in Appendix, figure 39)

The pupils were asked if they think Moodle meets their study needs. And many of them expressed positive attitudes.
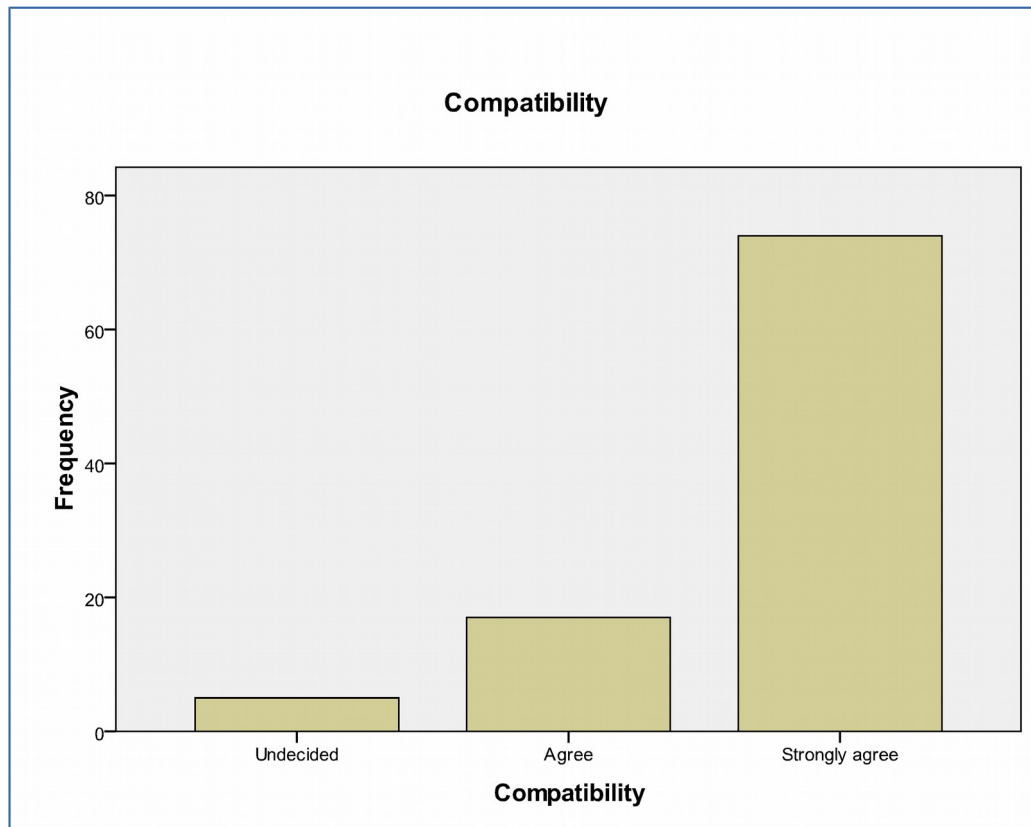
1) The variable "opinion" has weak correlation with compatibility variable. The Pearson's R is 0.067, with insignificant statistical value of 0.52. Pupils' answers to the question regardless their feelings when they express their opinion in Moodle are following: strongly disagree - 26, disagree - 21, undecided - 40, agree - 7, strongly agree – 2.
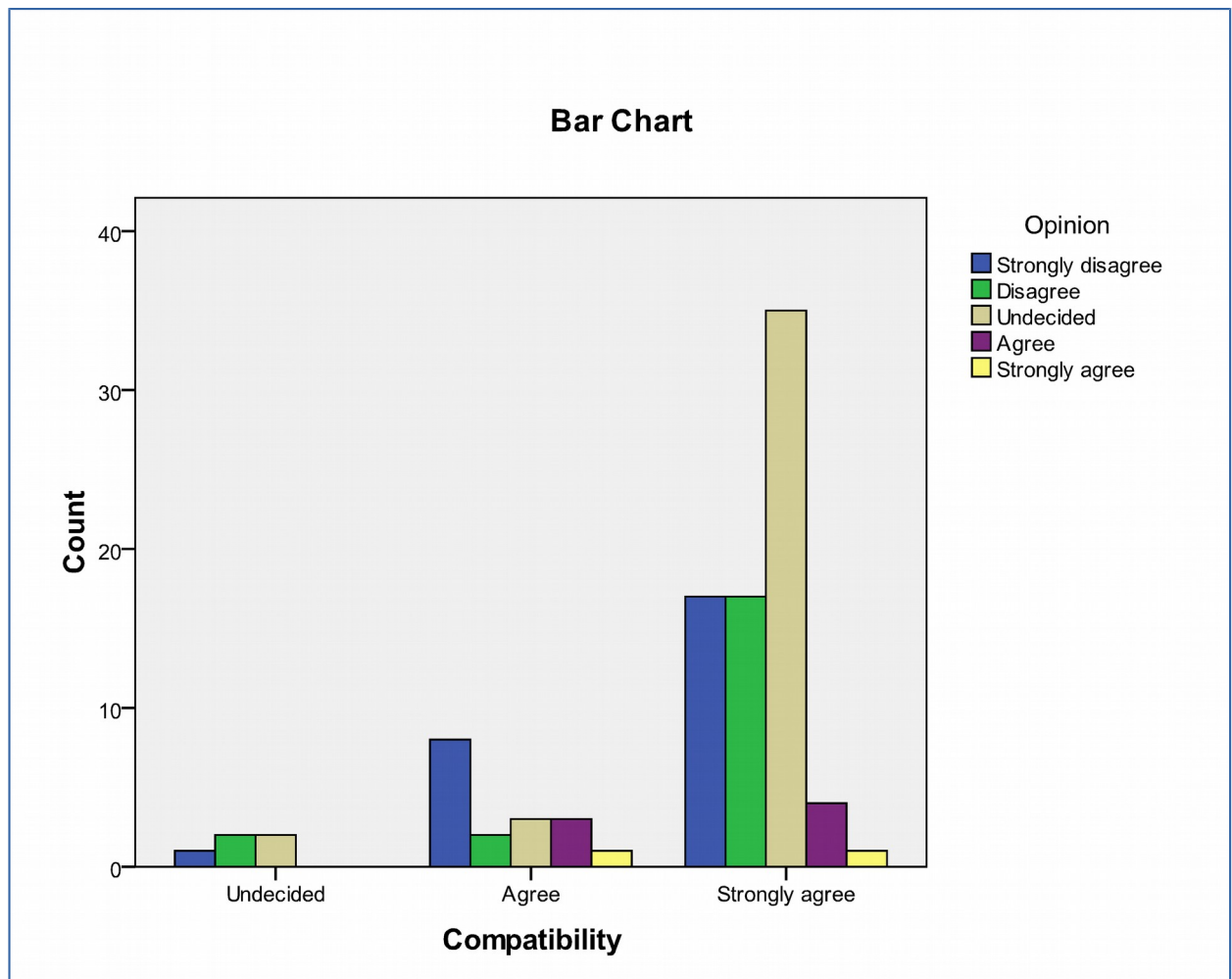
Figure 11. "I can express my point of view (in forum discussions, for example) without feeling shy, because I don't need to speak in front of class." N=96

The chi-square test shows there is no strong evidence of relationship between variables compatibility and opinion by the means of p-value 0,14. But there is difference between expected and observed frequencies in the cells, that indicate pupil's confirmation of compatibility of Moodle with their needs and uncertainty about their possibility to express opinion in Moodle. Clustered bar chart also reflects high level of uncertainty

2) Variable "studies before class" has also weak correlation with compatibility with Pearson' R meaning of 0.1, and insignificant statistical value of 0.33. Pupils' answers to the question where they look through study materials before class or not are following: strongly disagree - 13, disagree-8, undecided - 13, agree - 49, strongly agree – 13.
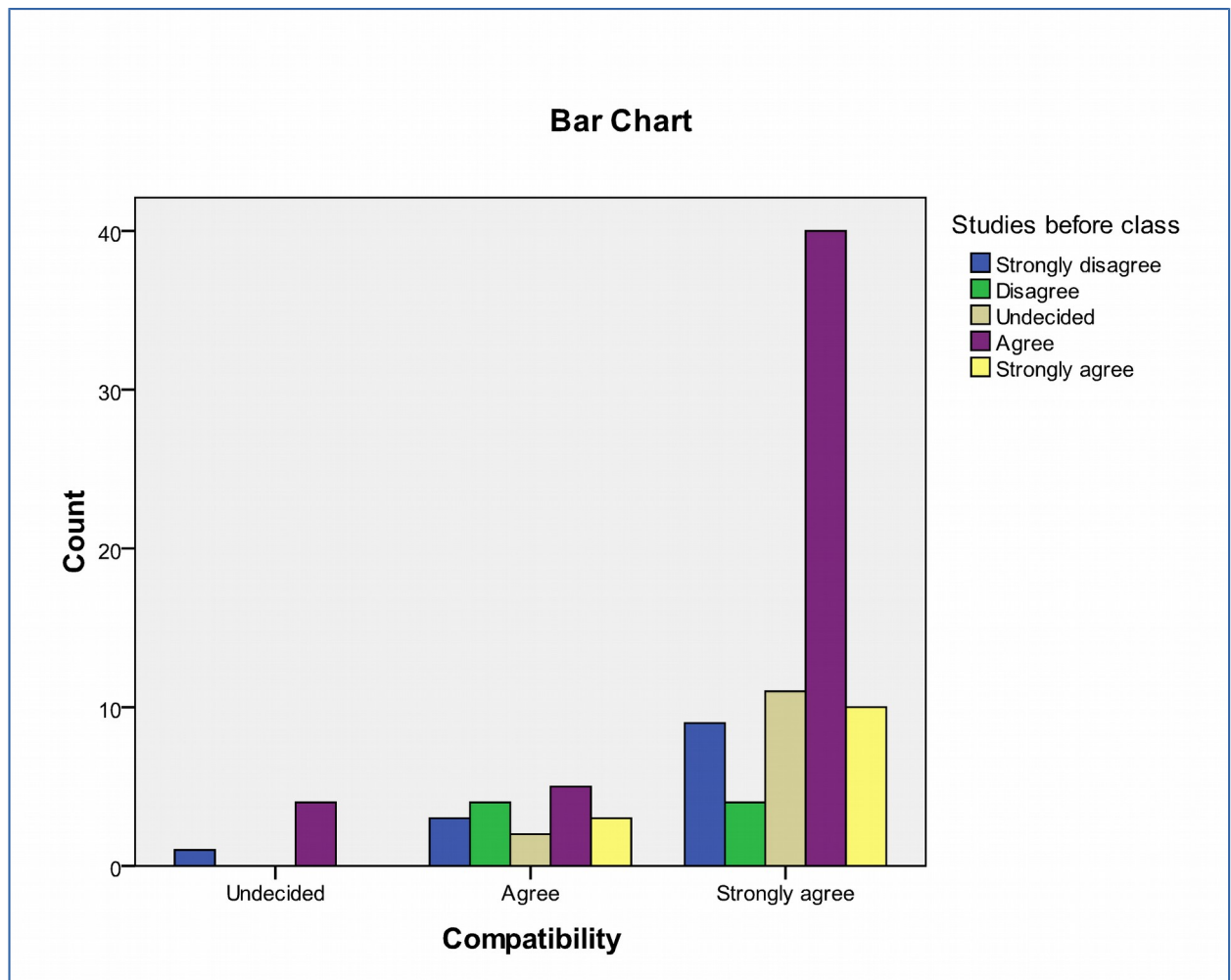
Figure 12. "I look through studies before coming into class." N=96

According to chi-square test the level of significance is low and doesn't mean the strong evidence of relationship between variables. At the same time there is difference between observed and expected frequencies in the cell that reflects agreement with Moodle's compatibility and opportunity to look through study materials before the lesson. The clustered bar chart shows that the majority of pupils agree they have opportunity to look through materials beforehand. Variable "independent study" has moderate correlation with compatibility with Pearson's R 0.3 and significant statistical value of 0,003. Pupils' answers to the question of whether they studied to use Moodle themselves are following: strongly disagree - 9, disagree - 5, undecided - 17, agree - 48, strongly agree – 17.
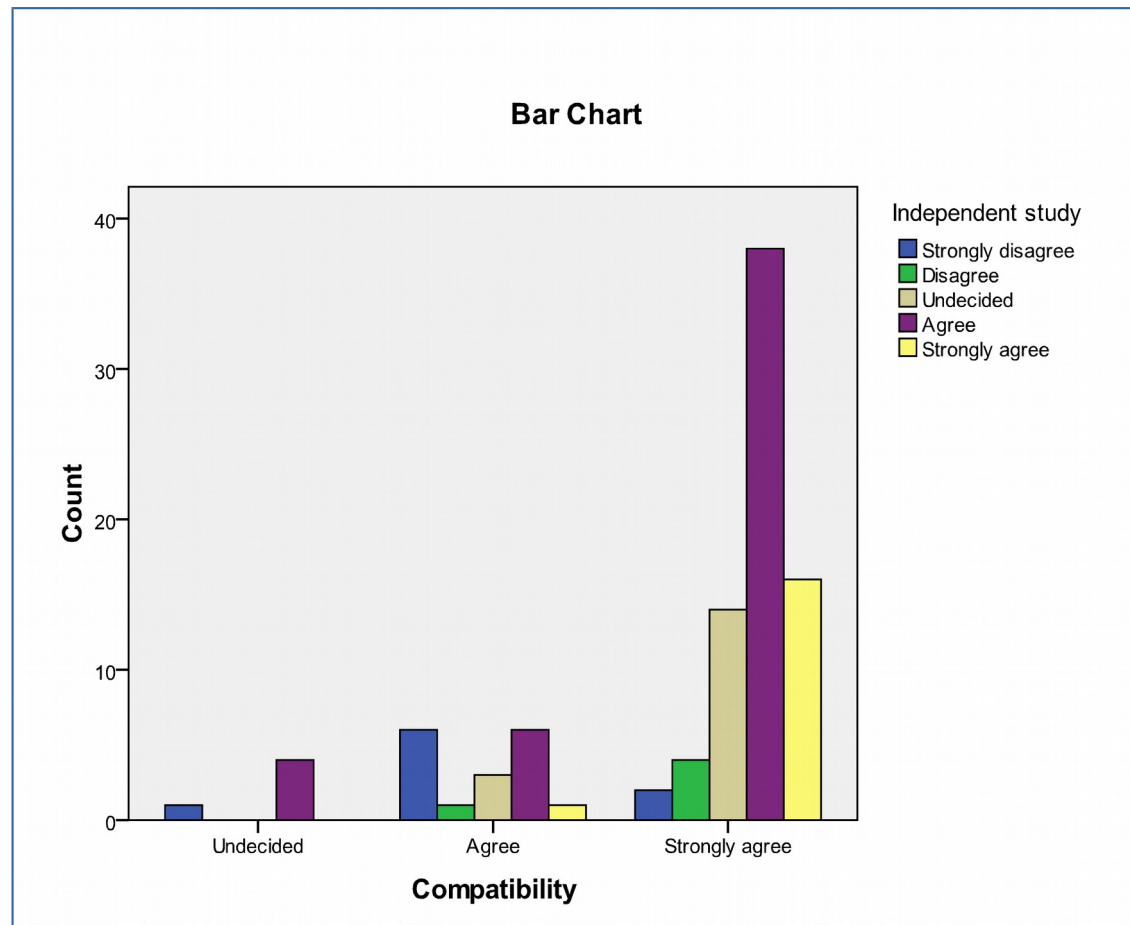
Figure 13. "I learn how to use Moodle myself." N=96

According to chi-square test the level of significance is strong 0,005, that means that there is strong evidence of relationship between variables. The difference between expected and observed frequencies exists. Thus, null-hypothesis is rejected. The clustered bar chart shows the majority of pupils agree on Moodle's compatibility and agree they learn how to use Moodle themselves.

3) Variable "Internet access" has negative correlation with compatibility with meaning -0.12 Pearson's R coefficient and insignificant statistical meaning of 0.22. Pupils answers to the questions of the Internet access are following:

strongly disagree - 1, disagree - 2, undecided - 1, agree - 21, strongly agree – 71.
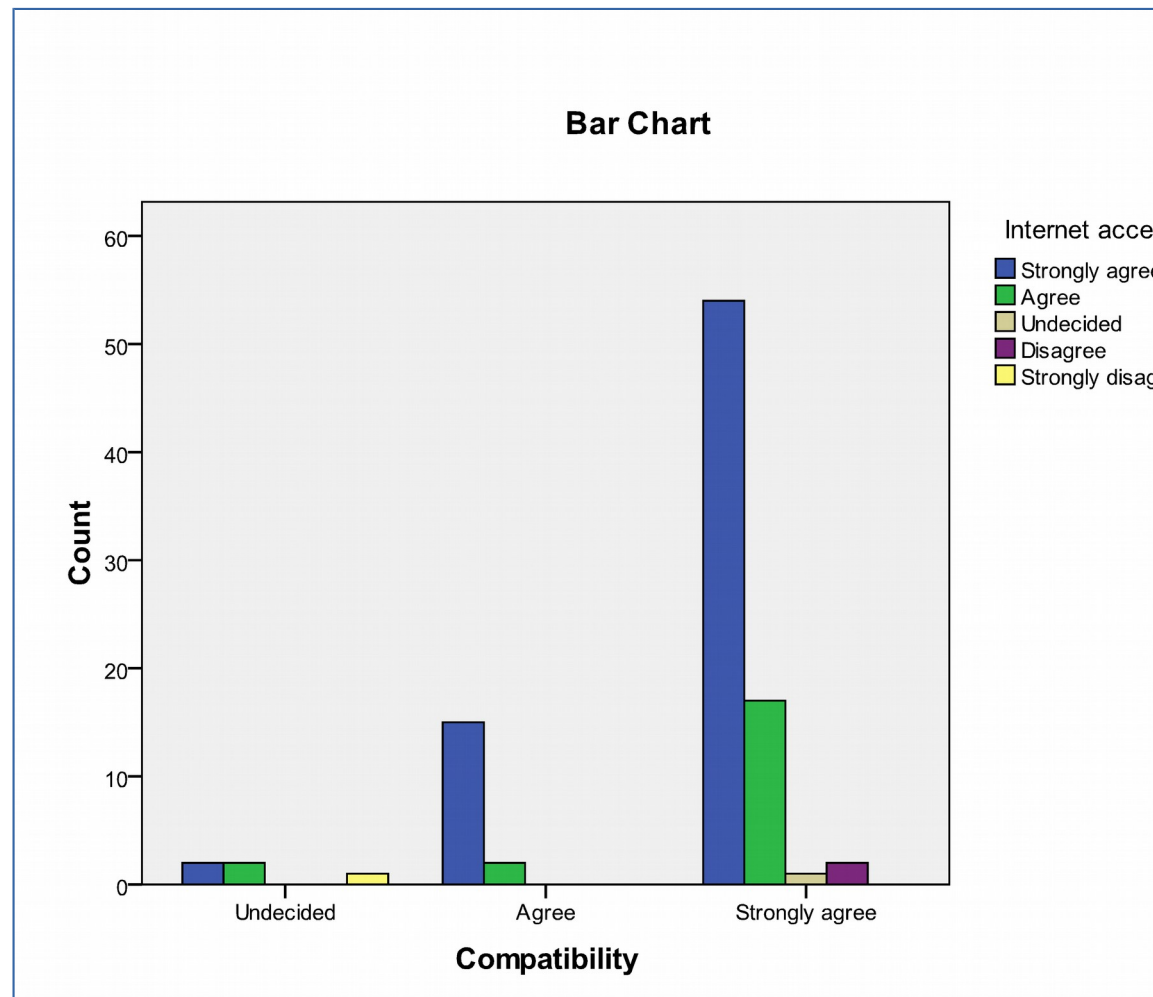
Figure 14. "It is difficult for me to gain access to Moodle, because I don't have Internet at home." N=96

According to chi-square test statistical value is significant, p-value 0,005 that means there is evidence of relationship between variables. Also, there difference between expected and observed frequencies in the cell, that reflects pupil's positive assessment of Moodle's compatibility and their access to the Internet. The clustered bar chart reflects the majority of students replied according to the maximum values for each of two variables.

4) Variable "easy exams in Moodle" has weak correlation with variable compatibility with the meaning of Pearson's R 0.08 and insignificant statistical meaning 0.43. Pupils' answers towards the preferability to take exams in Moodle are following: strongly disagree - 16, disagree - 17, undecided - 52, agree - 8, strongly agree – 3.
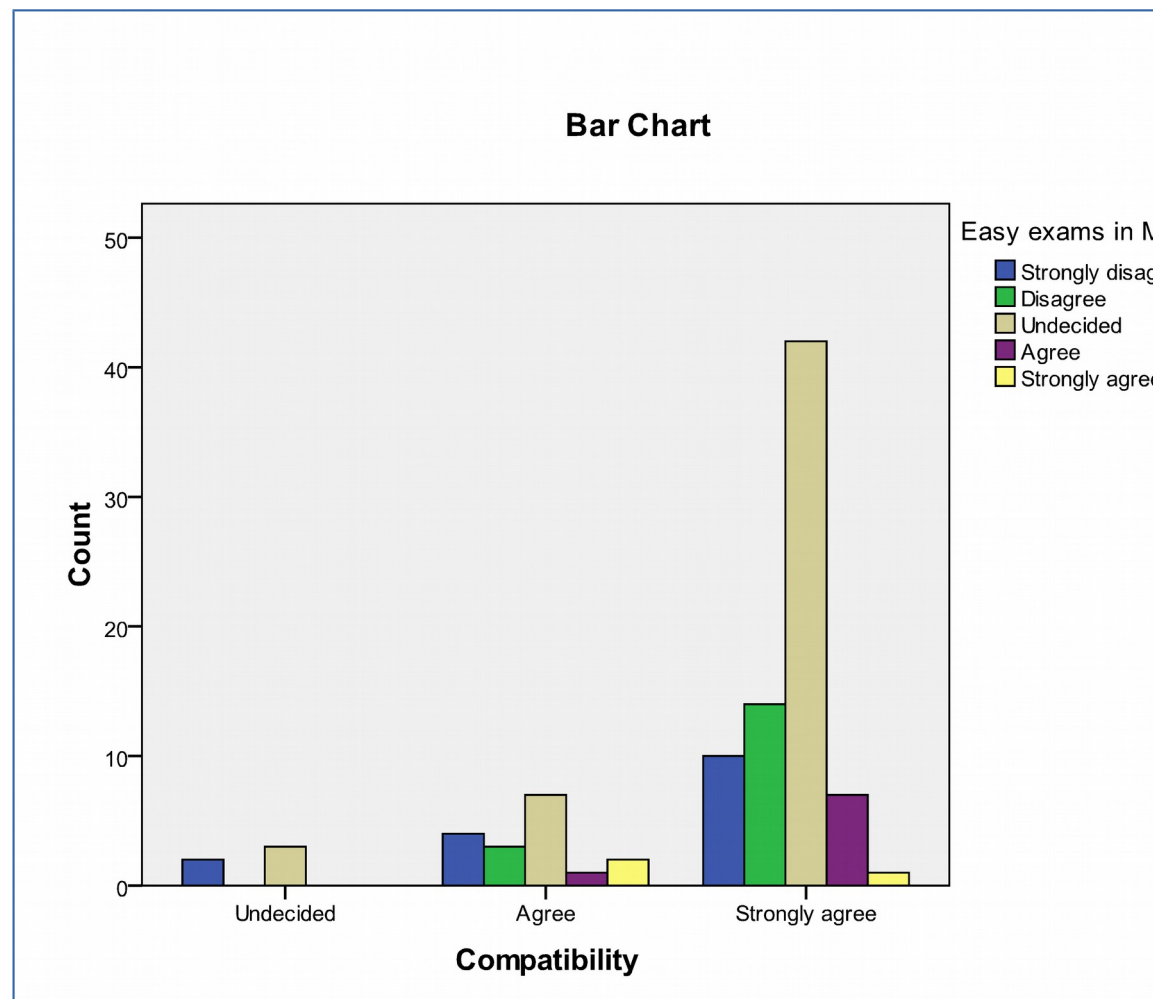
Figure 15. "It is easier for me to take exam in Moodle, than to do in paper in class". N=96

Chi-square test shows there is no strong evidence between variables, p-value is 0, 28. And, there is no significant difference between expected and observed frequencies, that means the null-hypothesis is true. Additionally, the clustered bar chart shows the majority of pupils reflect uncertainty in this question.

5) Variable "Stress-time" has low correlation with variable compatibility due to the meaning of Pearson's R 0.1, and insignificant statistical meaning of 0.32.

Pupils' replies to the question of whether they feel stress because of lack of time when they pass exams in Moodle: strongly disagree -11, disagree - 6, undecided - 52, agree - 21, strongly agree – 6.
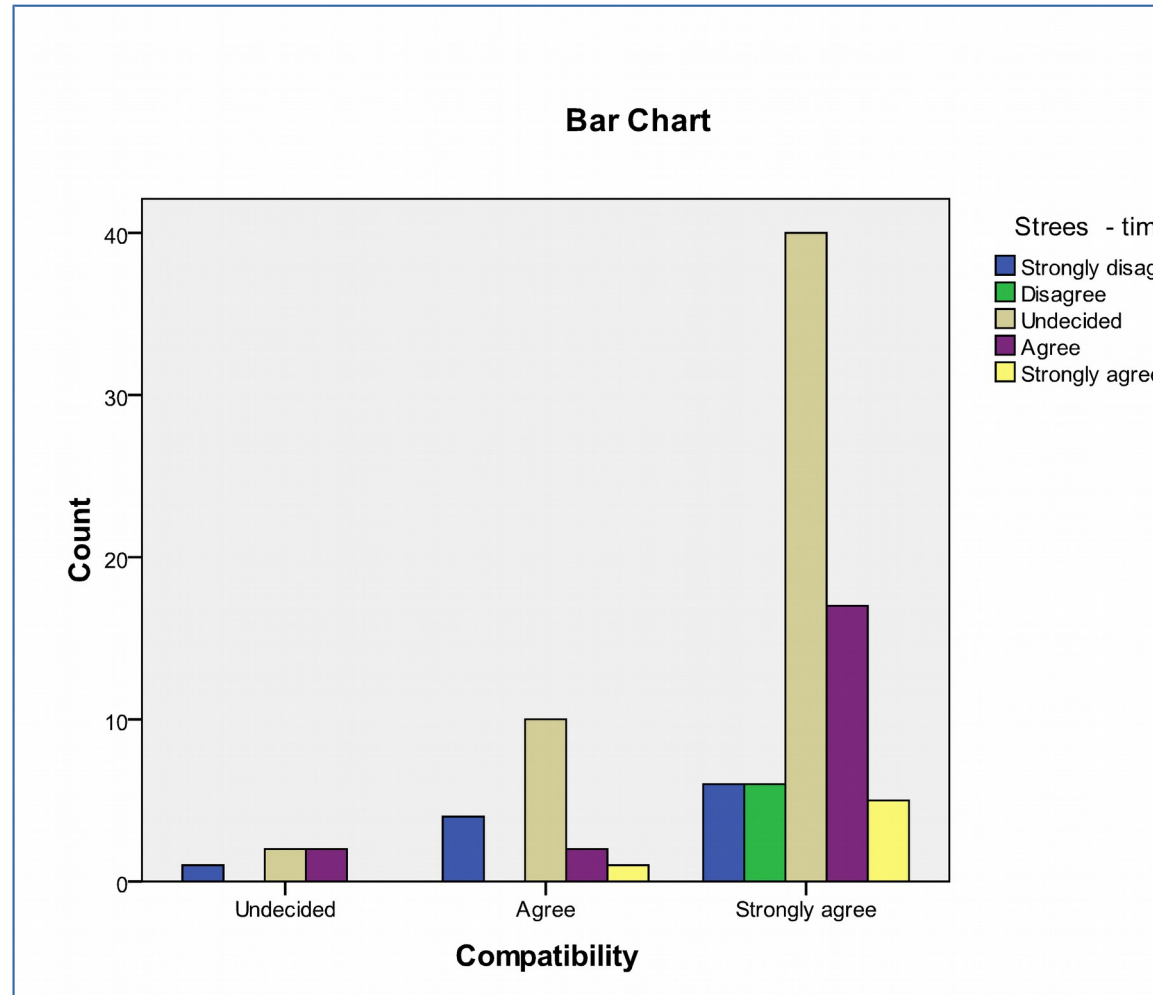
Figure 16. "I feel stress when I take exam in Moodle, because I have time limit". N=96

The chi-square test significance level is low by means of 0,52 and the distance between expected and observed frequencies is also not significant. Additionally, the clustered bar chart shows the majority of pupils expresses uncertainty in this question

6) Variable "Presentations" has low correlation with compatibility with the Pearson's R 0,24 and significant statistical value of 0.019. Pupils answers to the question of better understanding teachers and course mates when they use presentations: strongly disagree -1, undecided - 11, agree - 52, strongly
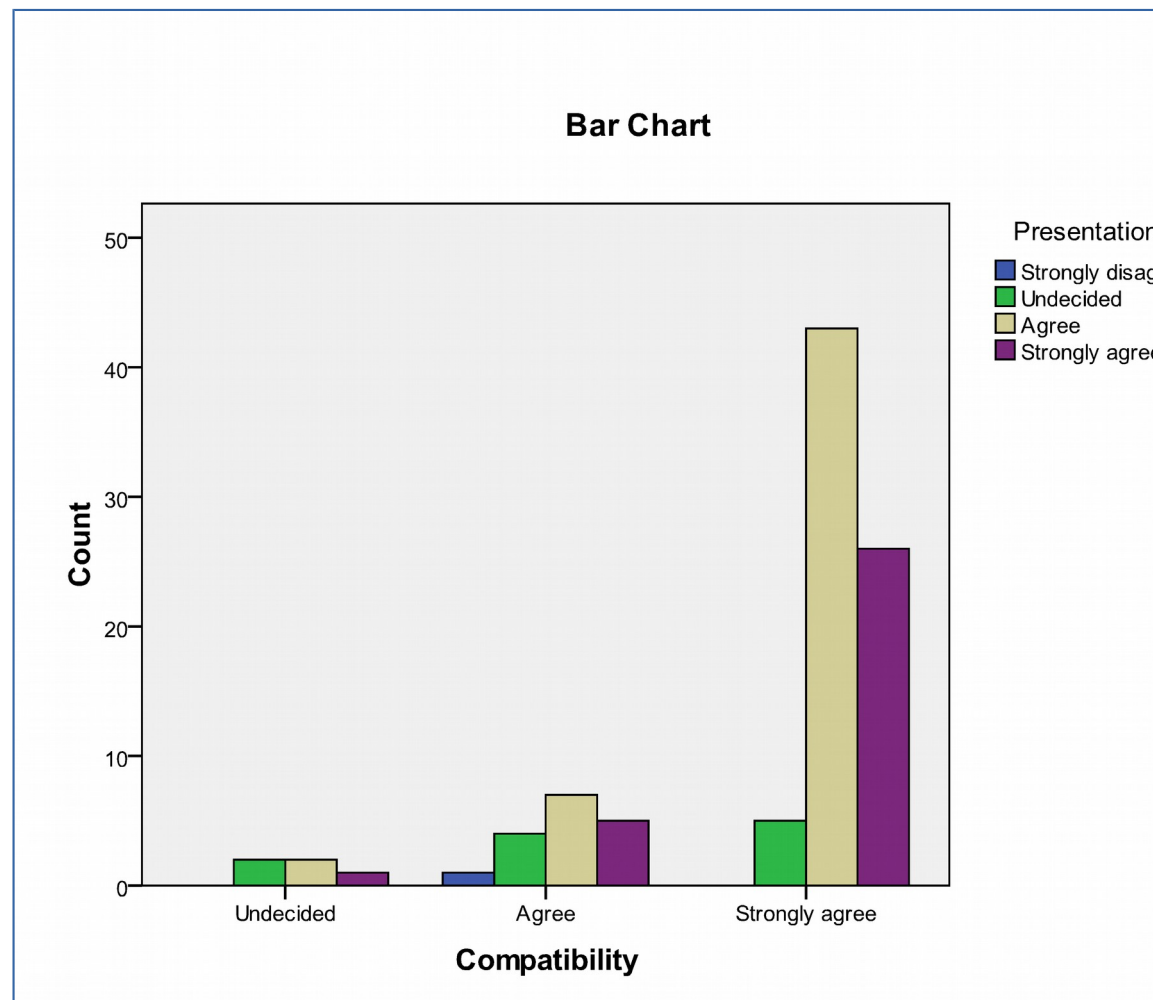
Figure 17. "I understand teacher or my classmates better, when they use slides or presentation during the lecture". N=96

According to chi-square test the level of significance is not strong – 0,04. But there is difference between expected and observed frequencies in the cells, that express positive answers to both variables. The clustered bar chat

also reflects the significant majority agrees on the necessity of using presentations during classes. Variable "Content" has low correlation with variable compatibility due to meaning of Pearson's R 0,2 and significant statistical value of 0.05. Pupils' answers to the question about better understanding of material with use of audio and video-content: strongly disagree - 2, disagree - 1, undecided - 6, agree - 54, strongly agree – 33.
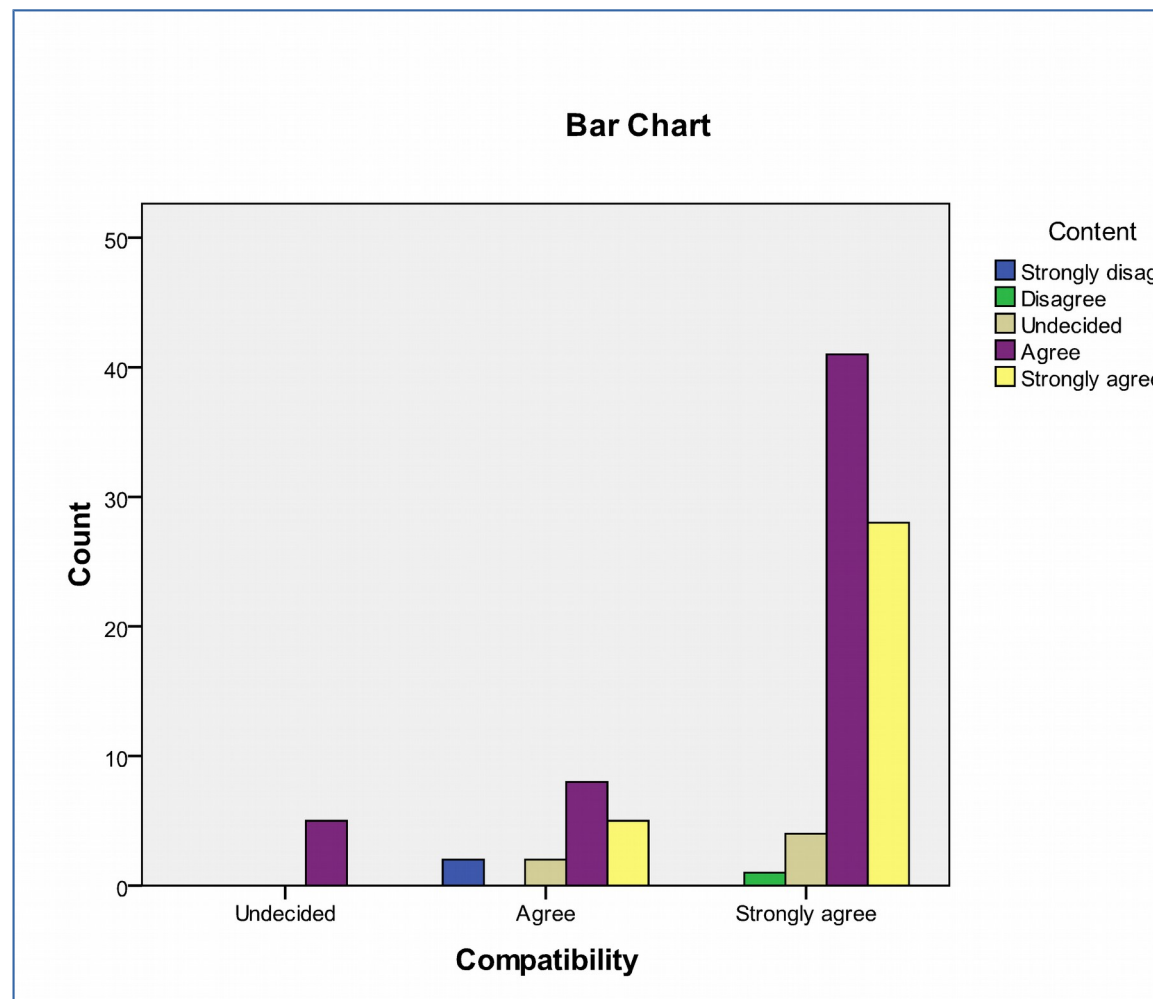
Figure 18. "I understand subject better, when teacher uses media (audio, video, pictures)". N=96

According to chi-square test, the level of significance is not very strong, p-value is 0,062. But there is difference between expected and observed frequencies in the cell that reflects answer "strongly agree" to both variables. The clustered bar chat also shows that majority of pupils who agrees that Moodle is compatible with their needs also agrees on statement, that they

understand teacher better when he uses pictures, video files and other content during the lessons.

Complexity (See correlation analysis in Appendix, figure 40)

Pupils were asked if they find Moodle easy to use. Opinions differ.
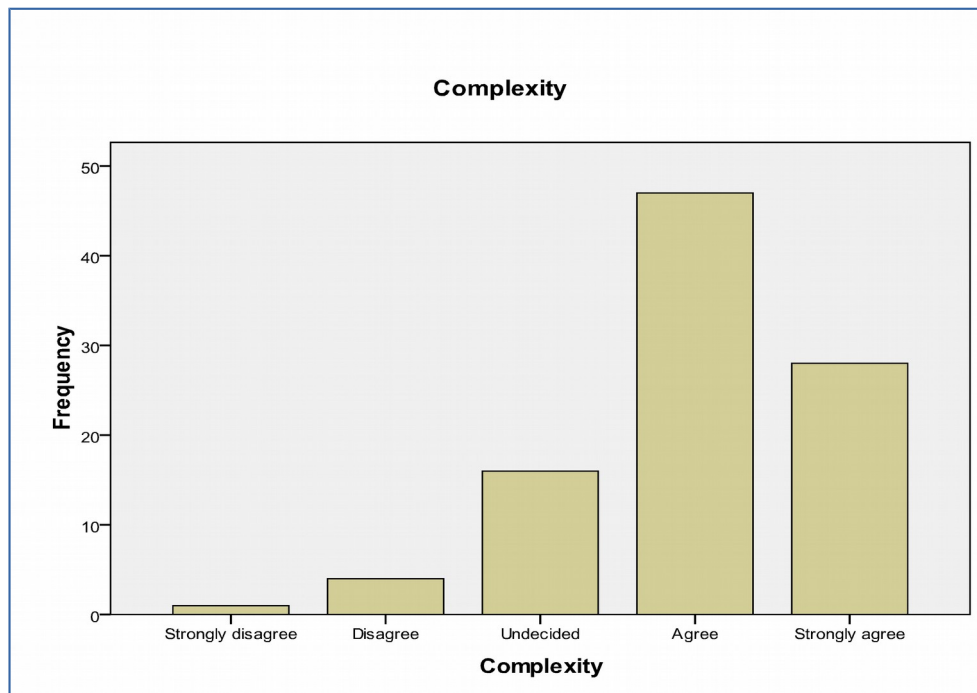
1) Variable "Loading difficulties" is negatively correlated with variable Complexity due to meaning of Pearson's R – 0.2 and insignificant statistical value of 0.1. Pupils answers towards difficulties with uploading documents are following: strongly disagree - 1, disagree- 6, undecided - 30, agree - 22, strongly agree – 37.
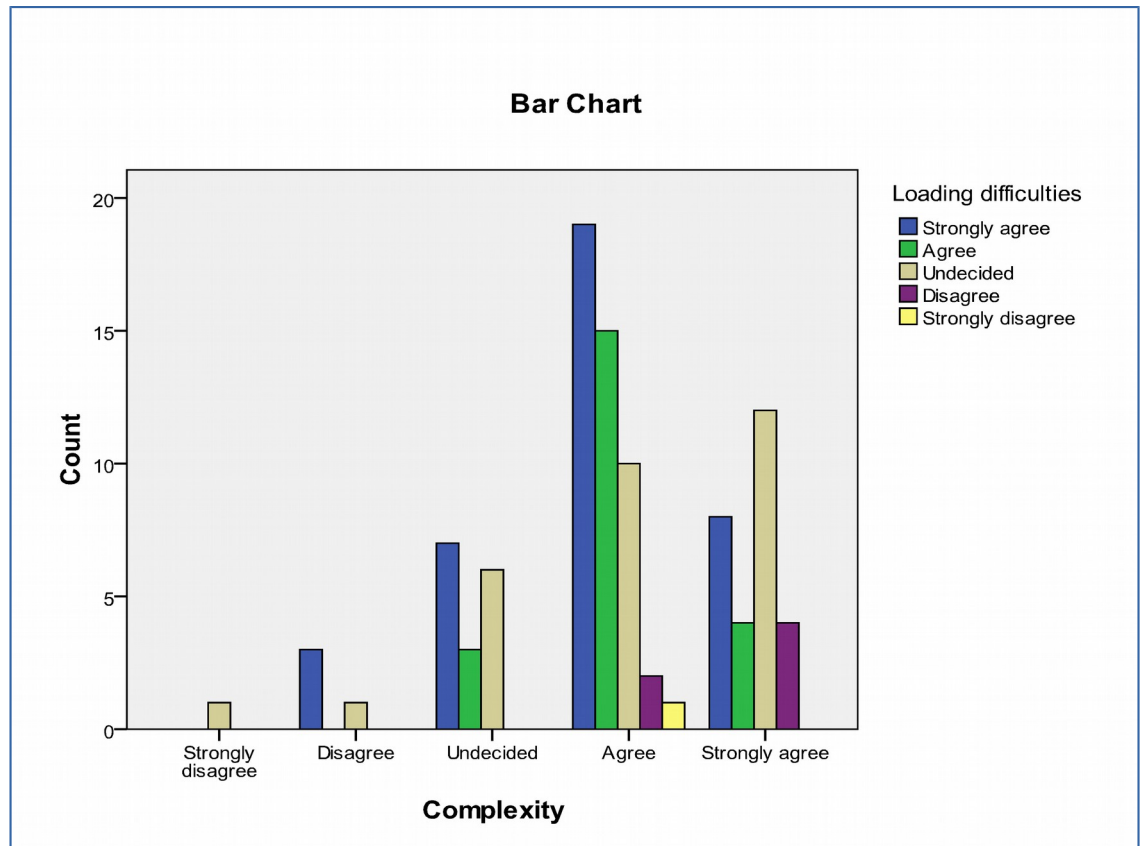
Figure 19. "It is difficult for me to upload video, audio, pictures". N=96

According to chi-square test the significance level is low, p-value is 0,42. The distance between observed and expected frequencies is not significant and the clustered bar chat shows the majority considers Moodle to be easy technology, but agrees, that find it difficult to upload their own materials in Moodle .

2) Variable "Internet speed" has also low correlation. Correlation index is 0.06 and insignificant statistical meaning of 0.541. Pupils' answers regarding the low speed of Internet in their schools are following: strongly disagree - 4, disagree - 18, undecided - 31, agree - 34, strongly agree – 9.
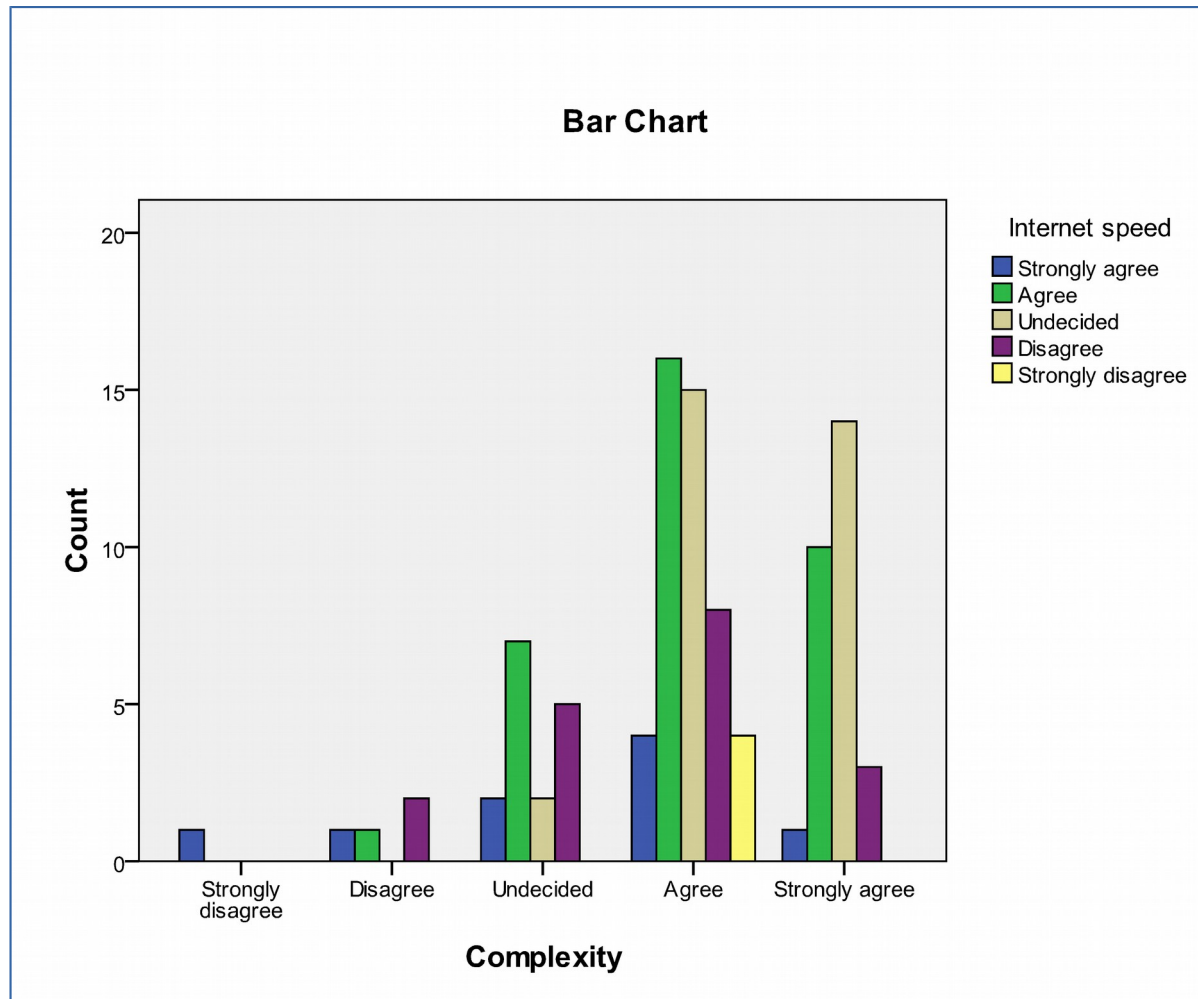
Bar Chart

Figure 20. "The speed of Internet is slow in school". N=96

The level of significance according to chi-square test is low, p-value is 0,042, an the difference between expected and observed frequencies is small. The clustered bar chart shows dispersed replies among undecided, agree and strongly agree in the answer to complexity and between agree, undecided and disagree in the answer to Internet speed.

3) Variable "Assessment section" has negative correlation with complexity variable. The Pearson's R meaning is -0.045 and statistical meaning is insignificant 0.66. Pupils' answers regarding the ease of access to assessment section are following: strongly disagree - 11, disagree - 10, undecided- 41, agree

-         23,   strongly   agree   –   11.
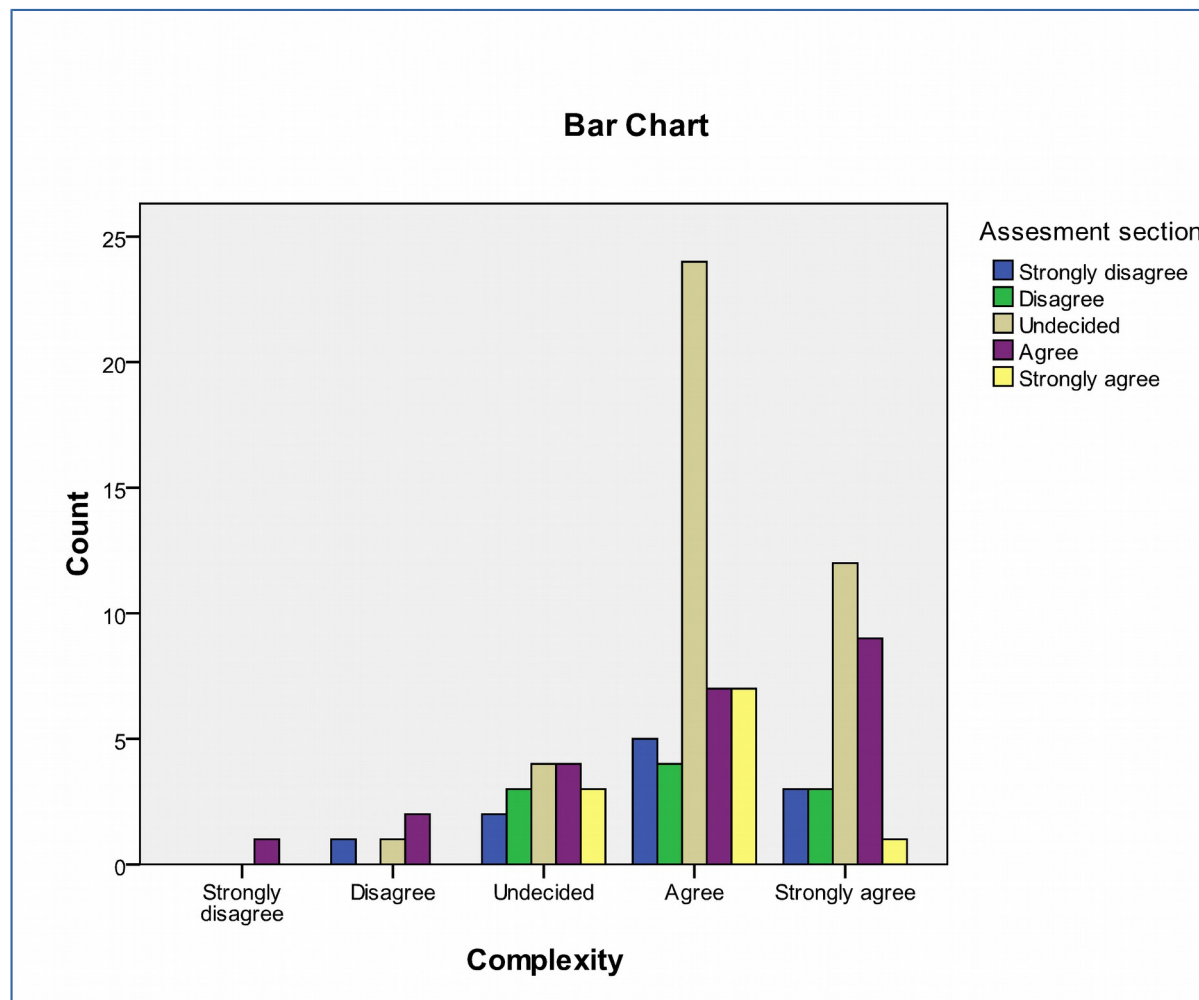
Figure 21. "I can easily find section with my grades". N=96

According to chi-square test the significance level is low, p-value is 0,56. The distance between observed and expected frequencies exists in the cells that shows uncertainty and the clustered bar chat also reflects the reply "undecided"

for the majority of pupils. Variable "Statistics" has very poor correlation with complexity variable with Pearson's R 0.04 as well as the insignificance of statistical value of 0.688. Pupils' answers to the question about how easy they can reach statistics sections are provided below: strongly disagree - 11, disagree - 20, undecided - 48, agree - 13, strongly agree – 4.
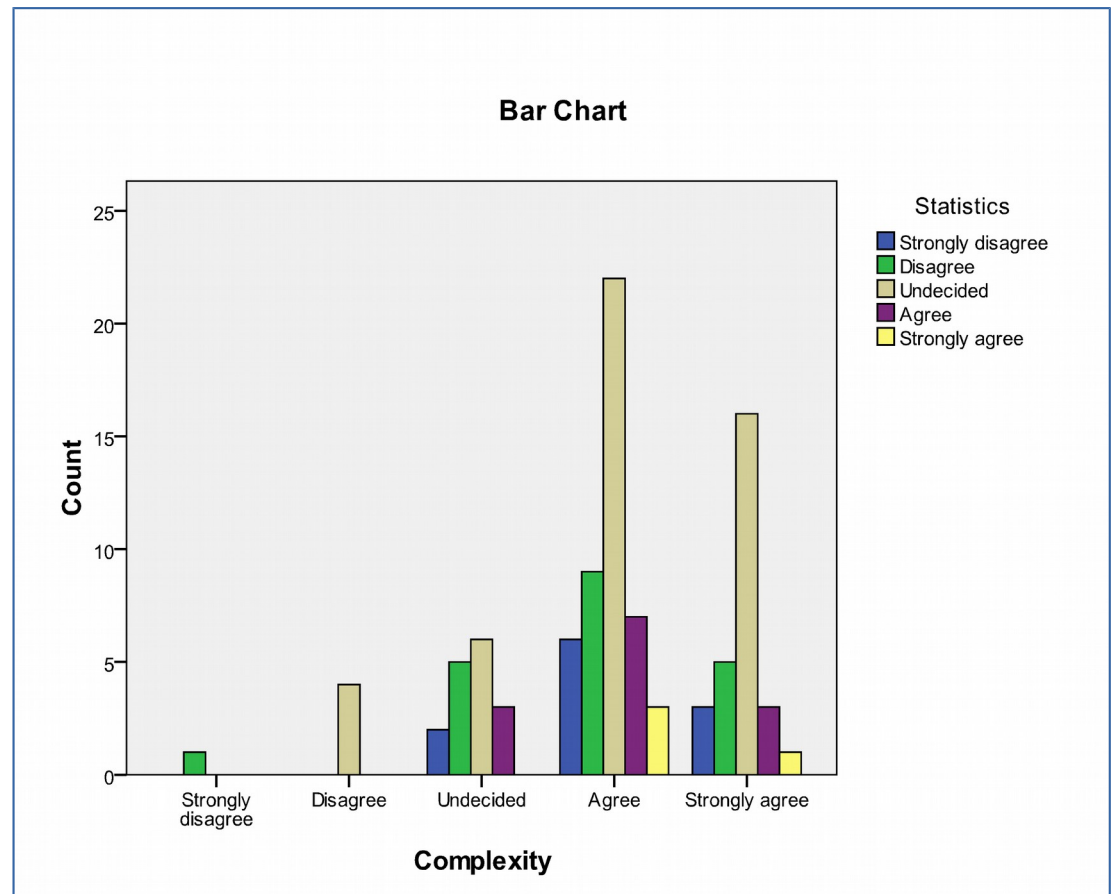

Figure 22. "I can easily find section with statistics of my activity". N=96

Regarding chi-square test the situation is the same as with previous variable: insignificant value of 0,77 and differences in frequencies in reply "undecided". Variable "Study materials" has moderate correlation with variable of complexity – Pearson's R 0.3 and significant statistical value of 0.01. Pupils' answers on the question of their accessibility to study materials are following: strongly disagree - 2, disagree - 2, undecided - 13, agree - 60, strongly agree – 19.
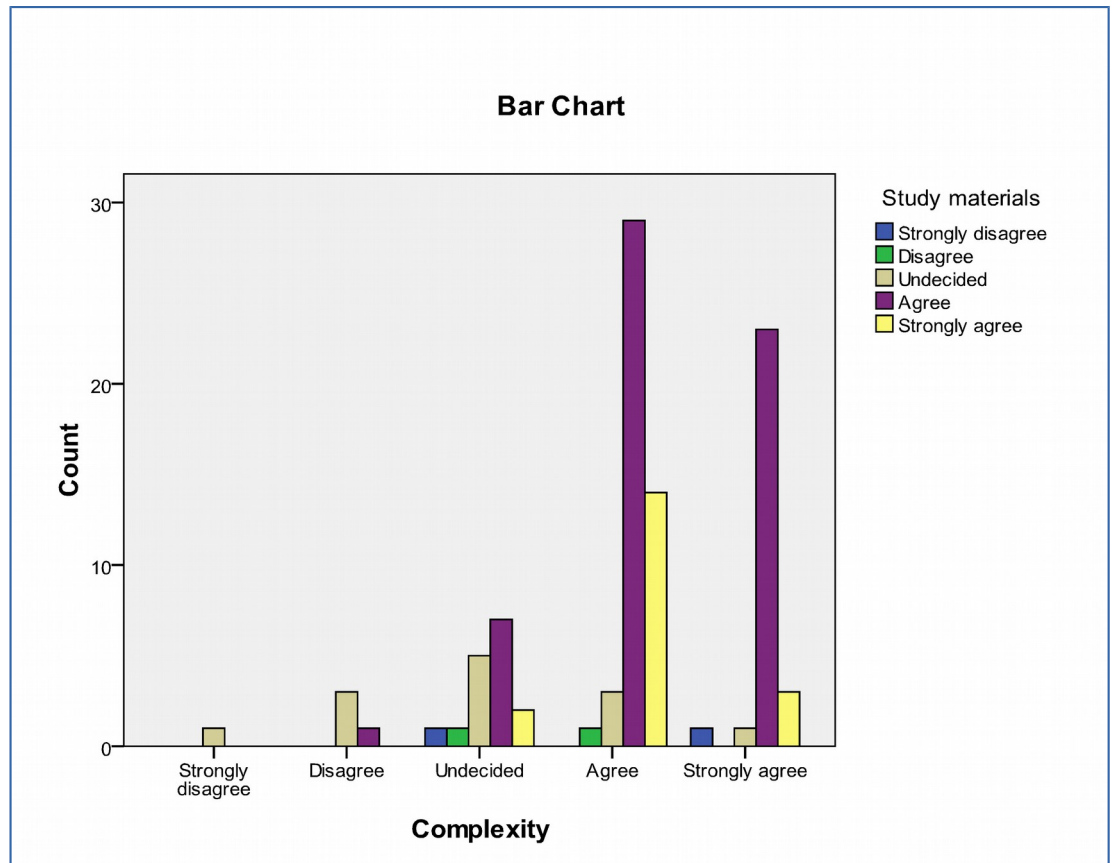
Figure 23. "I can easily find section with study materials". N=96

Chi-square test also confirms significant strong relationship between variables, p-value is 0,001. The difference between expected and observed frequencies exist in the cell, that reflects positive reply regarding Moodle's ease of use and ease in finding study materials section. Clustered bar chart also shows the majority of pupils reply "agree" to this question.

4) Variable "profile changes" is poorly correlated with variable of complexity due to Pearson's R index -0.06 and insignificant statistical value of 0.564. The answers to the question about feasibility of changing user's profile are provided below: strongly disagree - 1, disagree - 2, undecided - 26, agree - 46, strongly
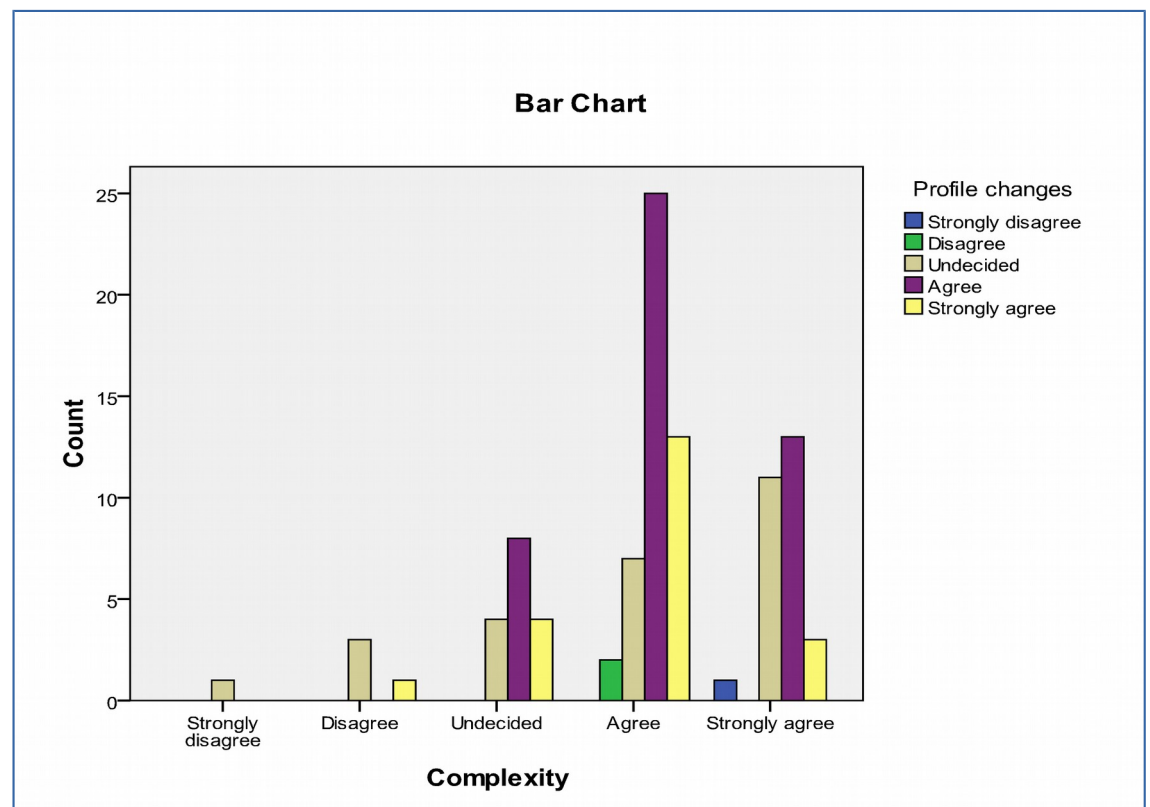
Figure 24. "I can easily edit my profile". N=96

Chi-square test shows low evidence of relationship, p-value is 0,252, but there is difference between frequencies in the cells, that reflect replies "agree" and "strongly agree" to the issue of profile changing.

5) Variable "Moodle design" is also poorly correlated with dependent variable: Pearson's R is -0.003 and insignificant statistical value means 0.97. Pupils' answers towards Moodle design are following: strongly disagree - 11, disagree - 30, undecided - 34, agree - 18, strongly agree – 3.
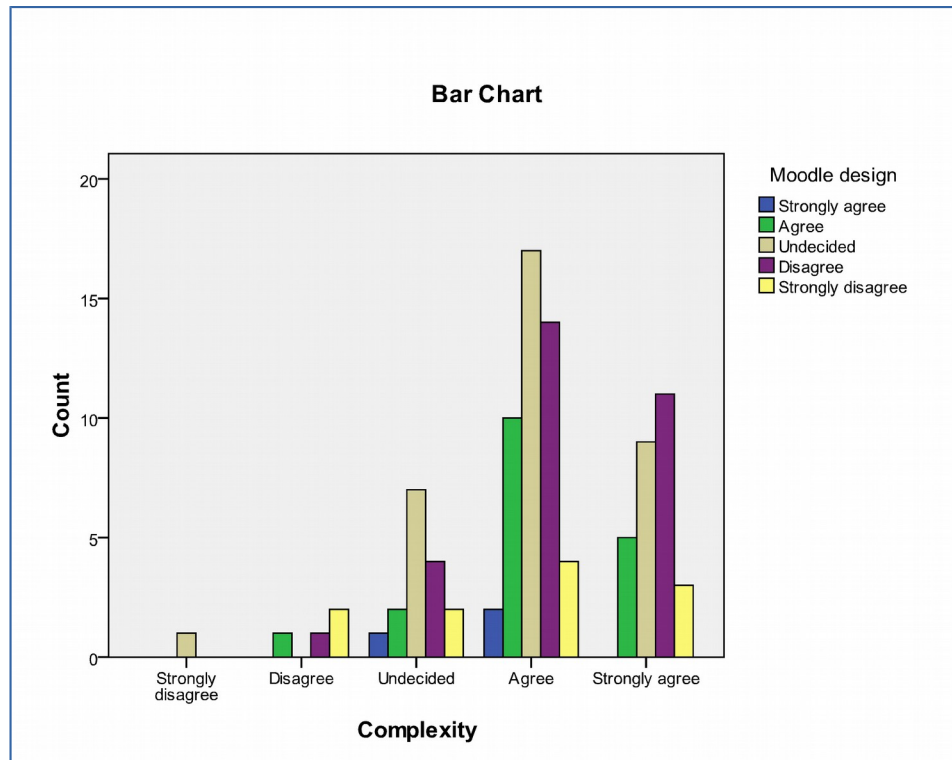
Figure 25. "I don't like design of Moodle (colour, size)". N=96

Chi-square test shows no evidence of relationship between variables, p-value is 0,72. The difference between frequencies exists only in the cell with reply "undecided". Clustered bar chart also reflects the majority's choice of uncertainty.

6) Variable "Moodle convenience" lowly correlates with complexity variable: Pearson's R index is -0.056 and statistical value is insignificant by means of 0.583. Pupils' responses to the statement, that proposes to make Moodle as convenient as Facebook or Google+ are displayed below: strongly disagree - 7, disagree - 27, undecided - 40, agree - 20, strongly agree – 2.
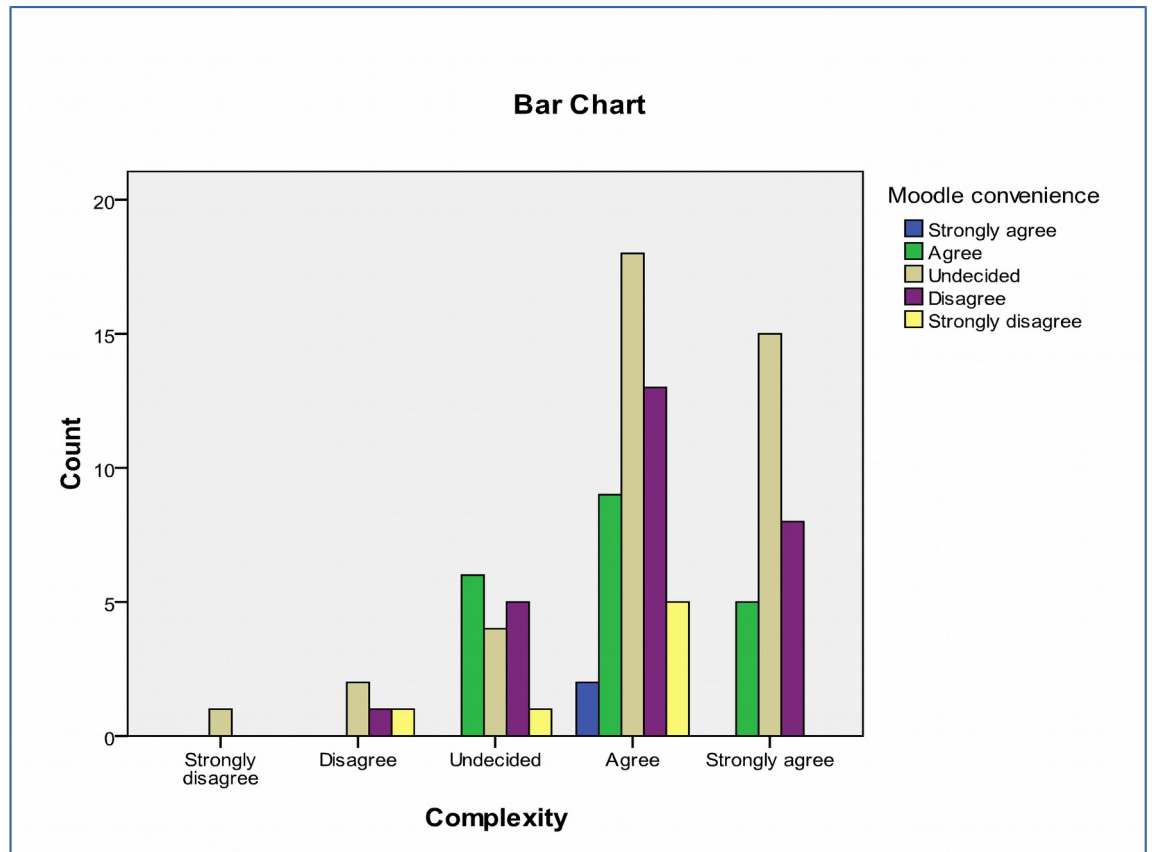
Figure 26. "Moodle should be more user-friendly, like Facebook, or Twitter" N=96

Like with previous variable, in chi-square test, p-value doesn't show strong relationship between variables. P-value is 0,64. And again, difference between frequencies exists in cell with "undecided" replies

7) Variable "e-mail" is also poorly correlated with complexity variable. Pearson's R is 0.053 and statistical value is insignificant by the means of 0.607. Pupils' answers towards the statement that implies using Moodle more often, then e-mail to connect with coursemates and teachers are performed below: strongly disagree - 66, disagree - 23, undecided - 3, agree - 2, strongly agree – 2.
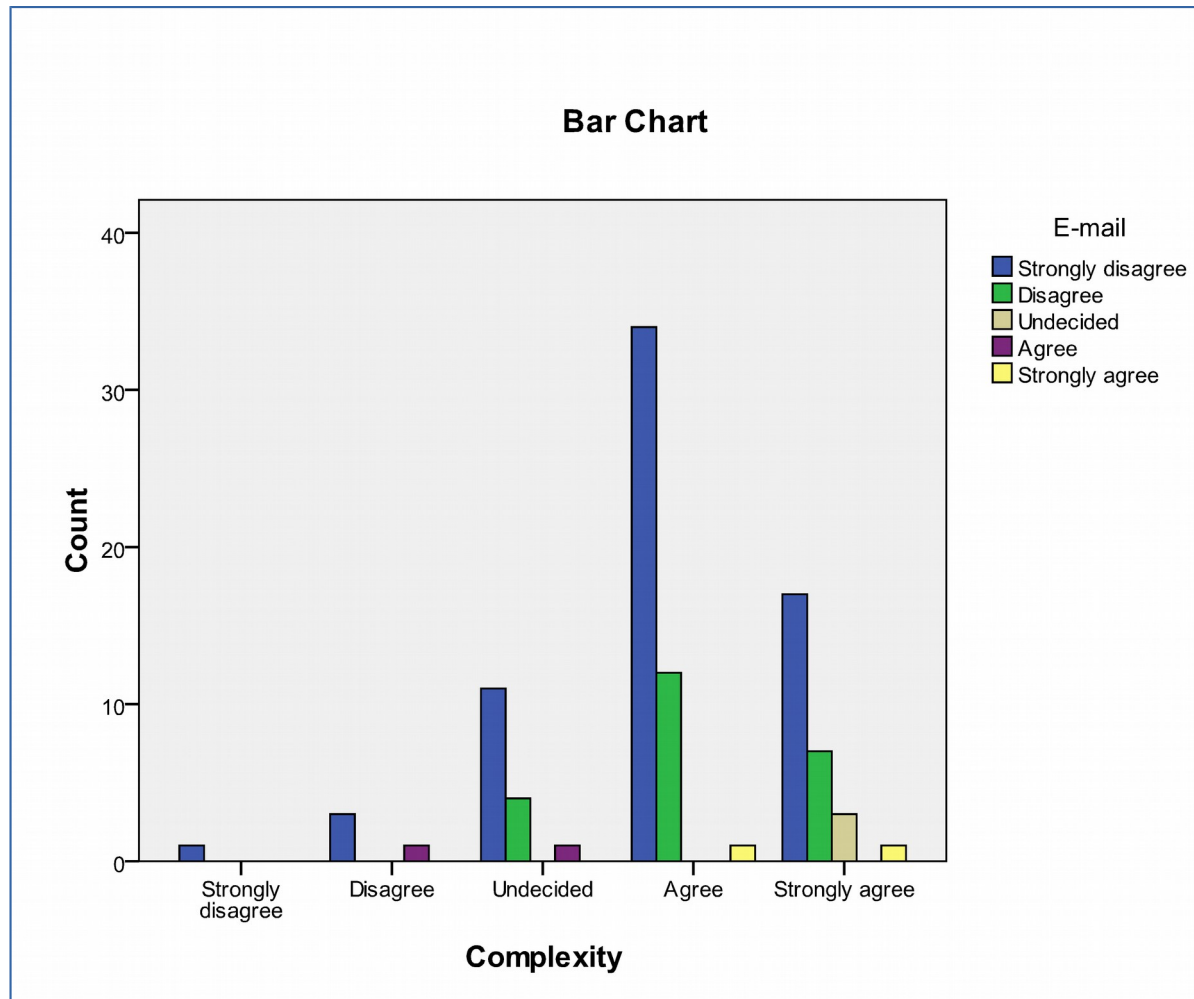
Figure 27. "I use Moodle chats to connect with my classmates or teacher more often, than e-mail". N=96

 Chi-square test doesn't show strong evidence of relationship between variables with p-value of 0,12. But the difference exists between frequencies in the cells that reflect information about confirmation Moodle as easy technology and rejection of using Moodle more, than e-male for connection with peers and teachers. Clustered bar chart also shows the majority of pupils deny their use of Moodle more often than e-mail

Observability (See correlation analysis in appendix, figure 41)
Pupils were asked question if they consider Moodle should be adopted by every teacher in every school.
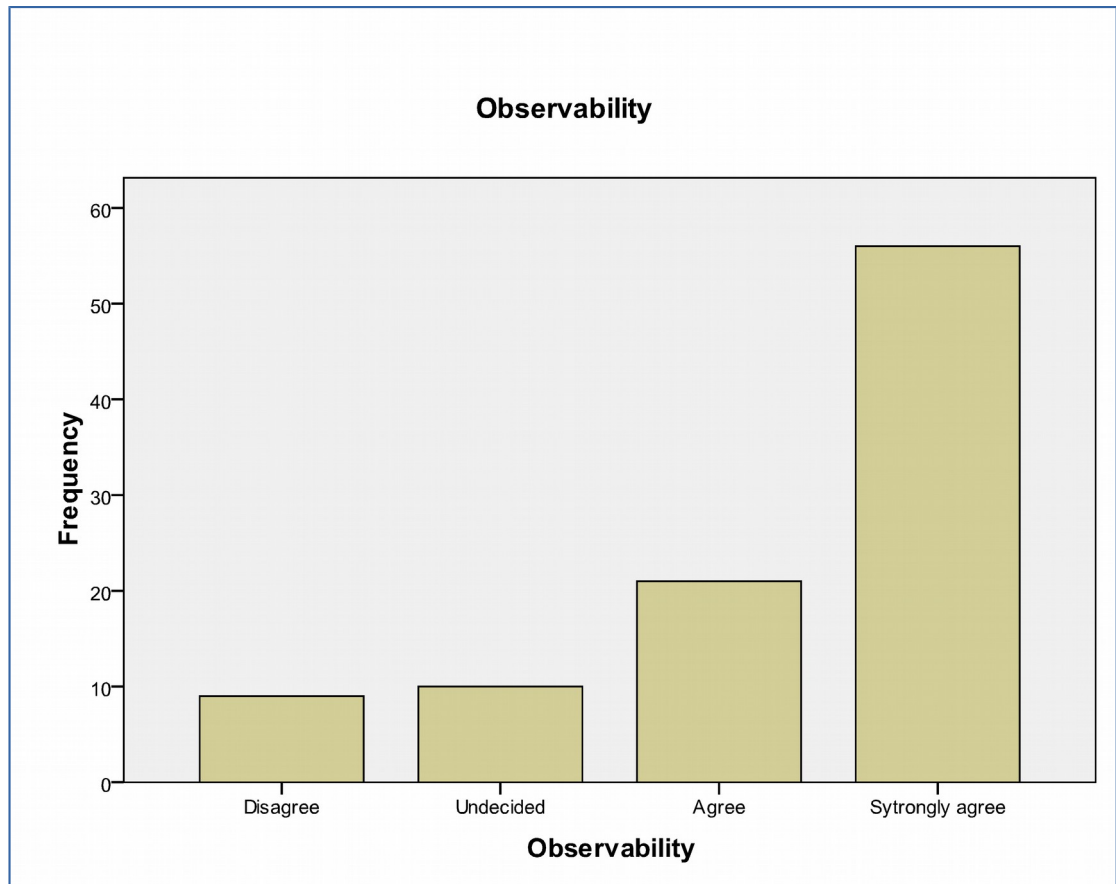
Observability

1) Variable "Moodle's friends" has moderate correlation with observability variable. Pearson's R coefficient is 0,2 and statistical value is significant by means of 0.05. Pupils' responds to the statements regarding they have friends which don't use Moodle are provided below: strongly disagree - 34, disagree - 11, undecided - 23, agree - 16, strongly agree – 12.
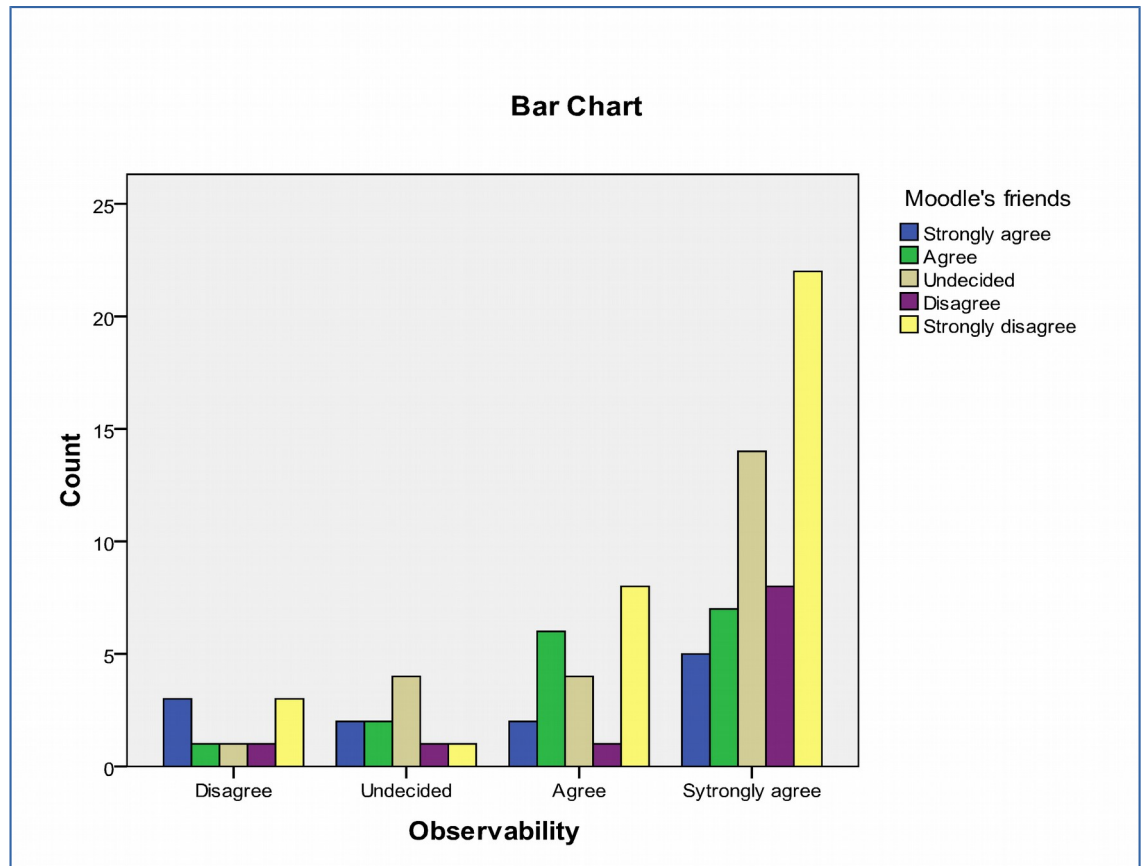
Figure 28. "I have friends that don't use Moodle in their classes". N=96

According to chi-square test there is no evidence of relationship between variables. Also there is difference between frequencies in cell, that reflects information about pupils who think Moodle should be introduced in other schools and who disagree they have friends who don't use Moodle.

2) Variable "My results" negatively correlates with dependent variable. Pearson's R is -0.06 and statistical value is insignificant by means of 0.57. Pupils' answers to the statement, that claims their own results are better than their friends' ones because they use Moodle are presented below: strongly disagree - 26, disagree - 18, undecided - 48, agree - 2, strongly agree – 2.
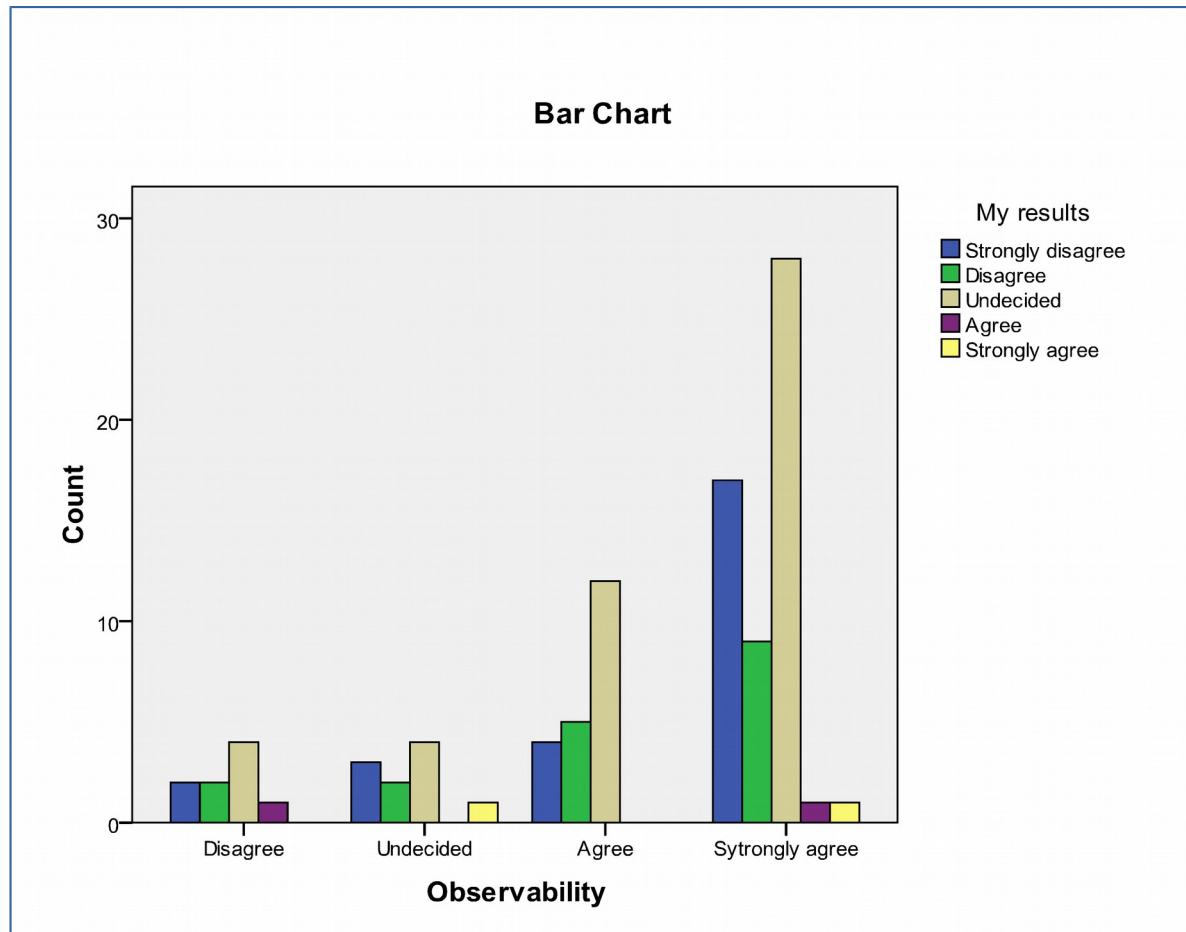
Figure 29. "I have better results, than my friend, because I use Moodle". N=96

The significance level is low in chi-square test, p-value is 0,64. At the same time there is difference between frequencies in the cell, that reflects uncertainty to this question. The clustered bar chart also shows, that "undecided" is the most popular reply among each group.

Are there differences in attitudes among the youngest and the eldest pupils?

Report

Age	Mean	N
14,00	5,0000	1
15,00	4,5000	10
16,00	4,7500	44
17,00	4,8000	5
18,00	4,7143	28
19,00	5,0000	7
Total	4,7368	95

Figure30. "Comparing means between age and relative advantage". N=95

As visible from the table above, the average reply to the question of Moodle's relative advantage is 5 for pupils of 14 and 19 years old. Also there is no significant differences between 5 and 4,8 or 4,75. We should also pay attention that there is only one pupil about age of 14, so it's not relevant to rely only on his reply. The next youngest cohort is 15 years old pupils and the difference in means is 0,5. But we should also keep in mind that "5" value corresponds to "strongly agree" reply and "4" corresponds to "agree" reply. 4,5 is somewhere between them and also reflects positive feelings, thus, there are no significant differences in attitudes among pupils of different age.

Report

Age	Mean	N
14,00	4,0000	1
15,00	4,8000	10
16,00	4,7045	44
17,00	4,6000	5
18,00	4,7500	28
19,00	4,8571	7
Total	4,7263	95

Figure 31. "Comparing means between age and compatibility", N=95

This table shows relative homogeneity of means among groups of different ages. Although it is visible, that the person of the age of 14 years old has the lowest mean in comparison not only to the eldest pupils, but also to the rest. At the same time it reflects

positive feelings, thus I would claim there is no significant difference in attitudes among pupils of different ages.

Report

Age	Mean	N
14,00	4,0000	1
15,00	4,8000	10
16,00	4,7045	44
17,00	4,6000	5
18,00	4,7500	28
19,00	4,8571	7
Total	4,7263	95

Figure 32. "Comparing means between age and complexity", N=95

The same situation as in previous case is with complexity. There is no significant differences between pupils of different ages, but one person's mean of the age of 14 differs from the rest of people. But at the same time the degree of attitude is positive.

Report

Age	Mean	N
14,00	5,0000	1
15,00	4,4000	10
16,00	4,2500	44
17,00	4,4000	5
18,00	4,2500	28
19,00	4,4286	7
Total	4,2947	95

Figure 33. "Comparing means between age and observability".

In this case situation is similar to previous ones. It would be possible to claim that there are differences in attitudes in age, if there would be more representatives in the 14 years old age group. The replies of this particular person differs form his peers' replies almost in every section and I would rather call him outlier, rather than take into account. Additionally, the results of 15 years old pupils don't differ a lot from the results of the eldest, 19 years old group.

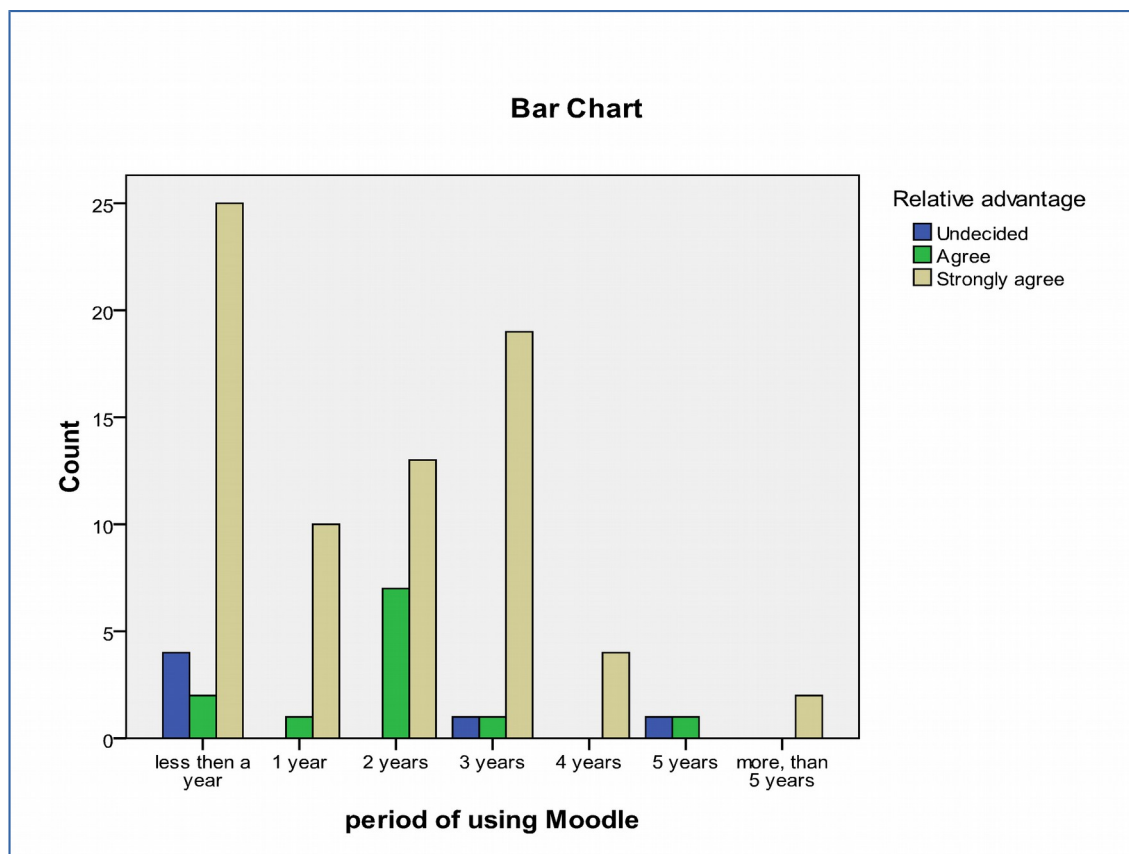Does experience in Moodle influence attitude to it?

1. Relative advantage

Figure 34. "Relationship between period of using Moodle and Relative advantage", N=91

It is evident from this table, that the highest score to Moodle's relative advantage is given by the majority of students, who use Moodle for period less, than a year – 27 pupils. At the same time two pupils, who have been using Moodle for 5 years give it lower scores.
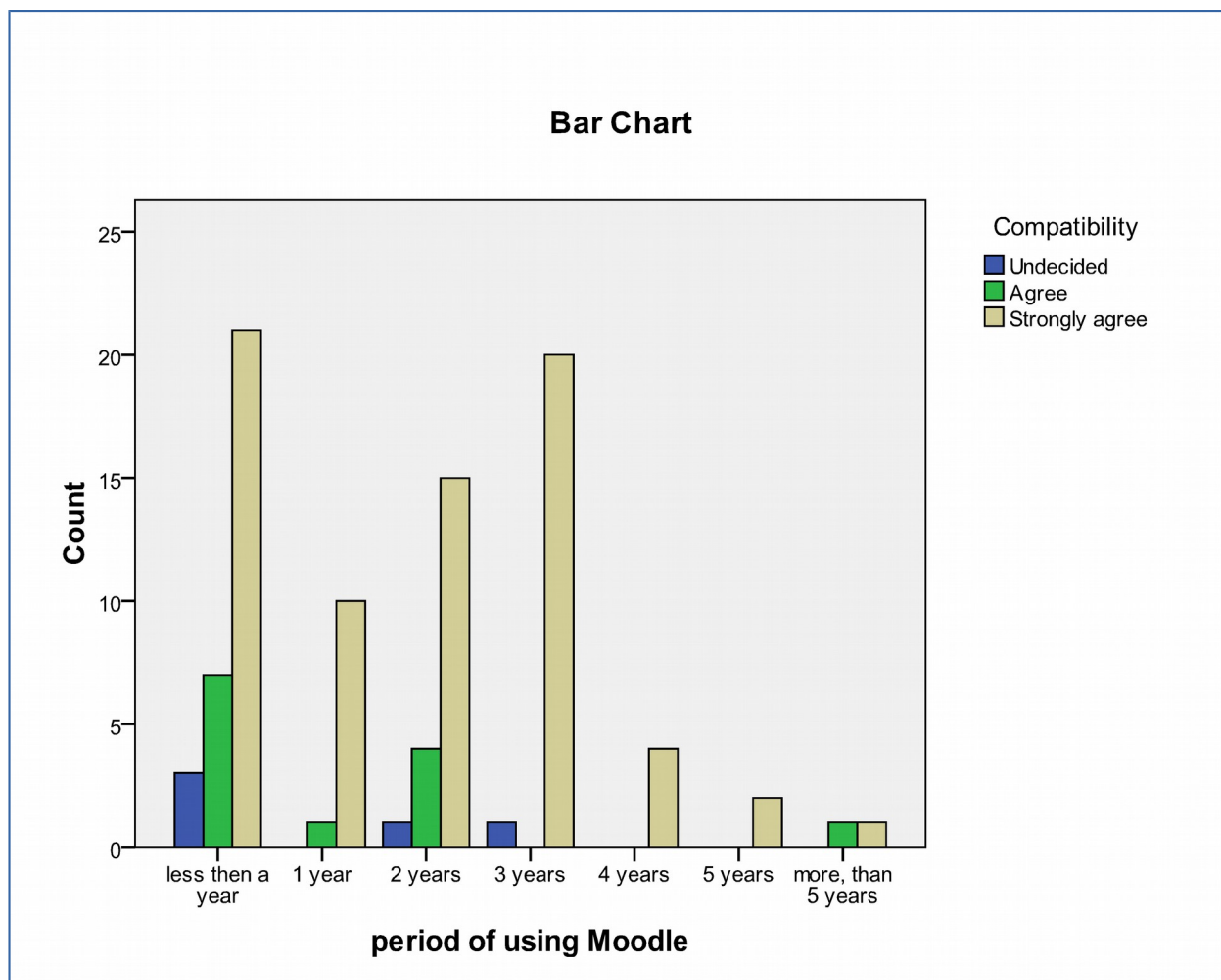
2. Compatibility

Bar Chart

Figure 35. "Relationship between period of using Moodle and Compatibility", N=91

The same situation appears with compatibility of Moodle: 23 pupils, who experience it for less then a year assess this learning system to be compatible with their needs with the highest score.
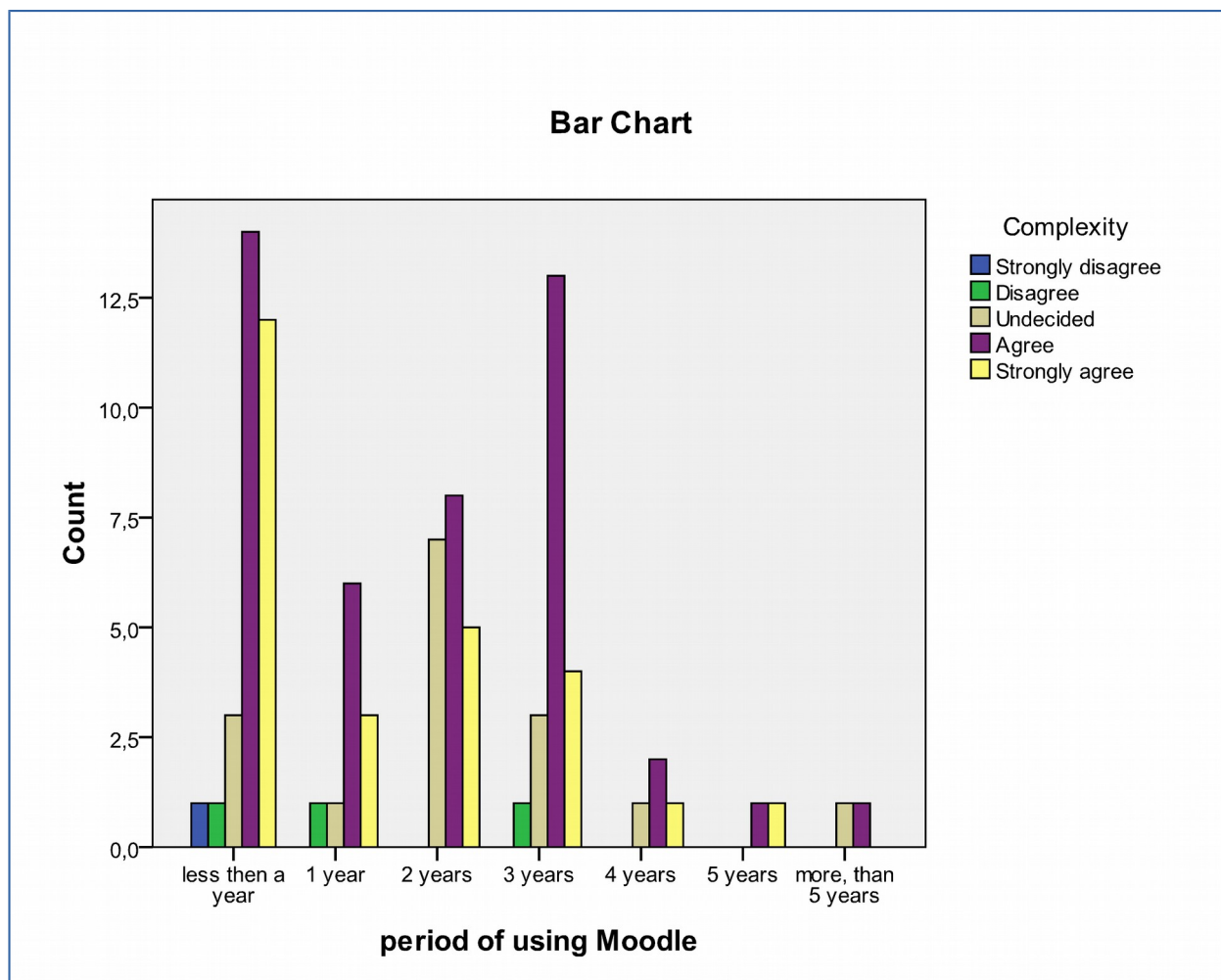
3. Complexity

Figure 36. "Relationship between period of using Moodle and Complexity", N=91

The picture is a bit different with Moodle's complexity. The highest scores are again given by the pupils who deal with Moodle for less, than a year period. But there are still cases among this cohort, that remain undecided and 3 of them don't perceive Moodle as easy-to-use environment. 3-years and 4-years cohort of pupils also give high scores to Moodle's ease of use.
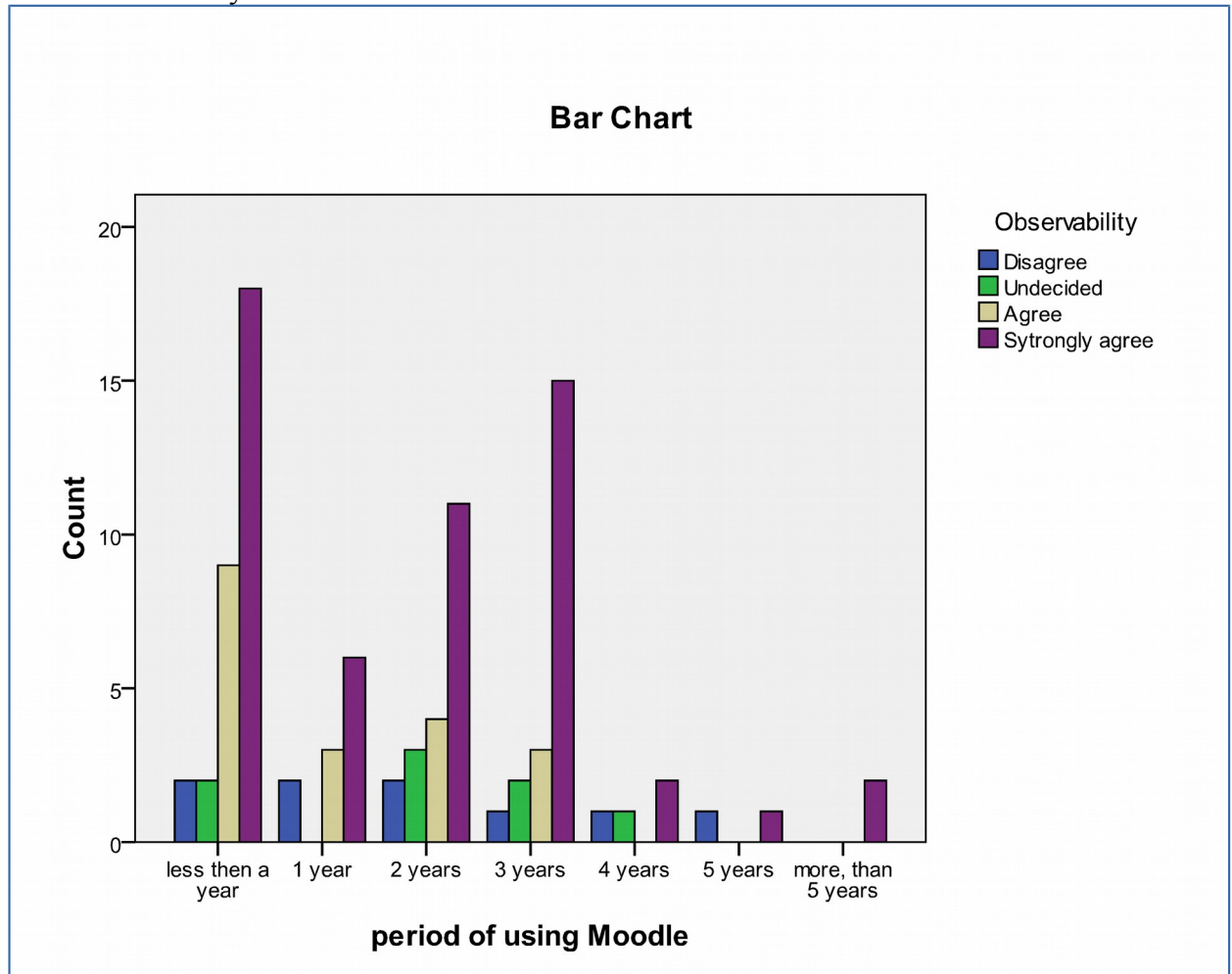
4. Observability

Bar Chart

Figure 37. "Relationship between period of using Moodle and observability", N=91

Observability is also highly assessed by pupils from different cohorts and simultaneously, in each cohort (except "more, than 5 years") there are cases, that disagree with assumption to establish Moodle in every school. Pupils that experience Moodle less, than a year again assess it with the highest scores.

Within the framework of the present study with only 96 samples and enormous heterogeneity in age and pupils' experience of using technologies, it's difficult to confirm Roger's assumption about innovativeness. Among the pupils there are 33 of them who studies with Moodle less than a year and 2 pupils who experience it more

than 5 years. In order to provide such assessment fairly the same amount of pupils in different cohorts should participate. But regarding the sample represented in present study assumption, that more experienced pupils have better attitudes is not supported. That's why, in order to distribute pupils through categories of innovativeness factors, that were statistically supported as factors that have relationship with dependent variables were chosen to be relied on, the attributes of technology about which attitudes were formed. Such factors were: "possibility to upload materials", "Internet access", "independent study", "presentations", "content", "study materials" and "Moodle's friends". Later among these factors I've chosen "possibility to upload materials", because to this particular question answers starting from strongly disagree to strongly agree were provided. Additionally the choice of this variable is justified through provision of correlation analysis between variable "possibility to upload materials" and variable "frequency" of using Moodle. The Pearson's R coefficient is moderate: R=0,4 and the level of significance is relevant p=0,000, that means that positive relationship exists between these two variables. The more frequently person uses Moodle the more confident he is about uploading materials and it makes possible to rely on variable "possibility to upload materials" when providing distribution of pupils among innovativeness categories.

		Freequency
Freequency	Pearson Correlation	1
	Sig. (2-tailed)	
	N	96
possibility to upload materials	Pearson Correlation	,370[**]
	Sig. (2-tailed)	,000
	N	96

Figure 38. "Correlation between frequency and possibility to upload material", N=96

As it is mentioned in the theoretical part, the category of 'innovators' are not taken into account in present case, due to the nature of social system where Moodle is diffused, where innovator is a teacher. Thus, pupils who answered strongly agree or

agree are distributed to the category "early adopters". It is considered that early adopters are active users of innovation and they contribute to promotion of innovation. In present social system of classroom the pupils with the most positive attitudes may be considered early adopters. It appears that the most suitable pupils for this category are those who use Moodle during one year and those who experience it during 4 years. Regarding to the question of possibility to upload materials they have the most positive answers: "1 year" pupils – 81,4%, "4 year" pupils – 75%. The next category is early majority. According to theory, early majority adopt innovation after a long-timing testing it. For present case pupils who expressed uncertainty with the reply "undecided" are suitable. They are children, who experience Moodle for 2 years (50%), and those one who do it for less than a year time (57,7%). The last category is late majority that is sceptical about innovation and adopt after the most members of the system already adopted it. For present case pupils who replied the question with "disagree" and "strongly disagree" answer are distributed to this category. They are pupils who have been using Moodle for 3 (33%), 5 (25%) and more than 5 years (25%). There is also category "laggards", the few people that resist to adopt technology due to different reasons, either financial problems or religious or other beliefs. This category is not suitable for our system of classroom, due to system's norms that exist and are regulated by teacher. Every pupil uses Moodle and no laggards can exist within this system. The issue is in the degree to which pupil does it.

In order to find out if there is correlation between age and frequency of using Moodle, correlation analysis was provided between these two variables.

		Freequency
Freequency	Pearson Correlation	1
	Sig. (2-tailed)	
	N	96
Age	Pearson Correlation	-,153
	Sig. (2-tailed)	,139
	N	95

Figure 39. "Correlation between age and frequency"

As the level of significance is irrelevant and Pearson's R is -,15 there is no relationship between age and frequency variables.

Moodle activities

It became evident through the findings of the questionnaires and the framework of conducted study, that above mentioned Moodle activities are used only Hugo Treffneri Gümnaasium. Wiki is used in History and Biology, Lesson is used in Computer science, Assignments are used in French language course in Computer science and in course "Research and practical work"; Quiz is used in French language course and Feedback is used in Maths. Pupils from Jaan Poska Gümnaasium didn't specify what courses are used in Moodle, neither is mentioned on the school's web-cite.

IV. Analysis

In accordance with theory of Diffusion and Innovations and after data description and analysis it's possible to claim, that Moodle in Tartu schools, as a technology is distributed through interpersonal channel - face-to-face exchange of information between teachers and pupils within such social system as classroom through authority innovation-decision making process. The implication of innovation-decision process in this context is not relevant, because pupils in schools don't choose voluntarily whether to use Moodle or not. They use it because it is compulsory for them and is introduced by school or teacher. They would use it in any case whether they like it or not, so they don't need to come to steps of innovation-decision process.

Research questions

1. What are the factors that influence pupils attitudes?

According to the present research, not so many defined factors have relationship to Moodle. As it was defined in theory, attitudes are generated when person can experience something. It appears that questioned pupils don't have experience with individual blog in Moodle, forum, personal account in Moodle, they don't know they can check their activity report, only few of them know about possibility to take exams in Moodle, they don't send messages within Moodle. They don't experience these attributes of Moodle, thus, they don't have attitude to them. It was revealed through tests of statistical significance and correlation coefficient. The factors that proved to form attitudes are following. "Possibility to upload materials" relates to Moodle's relative advantage over another technologies pupils used before or didn't use any of them at all. Pupils confirm they have possibility to upload their materials in Moodle and this possibility is proved to be advantage of Moodle over another technologies. The factor "independent study" relates to compatibility of Moodle with pupils' needs to explore the new technology themselves, not o e dependent on anybody, use Moodle whenever they need it. Additionally, it develops their technical skills. The factor "Internet access" also relates

to compatibility of Moodle with access to the Internet. Every pupil has access to the Internet, thus whenever he needs Moodle he can enter it. The factor "presentation" is compatible with pupil's need to understand teacher and his peers better during explanation of new material or revision the old one. The factor "study materials" that relates to complexity of Moodle indicates that pupils are aware of how to get to the section with study materials and it also relates to Moodle's complexity. The factor "content" relates to Moodle's compatibility with pupils' need to use audio and video content, pictures and photos in order to understand teachers and their peers better. And the factor "Moodle's friends" relates to the Moodle's observability and confirms that pupils have many friends who don't use Moodle in their classes and they assume Moodle should be used at their friends' courses also.

2. Which of the factors cause positive or negative attitudes?

All above mentioned factors – possibility to upload materials, independent study, Internet access, presentation, study materials, content and Moodle's friends cause positive attitudes to Moodle with different degree of relationship to it. The issue is what are the most influential factors. The strongest correlation is noticed between variable "possibility to upload materials" with the coefficient of 0,4, that is considered to be moderate correlation. Another variables have weaker relationship with their dependent variables with the coefficient of 0,3 for independent study and study materials and coefficient of 0,2 for presentation, content and Moodle's friends. The variable Internet access has negative correlation in accordance to Pearson's R, but chi-square test indicates the opposite meaning and the vast majority replies they have Internet access, that leads me to accept the chi-square test's results, that indicate that Internet access has significant relationships with dependent variable compatibility. Negative factors were not revealed in present study. The lack of experience with Moodle doesn't allow attitudes to be generated. And, although there are few factors, that cause positive attitudes to Moodle among pupils, they are mostly weak and low because of insufficient use of Moodle. Pupils still feel uncertainty when they deal with Moodle.

3. Whether attitudes between younger and older students towards Moodle are different or not?"

91

The attitudes between younger and older students towards Moodle don't differ a lot. As it was revealed in the sample, there are pupils from different forms and different schools and the extent of using Moodle differs. Additionally, the homogeneity of students within one form was not clear. For instance, in 10th form of Hugo Treffneri Gümnaasium the majority of pupils started to use Moodle in the 10th form, in the age of 16-17 years old, but there were five people who came to study in 10th form from another schools where Moodle was already used and for that moment they had 3-4 years of experience with Moodle. Additionally, as it was also mentioned, the teacher is main player when we talk about the extent of using Moodle whatever the age of pupils are. Variable "age" doesn't matter.

4. Whether differences in attitudes to Moodle exist between students who are experienced in using Moodle for several years and pupils who has been using it for period less than a year?

As it is revealed in the study there is also no significant difference between attitudes to Moodle and experience with using it. Pupils from each cohort of experience with Moodle reply in the same way but proportionally to their population.

Unexpected finding appears when it comes to distribution of pupils in accordance with their level of innovativeness to the categories defined in accordance with Roger's classification. The scale, that starts with more innovative adopters and gradually ends with less innovative adopters doesn't imply that the more innovative adopters are the most experienced adopters, as I expected it should be within the framework of classroom social system, where behavioural norms are established by teacher and pupils who use Moodle for years, because the systems claims would be more innovative, than beginners. It appears that distribution of level of innovativeness is following: innovators (teachers) – early adopters (pupils with 1 and 4 years of experience) – early majority (pupils with less than a years and 2 years of experience) – late majority (pupils with 3, 5 and more than 5 years of experience) – laggards (don't exist within classroom social system). Although, negative attitudes are not revealed in present study, it's obvious that more experienced pupils are more sceptical about Moodle. The vast majority, who are early majority, often feel uncertainty while dealing with Moodle. And only limited number of pupils feel comfortable working with Moodle. This assumption might be inaccurate due to heterogeneity of the sample in present study – most of the respondents are pupils, that use Moodle for less than a year period, while there are only few people

who use Moodle for several years. Thus, it creates scope for further research that build sample size that would include more experienced people.

5. "What Moodle collaborative characteristics are needed to pay attention?"
After looking through the schools' web-sites where Moodle courses are provided the impression, that Moodle is used integrally appears. But after conduction of present research and within its samples' framework it seems only few teachers are using some of Moodle's features. Notwithstanding, Wiki is used in History and Biology, Lesson is used in Computer science, Assignments are used in French language course in Computer science and in course "Research and practical work", Quiz is used in French language course and Feedback is used in Maths by teachers of Hugo Treffneri Gümnaasium the scope of these facilities application is not enough to reduce uncertainty among pupils, as study reveals. All of the teachers, who manage Moodle courses use it to upload study materials and lecture slides, to mark pupil's attendances and to provide assignments trough it. In this context Moodle provides support to the teacher and creates blended environment. But with the same extent another learning-management system can be used with the same success. Moodle consists of possibilities, that develop pupils skills. With the use of Wiki pupil will develop his team-working skills, with the use of Workshop, of Feedback module pupil will develop his assessment skills. In this context Moodle would be considered as collaborative learning environment, where pupils and teachers would share their knowledge, experience and thoughts, study in groups and gain new knowledge together.
That will be the main recommendation to the teachers of Tartu schools to use Moodle environment in a proper way, as it was developed not only to facilitate teaching process for teachers, but also to facilitated learning process and to help children to develop sufficient skills.

The limitations of this study are specified by difficulties to reach teachers in order to provide their pupils with questionnaires, that consequently leads to insufficient number of participants of sample. The future scope of research should extent the sample of questioned pupils. And, notwithstanding, I claim it's possible to rely on present sample size, but in order to provide more accurate data, avoid sampling errors and biases, that

may be caused because of the small sample, sampling should include more representatives of given population. As far as the margin error of the present study is 9,64% there is a huge deviation of population that can be included, that may make the data in present sample inadequate and eliminate possibility to make generalization about whole population the study is dealing with.

Another limitation relates to pupils willingness to reply to the questionnaire that consists of 58 questions. That defines the future scope of research – to make questionnaire less time consuming and with less numbers of questions or items to reply.

Another issue is laying in elaborating new possible independent variables that can form attitudes towards Moodle. Independent variables used in present research are elaborated in order to meet correspondence with dependent variables. There is huge extent and area for further elaboration of new variables that might suit better and cause attitudes.

V.   Conclusions

Providing analysis of pupils' attitudes to Moodle in schools in Tartu it becomes possible to come to conclusion that the process of diffusion of Moodle in Tartu secondary schools is still on the initial stage. It will probably change with the successful implementation of Lifelong Strategy until 2020, but as far for present moment Moodle is not actively used in schools. As it appears from the study pupils are aware only about it's main functions, that can be also replaced with innovations that were used before. Pupils deal only with limited Moodle activities and their attitudes towards this technology is formed only to the activities that are used by them in Moodle. In most cases, the factors that may cause attitudes to Moodle remain unrelated to dependent variables. Pupils simply don't know how to deal with particular Moodle activity, where to find forum or write a message to teacher or classmates, where to look to find grades or attendance. Only few factors cause positive attitude to Moodle: possibility to upload materials, possibility to study independently, access to the Internet, possibility to use presentations during lectures, possibility to use video and audio content, awareness of how to get to the section with study materials and assumption that Moodle should be applied in schools were pupils' friends who don't use Moodle study. On the basis of these factors it's possible to claim that Moodle is compatible with pupils' needs; it is relatively advantageous over another technologies in terms of possibility to upload pupils' materials; it is complex technology and it is easy to use only in terms of uploading study materials. It is observable in terms of it's usefulness to be applied by another teachers.

Assumption, that elder pupils should have better attitudes than younger was not supported, due to the different scope of use of this technology. Moreover the differences between more and less experienced pupils were not revealed. But on the basis of existed pupil's attitudes it became possible to distribute them according to Roger's classification of population, based on their level of innovativeness. Additionally, it was also revealed, that Moodle is not actively used as collaborative tool but rather as tool

that creates blended environment, that eliminates Moodle's importance as collaborative and skills-developmental tool.

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Appendix

		Relative advantage
Relative advantage	Pearson Correlation	1
	Sig. (2-tailed)	
	N	96
forum usage	Pearson Correlation	,123
	Sig. (2-tailed)	,234
	N	96
possibility to upload materials	Pearson Correlation	,040
	Sig. (2-tailed)	,697
	N	96
Individual blog	Pearson Correlation	-,125
	Sig. (2-tailed)	,225
	N	96
Moodle account	Pearson Correlation	,171
	Sig. (2-tailed)	,095
	N	96
Activity report	Pearson Correlation	,151
	Sig. (2-tailed)	,141
	N	96
Upload content	Pearson Correlation	-,040
	Sig. (2-tailed)	,700
	N	96
Taking exams	Pearson Correlation	-,054
	Sig. (2-tailed)	,601
	N	96
Messages	Pearson Correlation	,032
	Sig. (2-tailed)	,756
	N	96

Figure 38. "Correlation analysis between Relative advantage and independent variables"

		Compatibility
Compatibility	Pearson Correlation	1
	Sig. (2-tailed)	
	N	96
Opinion	Pearson Correlation	,066
	Sig. (2-tailed)	,525
	N	96
Studies before class	Pearson Correlation	,101
	Sig. (2-tailed)	,330
	N	96
Independent study	Pearson Correlation	,295**
	Sig. (2-tailed)	,003
	N	96
Internet access	Pearson Correlation	-,126
	Sig. (2-tailed)	,221
	N	96
Easy exams in Moodle	Pearson Correlation	,082
	Sig. (2-tailed)	,429
	N	96
Strees - time	Pearson Correlation	,102
	Sig. (2-tailed)	,321
	N	96
Presentations	Pearson Correlation	,240*
	Sig. (2-tailed)	,019
	N	96
Content	Pearson Correlation	,203*
	Sig. (2-tailed)	,047
	N	96

Figure 39 "Correlation analysis between Compatibility and independent variables"

Figure 40. "Correlation analysis between Complexity and independent variables"

		Complexity
Complexity	Pearson Correlation	1
	Sig. (2-tailed)	
	N	96
Loading difficulties	Pearson Correlation	,168
	Sig. (2-tailed)	,102
	N	96
Internet speed	Pearson Correlation	,064
	Sig. (2-tailed)	,533
	N	96
Assesment section	Pearson Correlation	-,046
	Sig. (2-tailed)	,659
	N	96
Statistics	Pearson Correlation	,041
	Sig. (2-tailed)	,690
	N	96
Study materials	Pearson Correlation	,254*
	Sig. (2-tailed)	,013
	N	96
Profile changes	Pearson Correlation	-,059
	Sig. (2-tailed)	,568
	N	96
Moodle design	Pearson Correlation	-,004
	Sig. (2-tailed)	,972
	N	96
Moodle convenience	Pearson Correlation	-,056
	Sig. (2-tailed)	,586
	N	96
E-mail	Pearson Correlation	,053
	Sig. (2-tailed)	,610
	N	96

		Observability
Observability	Pearson Correlation	1
	Sig. (2-tailed)	
	N	96
Moodle's friends	Pearson Correlation	,197
	Sig. (2-tailed)	,055
	N	96
My results	Pearson Correlation	-,058
	Sig. (2-tailed)	,573
	N	96

Figure 41. "Correlation analysis between Observability and independent variables"

Questionnaire

The variants of answers to statements:

Strongly agree, agree, undecided, disagree, strongly disagree.

1. I would prefer Moodle to another learning technology.
2. I think Moodle meets my study needs.
3. I find Moodle easy to use.
4. I think Moodle should be applied in another schools.
5. I use forums to discuss issues with teachers and classmates.
6. I have possibility to upload materials.
7. I have my individual blog in Moodle.
8. I have filled profile in Moodle (with my photo, and information about me, interests).
9. I regularly check activity report to follow my study progress.
10. I use massages to communicate with my classmates.
11. I have possibility to take tests and exams in Moodle.
12. I have possibility to upload audio, video content, images.
13. I can express my point of view (in forum discussions, for example) without feeling shy, because I don't need to speak in front of class
14. I look through studies before coming into class.
15. I learn how to use Moodle myself.
16. It is difficult for me to gain access to Moodle, because I don't have Internet at home.
17. It is easier for me to take exam in Moodle, than to do in paper in class.
18. I feel stress when I take exam in Moodle, because I have time limit.
19. I understand teacher or my classmates better, when they use slides or presentation during the lecture.
20. I understand subject better, when teacher uses media (audio, video, pictures)

21. It is difficult for me to upload video, audio, pictures.
22. The speed of Internet is slow in school.
23. I can easily find section with my grades.
24. I can easily find section with statistics of my activity.
25. I can easily find section with study materials.
26. I can easily edit my profile.
27. I don't like design of Moodle (colour, size).
28. Moodle should be more user-friendly, like Facebook, or Twitter.
29. I use Moodle chats to connect with my classmates or teacher more often, than e-mail.
30. I have friends that don't use Moodle in their classes.
31. I have better results, than my friend, because I use Moodle.
32. I like Database
33. In what courses do you use Database?
34. I like Wiki.
35. In what courses do you use Wiki?
36. I like Lesson.
37. In what courses do you use Lesson?
38. I like Glossary.
39. In what courses do you use Glossary?
40. I like Assignments.
41. In what courses do you use Assignments?
42. I like Choice.
43. In hat courses do you use Choice?
44. I like Survey.
45. In what courses do you use Choice?
46. I like Survey.
47. In what courses do you like Survey?
48. I like Workshop.
49. In what courses do you use Workshop?
50. I can assess my peers.
51. The teacher asks to feel Feedback.
52. In what courses do you use Feedback?
53. How long do use Moodle?
54. How old are you?
55. What form are study in?
56. What school are you from?