NEAR EAST UNIVERSITY
GRADUATE SCHOOL OF EDUCATIONAL SCIENCES
COMPUTER EDUCATION AND INSTRUCTIONAL TECHNOLOGY
DOCTORAL PROGRAM

THE EFFECTS OF FLIPPED LEARNING METHOD ON STUDENTS' PERCEPTION AND ACADEMIC ACHIEVEMENT IN ENGINEERING EDUCATION

PhD Thesis

Blerta PREVALLA ETEMI

Nicosia, 2020

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Thesis Supervisor: Prof. Dr. Huseyin UZUNBOYLU

Nicosia, 2020

To my loving kids and husband….

Approval of the Graduate School of Educational Sciences

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Prof. Dr. Fahriye ALTINAY AKSAL

Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Doctor of Philosophy

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Assist. Prof. Dr. Emrah SOYKAN

Head of Department

This is to certify that we have read this thesis submitted by Blerta PREVALLA ETEMI titled: "**The effects of flipped learning method on students' perception and academic achievement in engineering education**" and that in our opinion it is fully adequate, in scope and quality as a thesis for the degree of Doctor of Philosophy.

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DECLARATION

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other University. This dissertation is the result of my own work and my own research study. This dissertation contains more than 38400 words including appendices, bibliography, footnotes, tables and equations and has 22 figures and 13 tables.

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Blerta PREVALLA ETEMI
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Nicosia, 2020

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ABSTRACT

THE EFFECTS OF FLIPPED LEARNING APPROACH ON STUDENTS' PERCEPTION AND ACHIEVEMENT IN ENGINEERING EDUCATION

Blerta Prevalla Etemi

Doctor of Philosophy, Near East University
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Flipped learning as an educational strategy changes the traditional lecturing by flipping the classroom in the sense of listening and learning the lectures at home from pre-recorded video materials and doing dynamic, group-based problem-solving activities in the classroom. This will engage the students in active learning, critical thinking and meliorates interpersonal skills. The purpose of this study was to develop and implement flipped learning materials in the Introduction to Programming course and investigate the effect of flipped learning on student's achievement and perceptions related to the flipped classroom. This study was conducted in the fall semester of 2018-2019 for 14 weeks at a university in the Republic of Kosovo. This study employed an explanatory mixed method research design. There were 87 students in the experimental group and 87 students in the control group. In the current study, the Achievement Test in the course Introduction to Programming with Java, Flipped Learning Technology Acceptance Model, Self-Directed Learning Readiness Scale, Course Evaluation Questionnaire and the perception of the students about pilot study of flipped classroom in engineering education were implemented to answer the research questions. The data collected through the achievement test, scales and student questionnaire were analyzed by using descriptive and inferential statistical analysis techniques. For the analysis of the data, SPSS 24.0 was used, and alpha level was determined as .05.

The data for qualitative analysis obtained from the interviews were analyzed by using both the content and descriptive analysis techniques.

The findings of the study indicated that students' in the experimental group perform better according to all the instruments involved in this study.

Keywords: Flipped classroom, Engineering Education, Flipped learning, inverted classroom, engineering subjects

ÖZET

MÜHENDİSLİK EĞİTİMİNDE KULLANILAN TERS YÜZ ÖĞRENME YAKLAŞIMININ ÖĞRENCİLERİN ALGI VE BAŞASINA OLAN ETKİLERİ

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Bir öğretim yöntemi olarak ters yüz öğrenme, dersleri evde dinlemek ve sınıfta dinamik, grup tabanlı problem çözme aktiviteleri yapmak anlamında sınıfı çevirerek geleneksel ders anlatımını değiştirmiştir. Bu, öğrencileri aktif öğrenme ve eleştirel düşünme ile meşgul edecek ve kişiler arası becerileri geliştirecektir.

Bu çalışmanın amacı, Programlamaya Giriş dersine yönelik ters yüz öğrenme materyalleri geliştirmek, uygulamak ve ters yüz öğrenmenin öğrencilerin başarısı ve ters yüz sınıfla ilgili algıları üzerindeki etkisini araştırmaktır. Bu çalışma, 2018-2019 Akademik Yılı Güz döneminde 14 hafta boyunca Kosova Cumhuriyeti'nde bir üniversitede gerçekleştirilmiştir. Bu çalışmada açıklayıcı karma yöntem araştırma yöntemi kullanılmıştır. Araştırmanın deney grubunda 87, kontrol grubunda 87 öğrenci bulunmaktadır. Bu çalışmada, Java ile Programlamaya Giriş dersinde Başarı Testi, Ters Yüz Öğrenme Teknolojisi Kabul Modeli, Kendine Yönelik Öğrenmeye Hazırlık Ölçeği, Ders Değerlendirme Anketi aracılığıyla ve öğrencilerin mühendislik eğitiminde ters yüz sınıf pilot çalışmasına yönelik görüşlerine yönelik very toplanmıştır. Başarı testi, ölçekler ve öğrenci anketi ile toplanan veriler betimsel ve çıkarımsal istatistiksel analiz teknikleri kullanılarak analiz edilmiştir. Verilerin analizi için SPSS 24.0 kullanılmış ve alfa seviyesi .05 olarak belirlenmiştir.

Görüşmelerden elde edilen nitel analiz verileri hem içerik hem de betimsel analiz teknikleri kullanılarak analiz edilmiştir.

Araştırmanın bulguları, ileriki bölümlerde bahsedileceği üzere, araştırmada kullanılan tüm araçlar deney grubundaki öğrencilerin daha iyi performans gösterdiğini ortaya koymuştur.

Anahtar Kelimeler: Ters yüz sınıf, Mühendislik Eğitimi, Ters yüz öğrenme, ters sınıf, mühendislik konuları

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LIST OF ABBREVIATIONS

AT	Achievement Test
ATU	Attitude Toward Usage
BIU	Behavioral Intention to Use
CEQ	Course Evaluation Questionnaire
EFA	Exploratory Factor Analysis
EFL	English as a foreign language
FB	Flipped Based
FL	Flipped Learning
FLTAM	Flipped Learning Technology Acceptance Model
FLN	Flipped Learning Network
JR	Job Relevance
LB	Lecture Based
MANOVA	Multivariate Analysis of Variance
MOOC	Massive Open Online Courses
SDLR	Self - Directed Learning Readiness
SE	Software Engineering
SPFLEQ	Students Perception about flipped learning questionnaire
SPSS	Statistical Package for Social Sciences
PEU	Perceived Ease of Use
PU	Perceived Usefulness

INTRODUCTION

This chapter contains the motivation, theoretical framework, conceptual framework, purpose, and importance of the study, educational effectiveness of flipped learning, the concept of flipped learning and the research questions. The dissertation content is outlined in the end of this chapter.

In recent years, there are important developments in the fields of economy, technology, education, and innovation (Kohnova & Papula, 2018). Among these developments, education and technology emerge as the most important areas (Lai & Zou, 2018). Flipped learning as an instructional procedure (Pulipaka, Laigo and Bhatti, 2016) creates a dynamic and intelligent learning environment where students work under instructor supervision during in-class learning and learn the teaching material at home (Dirgahayu, 2017). Lage, Platt, and Treglia (2000) indicated that there is a gap between instructors' teaching style and students' learning style that's why alternative forms of teaching should be considered to embrace all types of learners. Bergmann and Sams (2007), habitually cited as the pioneers of the application of the idea of flipped learning, recorded all their classes, lectures, exercises so the students would not miss any teaching material and it turned out to be a real success.

Instructors are including flipped learning methodology in their teaching in a way that the teacher "distributes" lectures before class in the form of pre-recorded videos, and during the class time engages on learning activities with students that include cooperation, interaction, and supervision (Uzunboylu & Kocakoyun, 2017). The greatest advantage of providing the lecture in this format is that students can review the videos several times (Rockland, Hirsch, Burr-Alexander, Carpinelli, & Kimmel, 2013). Having watched the videos at home, students become ready to do some activities related to the videos in the classroom (Umutlu & Akpinar, 2017) that's why in a flipped classroom environment students participate in class exercises more actively rather than in the traditional classroom (Uzunboylu & Karagozlu, 2015).

Even though the traditional way of teaching is the most widely used teaching methodology in higher education, still, it makes students have an inactive role, whereas flipped learning expands peer communication, making students have more profound engagement with the material and implicitly being more active.

Flipped learning has become a prominent instructional strategy and trend within the past 10 years (Ceker & Ozdamli, 2016), but, empowering and using flipped learning is not an easy job, it requires a great knowledge of teaching methods and arrangement of the technology to adapt this methodology. (Aqqal, Elhannani, Haidine, & Dahbi, 2017). The outcomes show that this approach gives a good impact on students' understanding and practical skills. (Dirgahayu, 2017).

The most significant part of the flipped learning methodology is the additional time that the professor must engage students in the interactive learning process by offering video materials (Al-Khatib, 2018). This method has proven to be a compelling methodology that improves the critical thinking skills and has a good impact on the performance of the students in higher education (Priyaadharshini & Sundaram, 2018).

For engineering students, which are prone to use technology in their everyday lives, it is easy to apply technology in the process of learning and work in groups as well. Moreover, after finishing their studies, students moving into professional engineering careers are often required to work as part of bigger groups, thus preparing them with similar experiences is beneficial (Comerford, Mannis, De Angelis, Kougioumtzoglou, & Beer, 2017). To support an ideal software engineering education, Lin, 2019, applied a flipped learning approach to study the learner-centered learning environment in a software engineering course and the proposed methodology altogether improved the student's learning performance, learning motivation, and learning behavior. From the aspect of learning achievement, the proposed framework gives a strong learning and diagnosis tool for professors and students since appropriate learning and assessment activities significantly affect learning accomplishment in a flipped classroom (Wang, 2017).

Even though the interest in flipped learning is increasing, still, there isn’t an agreement on what flipped learning is and how effective it is in improving students’ performance in engineering education. Therefore, when flipped learning is applied in engineering education, it is wondered what the results will be, and it is seen as a necessity to be taken as a research problem and to present its results. This work tries to conclude that flipping a classroom does affect students ‘achievement and perception in a positive way. Moreover, it is of an extraordinary significance as far as being one of the few investigations identified for flipped learning usage at a university level to expand the adequacy of flipped learning in engineering courses.

Motivation

As technologies and internet-based learning are becoming easily accessible and as the focus on integrating technology into education increases, interest in flipped learning is growing everyday more and more.

Developing technology has made information more accessible and has necessitated the delivery of the increasing quantities of information in accord with individual's learning needs. Besides this, the development of adaptive systems to form structures that are shaped in time with the needs of individuals has gained speed (Çetinkaya & Keser, 2018). Even though traditional lecture approach is the most widely used teaching methodology in higher education, still, it can often place students in an inactive role, which commonly involves students learn isolated facts that can later be forgotten (Uzunboylu & Karagozlu, 2015).

Flipped learning is a form of blended learning that has become a prominent new instructional strategy and trend within the last ten years (Ceker & Ozdamli, 2016). In a flipped setting, students learn new material outside the class via online video lectures and make notes of questions or concerns they may have. Meaning, studying at home and the traditional 'homework' normally done at home is then completed in the next class session where professors can provide students with more collaboration, customized guidance, and opportunities to apply what they learned in their homework. However, empowering and using the flipped learning is not an easy job that can be simply achieved through a combination of online learning and face to face problem solving activities. It requires a more of sophisticated comprehension of effective teaching methods to deal with the shift from the traditional to the flipped learning and the ideal adjustment of technology as a feature of this change (Aqqal et.al, 2017). That method became much more important in the action in many applications, as it is stated in the Flipped Learning Network (2012) that observed rising of the number of members on flipped learning network social media site from 2500 teachers to 9000 teachers in one year 2011/ 2012 (El-Senousy & Alquda, 2017).

Professors' teaching engineering faces the challenge of balancing fundamental engineering theory with the knowledge of the tools to perform these tasks. They are forced to teach the latest and greatest software but never sacrifice the fundamentals and to increase class enrollment and grow these programs, but growing programs lead to reduced contact time between professor and students (Bagriyanik & Karahoca, 2016).

Flipped classrooms help two-way communications between professors and students. It meliorates interpersonal and intrapersonal skills of the students. Utilizing the latest technology gives them an opportunity to learn in an improved way by having all the materials in their hands whenever and wherever they want. Methods that enable progressively active learning to the students are flipped classroom, think pair share and peer instruction.

Numerous schools and universities adopted the flipped learning model as it provides opportunities for expanded peer communication and more profound engagement with the material. Therefore, it is time to analyze and synthesize research findings to describe the current state of knowledge and inform on future research and development efforts (Karabulut – Ilgu, et. al, 2017).

Purpose Statement

The purpose of this research is to compare the educational effectiveness of flipped classroom instruction consisting of in class activities and video lectures to traditional classroom instruction in a university-level Introduction to Programming course for engineers.

Research Questions

Based upon the main purpose of the study, the following research questions were sought:

1) Is there a significant difference between academic achievements of the students in the experimental and control group?
2) Is there a significant difference between the students in the experimental and control group in Self Directed Learning Readiness Scale (SDLRS)?
3) Is there a significant difference in the pretest and posttest of the experimental group in terms of Flipped Learning Technology Acceptance Model (FLTAM)?
4) Is there a significant difference between students' perception in the experimental group in terms of their perceptions about flipped learning in engineering education at the beginning and in the end of the course?
5) Is there a significant difference in course evaluation in the beginning and in the end of the course?

Definition of the concept

As a standardized, formal definition for Flipped Learning can be taken the definition composed by the governing board and key leaders of the Flipped Learning Network (FLN), which says: ” Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter.” (Flipped Learning Network (FLN), 2014. The Four Pillars of F-L-I-P[1]).

The importance of the study

Flipped learning appears to be particularly well suited to engineering education. Using different strategies like think – pair – share, peer – instruction can be used to get the most from this approach considering the student achievement. It can be also used to improve teacher methodology and meet learning objectives more easily (Uzunboylu & Karagozlu, 2017).

Even though the concept of flipped classroom isn’t new, there are few researches and publications during the last 5 years that support this study (Prevalla & Uzunboylu, 2019). In many studies related to flipped learning there is no clear conclusion that flipped learning outperforms traditional learning, even though there are some positive result in favor of flipped learning in contrary to traditional learning, still, there are a lot of factors that should be taken into consideration to make this conclusion definitive.

Also, students’ perception about flipped learning problem solving activities, video materials, teacher student collaboration and their effect on student results, involvement, satisfaction and perceptions are also not clear (Ozudogru, 2018). Hence, this study tries to conclude that flipping a classroom does affect students ‘achievement and perception in positive way.

The purpose of this study was to develop video recording as additional materials for the experimental group in the Introduction to Programming course and examine the effect of flipped learning on student’s achievement and student perceptions related to

[1] The Four Pillars of F-L-I-P and the definition were written by the FLN’s board members: Aaron Sams, Jon Bergmann, Kristin Daniels, Brian Bennett, Helaine W. Marshall, Ph.D., and Kari M. Arfstrom, Ph.D., executive director, with additional support from experienced Flipped Educators.

flipped classroom. Achievement of students determines the effectiveness of a new teaching approach. In this regard, the examination of the impact of flipped learning on student achievement is thought to contribute both to literature and studies related to flipped learning approach in programming courses. Hence, there is still a need for research about the contributions of flipped learning on university student's achievement

This study was conducted in the Introduction to Programming course with the use of flipped learning approach. The primary reason for applying flipped learning is that this course is one of the mandatory courses and it serves as basics for all other following courses in software engineering faculty. This course is in first semester but it's preferable for students to have basic knowledge in algorithm logic, or to know the basic concepts of programming from high school. Moreover, Introduction to Programing with Java learned in traditional way expects students to understand by themselves according to lectures and practice codes at home, and in flipped learning they can listen to lectures as much as they want at home and do in class activities, coding in Eclipse and exercises.

Over the last few years the psychosocial part of the classroom has gotten impressive enthusiasm and it centers on the significance of making positive classroom environment for the cognitive and affective advancement of the students. Thus, it is considered that the psychosocial aspects of the classroom environment ought to be researched in both flipped learning and traditional classroom environment to learn the perceptions of instructors and design instructions properly. (Ozduogru, 2018).

In addition, there is a requirement for studies which show the effect of flipped learning method in student achievement and student perception towards technology usage in their learning, use of flipped learning methodology, ease of use, attitude etc. Consequently, this study is one of the first studies in Kosovo that show the positive effect of flipped learning in students' achievement, especially in their passing the exam rate and positive attitude towards technology usage and flipped learning in general.

Even though there are numerous of studies related to flipped learning usage in elementary and high school, there are few corresponding studies at a university level. Henceforth, this work is of extraordinary significance as far as being one of the main investigations identified for flipped learning usage at a university level with computer science students to expand the adequacy of flipped learning in engineering courses.

As it is expressed in the literature flipped learning is an instructive methodology that creates a dynamic and intelligent learning environment. It has been utilized in

Software Engineering (SE) course to give students more time for doing their work under instructor supervision during in-class learning. The outcomes show that this approach gives a good impact on students' understanding and practical skills. (Dirgahayu, 2017). Moreover, data demonstrated that while students reported a high level of commitment with the video recordings and believed that they supported their learning, opinions were divided as to whether a flipped learning classroom was favored over traditional lectures. Furthermore, our reflections on how students engaged with the dynamic learning strategies uncovered that significant time was required at the beginning of class to audit key concepts, as students seemed hesitant to connect independently with the arranged activities–especially those that included more challenging science concepts. Taking into consideration these findings, Tomas (2019), proposed a flipped learning continuum that encourages different levels of student-focused learning and autonomy, upon students' learning needs and their preparation for a flipped learning approach (Tomas et al., 2019).

In this study, also, student perception and commitment to the subject and flipped learning approach is analyzed because the learning methodology in the University in which the experiment is conducted is student - centered and their politics is to maximize students retaining knowledge. This is important because it is one of the first experimental studies about flipped learning in the Republic of Kosovo and it represents the flipped learning studies that have focused specifically on Introduction to Programming course for high school students.

Apart from these mentioned, the validity of findings of the study was verified by a wide range of qualitative and quantitative analyses. It can be said that this study contributed to the literature by combining both qualitative and quantitative methods.

Finally, the findings of this study show that applying flipped learning methodology has positive effect on students' performance and positive perception on usage.

LITERATURE REVIEW

Related Research

If we see related research publications about the use of the flipped classroom approach in education based on the emerging developments in the area of video and learning technologies, there are a lot of different results.

Using the keywords such as flipped learning, flipped classroom, content analysis are searched documents published and indexed during the period 2014–2018. There were found exactly 262 documents corresponding with the topics and are analysed in detail according to these criteria: author, countries & publication years. All the keywords from each document in selected databases were classified and accumulated from the years 2014–2018.

Even though, the highest influence that flipped learning had is on 2012, the following years are the poorest with publications, only 10 in 2014, then 42 publications on 2015, which is still a small number, and on 2016, 44 research publications, followed by the most productive year on this field, 2017 when around 40% of publications were published (n = 97). On 2018, there were 69 papers published which mean that the interest in writing papers on Web of Science and doing research on this subject has fallen.

The papers published on 2014 were about tools for the flipped classroom model: an experiment in teacher education (Fassbinder et al., 2014), Online Learning Room for "Flipped Classroom" (Nielsen & Bugge 2014), flipped learning results: a case study in macroeconomics (Sanchez et al., 2014), implementing the Flipped Classroom in elementary and secondary schools in China (Yang, 2014), is FLIP enough? Or should we use the FLIPPED model instead? (Chen, Wang & Kinshuk, 2014), evaluation of the effectiveness of flipped classroom videos (Ferrer & Garcia – Barrera, 2014) etc.

The topics covered on 2018 publications are about: flipping large classes on a shoestring budget (Bajwa, 2018), new combinations of flipped classroom with just in time teaching' and learning analytics of student responses (Prieto et al., 2018), using the flipped classroom to teach educational models in English at the education national university (UNAE) of Ecuador (Pineda et. al, 2018), innovative redesign of teacher education ICT courses: how Flipped Classrooms impact motivation? (Turan & Goktash,

2018), flipped classroom - essence, development and design (Georgieva – Lazarova, 2018), and so many other topics.

The distribution of number of publication papers per year that we can see in the Table 1 and presented in the line chart in the Figure 1.

Table 1.

Number of publications per year

Publication years	Record Count	Percentage of Total
2014	10	3.82%
2015	42	16.03%
2016	44	16.79%
2017	97	37.02%
2018	69	26.34%

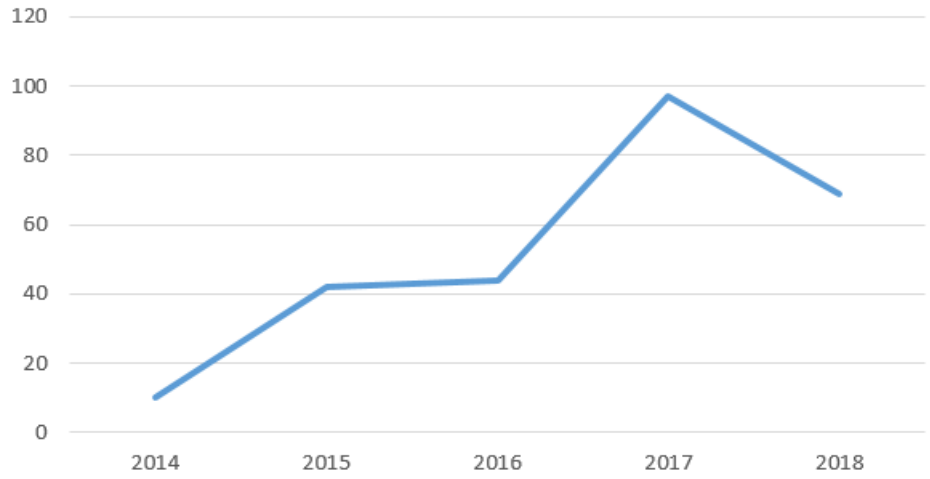

Figure 1. Number of published papers from 2014 to 2018

On web of Science, there are 249 authors who have published papers related with flipped learning, moreover, 222 authors with single publication (0.38% per author) 23 with two publications, (0.76% per author) 3 authors with three publications (1.15% per author), 1 with four publications (1.53%) and Hwang GJ with 6 publications (2.29%). Below, on Figure 2, we can see the chart with listed authors with more than one publication per author.

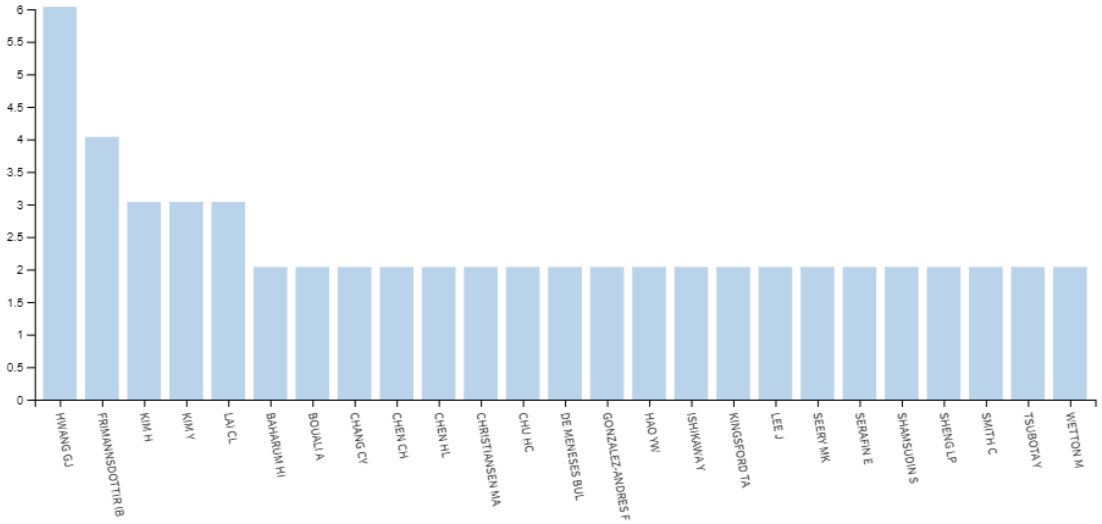

Figure 2. Number of publications per author, authors with more than one

According to the authors who have more articles published on this topic, for example, Hwang, reveals importance on three possible headings for future investigations of this instructional methodology, including (1) longitudinal examinations, (2) studying its impact on different learning objectives, and (3) incorporating gamification into flipped classroom. A descriptive framework for flipped classroom interventions is then proposed, comprising of four dimensions: (1) research background, (2) course design, (3) course exercises, and (4) result of interventions (Hwang, 2018).

Hsieh, Huang and Wu (2017) analyzed the technological acceptance of LINE in flipped English as a foreign language (EFL) oral preparation and performed critical examination of the elements embedded in EFL learners' technological acceptance. The outcomes revealed beneficial effects of the mobile-based flipped guidance over the traditional approach based on lectures, and yielded the determinant role of attitude about the utilization of LINE in learners' subsequent behavioral aim to acknowledge the integration of such technology in language learning, albeit differences in the construct relationship between students of difference capability levels.

Wu, Hsieh and Yang (2017) research about improving EFL learners' oral capability by making an online learning community in a flipped classroom remains insufficient. Accordingly, the current study analyzed the effect of an online study community in a flipped classroom, via mobile platforms, on EFL learners' oral

proficiency and student recognitions. The outcomes from different sources showed that the online learning community not only facilitated successful collaboration, but also significantly improved the members' oral proficiency; therefore, leading to more active commitment in highly interactive learning exercises such as narrating, dialogue collaboration, class discussion and group presentations. Flipped learning has a lot of advantages like enhancing retention, makes learning easier, promotes regular study habits, improves comprehension skills and helps develop computer skills (Karadag & Keskin, 2017).

Kim and Jang (2017) made a study intended to confirm the impacts of flipped learning on the academic achievement, collaboration skills and satisfaction levels of undergraduate nursing students and as a result, the flipped learning group got higher scores on scholarly achievement, collaboration skills and satisfaction levels than the control group including the areas of content knowledge and clinical nursing practice competency.

Hao (2016) analyses the learning readiness for flipped classroom, and on his analyses, he found that approximately 60% liked the concept of flipped classrooms, but only 39% agreed that the flipped classrooms met their needs in learning and education. Student's readiness levels for flipped learning were reasonably over the average levels, and males or youngsters (compared with freshmen) felt more prepared for flipped learning. In general, course assessment, self-directed learning readiness and teamwork preference can anticipate the different readiness dimensions.

Uzunboylu, Hursen, Ozuturk and Demirok (2015) emphasized the benefit of mobile coordinated language teaching, and university students have positive attitudes towards utilizing mobile devices in language learning. Furthermore, it was likewise revealed that pre-service teachers have positive attitudes towards using technology in education (Birkollu, Yucesoy, Baglama & Kanbul, 2017).

An interesting factor for analyzing is also the countries that mostly contributed with publications in Web of Science about the flipped learning issues, and according to the analyses done, most published papers come from the USA, 18.7 % (n = 49, in total from 262), then, Republic of China 10.7% (n = 28), Spain almost 10% (n = 25 papers), Taiwan 9.5% (n = 25 papers published), South Korea 7% (n = 19), Japan around 4%, (n = 10 papers), Australia 3.4% (n = 9), England 3.4% (n=9), Turkey 3% (n=8), followed by Canada, Mexico, Island, Indonesia, Italy, Malaysia, Finland, Russia, etc. In the chart below, we can see the data more in detail.

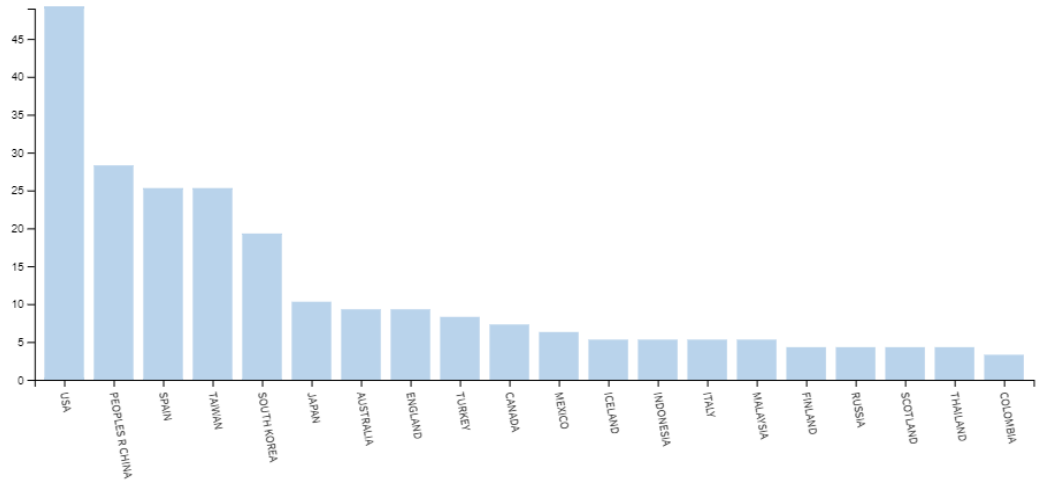

Figure 3. Number of publications per countries, sorted on a scale from the highest to the lowest

If we analyze the papers, we can see that, papers coming from USA mainly analyze the current interest of educators in flipped learning (Baggaley, 2015), engaging students within a flipped learning approach to the classroom (Luker, Muzyka & Belford, 2015), flipped learning as a subset of blended learning (Greener & Watson, 2015; Rozano & Romero, 2016), alternative teaching methodologies: implementing project-based and flipped learning (Howell, 2016), etc.

Research papers coming from Taiwan mainly analyse how a community language learning approach, when utilised via new technology with the social network Facebook, can be most effective in a flipped EFL classroom (Bektas & Fayad, 2017; Charoento, 2017; Liao et al., 2014) and transformative use of team-based learning in human resource management classrooms (Huang & Lin, 2017).

According to Pulipaka, Laigo and Bhatti (2016), flipped learning is an instructional procedure that changes the traditional teaching by conveying the instructional content through online tools outside the classroom. In the Mathematics Department, content was conveyed by sharing the videos, slides and other materials for reading a week before classes. Students then watch the recorded videos and read the materials before coming to class. Almost all the semester one modules have a lab segment, so laboratory videos were shared each prior week before starting the lab class. In this paper, are compared the results between the theory and laboratory components of modules where flipped learning was implemented. Also, are analyzed the marks of the students between the two components and between semesters where flipped learning

was and was not implemented, and how students perceive this methodology by giving to a student a satisfaction survey.

Motivation is an important factor for university students' preferences for new learning approaches (Genc & Ozcan, 2017). Next, the research conducted at Taiwan National University (Tao, Huang & Tsai, 2016) was about applying the flipped learning approach with game-based learning in primary school students' English learning, where this study intended to use flipped classroom with digital game-based learning exercises in primary school students' English learning. The study explored the impacts of English learning, and the motivation of the experimental group in attention, relevance, confidence and fulfilment. Results show that there were no significant differences between the experimental and control groups. However, the experimental group did show huge improvement in learning accomplishments after game-based flipped learning exercises.

By looking at the conscious response of experimental group toward the flipped classroom with game-based learning, likewise, the research found that members believed that the strategy could trigger their interest and curiosity in learning and that the games prepared for them will be progressive learning materials. In addition, results also demonstrate that the game-based learning process could advance their sense of achievement in learning, thus, encouraging them to keep learning.

At Middle East College in Spain is analyzed how flipped learning as a new pedagogical approach is used in teaching mathematics. One of the most common challenges expressed by classroom teachers in mathematics teaching and in the literature is the concretization of abstract concepts in teaching basic subjects. (Kukey E, Gunes H & Genç Z).

After analyzing the literature for the flipped learning research, we can see that the mainly covered topics are about educational research, more than 65% then, the next topic is computer science with which means there is a huge gap between the first well researched topic and the second one. Even though, generally speaking, flipped learning are more familiar with computers, networks and other technology facilities and we can apply this technique more easily, but still, the number of research papers on computer science and engineering is low.

Most of the research were coming from the USA, then, Taiwan, Spain China, etc, and from the authors listed on Figure 2, most of the contribution came from Jun Scott

Chen Hsieh, Yung, Hao, Hea-Ran Kim and Wen-Chi Vivian Wu who contributed with 12 research papers in total, around 6%.

One concerning conclusion is about funding agencies that, there are less than 5% covered research publication by funding agencies and those are from Ministry of Science and Technology in Taiwan and two from University of Zaragoza, Spain (1.27%). If the support was bigger, there can be processed more experiments and research and the results of applying flipped learning would have been bigger and more efficient.

Also, an interesting finding on this analysis is the publications per year about flipped learning. Even though the concept is known from 2000, widely spread on 2012, still till 2015 there were only 18 papers published on Web of Science covering around 10.5% and the biggest boom it had on 2016 with more than 44% (n = 70 publications).

With the rise of technology and its applicability on everyday life and education, I think that this trend will arise in the next years, and also, the number of publication will become bigger, presenting real cases of flipped learning applied on the education process. So, as future issues to be considered are: what is the effect of flipped classroom approach on students' achievement? How to arise student's perception and educator's readiness to work with this kind of technique? How learning environment can meet student needs and schedules? Etc.

Missing gap in the literature

There are numerous of studies related to flipped learning usage in elementary and high school (Toh, Tengah, Shahrill, Tan, & Leong, 2017; Yang, 2014; Lo, 2017; Finkenberg & Trefzger, 2017, Villalba, Castilla, & Redondo-Duarte, 2018; Hulten & Larson, 2018, etc.) but few corresponding studies at a university level.

This work tries to conclude that flipping a classroom does affect students 'achievement and perception in a positive way. Moreover, it is of an extraordinary significance as far as being one of few investigations identified for flipped learning usage at a university level with computer science students to expand the adequacy of flipped learning in engineering courses.

Despite this increasing interest, there does not seem to be an agreement on what flipped learning is and how effective it is in improving students' learning in engineering education. Therefore, when flipped learning is applied in engineering education, it is

wondered what the results will be, and it is seen as a necessity to be taken as a research problem and to present its results.

Conceptual Framework

The concept of ‘flipping the classroom’ was initially presented utilizing learning management tools based on the web; and around the same time, Lage, Platt and Treglia (2000) highlighted the negative impacts of the presumable gap between existing teaching and students’ learning styles. Flipped learning gains its ubiquity when Bergmann and Sams (2007), habitually cited as the pioneers of the application of the idea of flipped learning, began to apply this reversed classroom by recording live classes, lectures, demonstrations and presentations with annotated slides, so the students would not miss any lecture and had their ultimate achievement.

Even though traditional lecture approach is the most widely used teaching methodology in higher education, still, it can often place students in an inactive role, which involves students learn isolated facts that can later be forgotten, that is why flipped learning is a form of blended learning that has become a prominent instructional strategy and trend within the past 10 years (Ceker & Ozdamli, 2016).

However, empowering and using flipped learning is not an easy job that can be simply achieved through a combination of online learning and face-to-face problem-solving activities. It requires a more of sophisticated comprehension of effective teaching methods to deal with the shift from the traditional to the flipped learning and the ideal adjustment of technology as a feature of this change (Aqqal, Elhannani, Haidine, & Dahbi, 2017).

Numerous schools and universities adopted the flipped learning model as it provides opportunities for expanded peer communication and more profound engagement with the material. Moreover, developed countries such as the United States of America, China, Australia, and Canada implemented flipped learning approach to reform their educational system, due to advanced internet technology as well as modern digital technologies (Kissi, Nat & Idowu, 2017).

As it is expressed in the literature flipped learning is an instructive methodology that creates a dynamic and intelligent learning environment (Tugun, Uzunboylu & Ozdamli, 2017). It has been utilized in Software Engineering (SE) course to give students more time for doing their work under instructor supervision during in-class

learning. The outcomes show that this approach gives a good impact on students' understanding and practical skills. (Dirgahayu, 2017). Tomas et al., proposed a flipped learning continuum that encourages different levels of student-focused learning and autonomy, on students' learning needs and their preparation for a flipped learning approach. (Tomas, et al., 2019).

Knowing the fact that engineering students are closer and prone to use technology in their everyday lives, at work and in studies, it is easy for them to apply technology in the process of learning and work in groups as well. Moreover, after finishing their studies, students moving into professional engineering careers are often required to work as part of bigger groups, thus preparing them with similar experiences is beneficial (Comerford, Mannis, De Angelis, Kougioumtzoglou, & Beer, 2017).

The most significant part of the flipped learning methodology is the additional time that the professor has to engage students in the interactive learning process by offering video materials (Alkhatib, 2018). This method has proven to be a compelling methodology that improves the critical thinking skills of students in higher education and has a good impact on the performance of the students. (Priyaadharshini & Sundaram, 2018). To support an ideal software engineering education, Lin, 2019, applied flipped learning approach to study the learner-centered learning environment in a software engineering course and the proposed methodology altogether improved the student' learning performance, learning motivation, and learning behavior. From the aspect of learning achievement, the proposed framework gives a strong learning and diagnosis tool for professors and students since appropriate learning and assessment activities significantly affect learning accomplishment in a flipped classroom (Wang, 2017).

Theoretical Framework

In a flipped learning approach, classroom time is not used for delivering the materials, but for active learning & supervised exercises (Cavalli, Neubert, Mcnally, & Jacklitch-Kuikan, 2014). It is important to examine the theories and models in which flipped learning is based on and compare with previous studies results to design the most suitable in-class activities and out of class materials.

Flipped learning method uses a combination of theories to provide the best learning environment for students. This study primarily uses a synthesis of the cognitive

constructivism of Piaget (Bishop &Vergheler, 2013), the zone of proximal development (Vygotsky, 1978) and mastery learning (Bloom, 1968). Based on the Piagetian cognitive constructivist theory, to achieve higher learning rate students need to engage with their peers having 'cognitive confrontations' which will lead to higher retaining of knowledge. Students should cooperate with one another, exchange ideas and learn the concepts in their own manner (Schreiber & Valle, 2013). That's why, in this study are created interactive learning assignments and exercises in Programming with Java in line with previous studies (Gannod, 2008; Ghadiri, Qayoumi, Junn & Hsu, 2014; Lage, Platt & Treglia, 2000) and supervised by the professor as suggested by Uredi (2013). According to Vygotsky, the learning process happens inside the zone of proximal development which according to Ireri & Omwenga (2016) (p, 107) is "the distance between a student's ability to perform a task under adult guidance and/or with peer collaboration and the student's ability of solving the problem independent".

Eppard & Rochdi (2017) indicated that "Using mastery learning, students learn in their own pace" (p, 37) which is exactly what flipped learning offers to students, mastering objectives in their own way, according to their own needs. Bergman and Sams (2012), indicated that flipped learning is based on mastery learning because it offers instructions that are differentiated, and provide a framework for constructive feedback.

In this study, students use video lectures to study the material at their own pace, watch it as many times as they need, take notes, do quizzes, be prepared for next classroom activities, etc. Being prepared for the next classes is a very important stimulus that improves the overall performance of the students (Mason et al., 2013, Skinner, 1974).

How to Flip' the Classroom

In a traditional way of learning, students try to catch what is being said by the professor at the very moment when he teaches. They cannot stop it, rewind it, or listen to it again, nor reflect upon what is being said, and they may miss valuable parts of the material because they are trying to write down the professor's words (Ozcan & Genc, 2016).

On the contrary, the concept of flipped learning is to provide to students lectures in a video format and other supportive materials to review as their homework, get the

maximum of it, and then, use the next class time for in-class activities and problem solving exercises.

This can create more class time and not lose education time by having students take notes at home and do the work in class. The greatest advantage of providing the lecture in this format is that students can review the videos several times (Rockland, et al., 2013).

Hughes highlighted that there are many ways that a classroom can be flipped. However, the most common way to apply the flipped classroom approach is to encourage students to view the recorded lectures or read course materials outside the class and then meet to engage in problem solving, discussion and practical application exercises with their instructor and other students in the class. Hughes also suggested that moving the lecture out of the classroom may involve selecting course content, deciding the organization of content, choosing multimedia to deliver content, creating materials and making the materials available to the student. (Hughes, 2012).

As indicated by Talbert (2014), for a flipped classroom experience to be effective, it ought to incorporate the following:

1. Very organized pre-class assignments which are equipped towards presenting the students with the new theoretical notions.
2. Tools for responsibility to guarantee that students will finish the required pre-class assignments and out-of-class work.
3. Activities should be well planned and designed, attractive for the students to engage with during lecture time.
4. The lines of correspondence all through the course should be open, so the students can communicate freely with their professor.

From this point of view, it is evident that a comprehensive and coherent pedagogy should be implemented to address the limitations experienced in the information systems' curricula over the past years (Tanner, 2015).

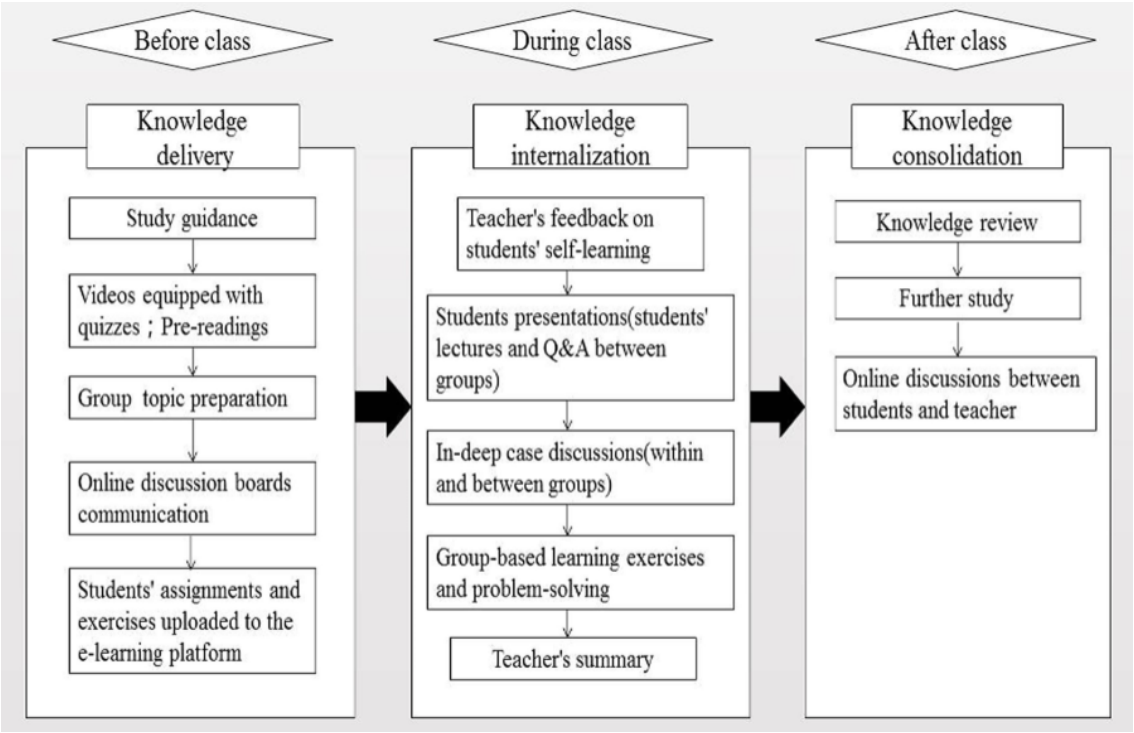

Figure 3. The Flipped classroom structure and setting flowchart.

Source: (He et al., 2019, https://doi.org/10.1371/ journal. pone.0214624)

According to Gnaur (2015), the faculty collaboration should be among the following:

- Subject specialists.
- Pedagogical experts.
- Learning technologists.

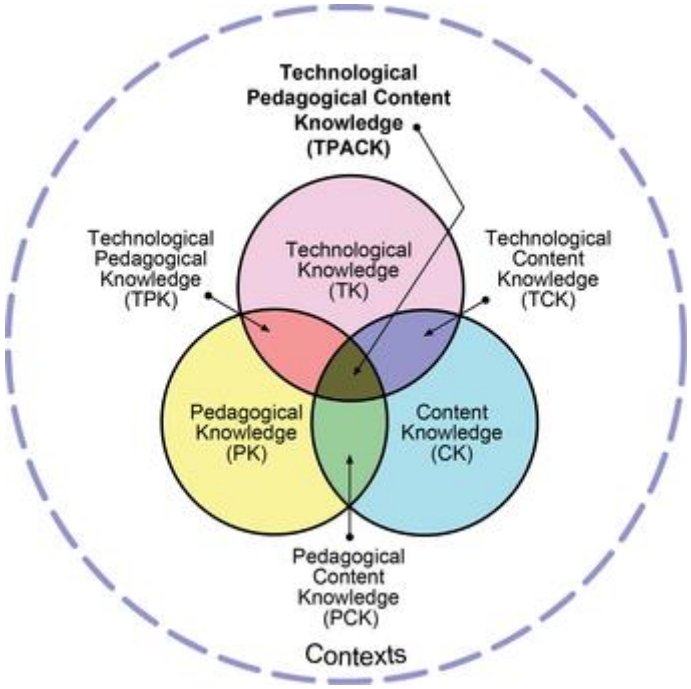

Figure 4. Technological pedagogical content knowledge (TPACK)

(Retreived from: http://tpack.org)

Four pillars of flipped learning

The four pillars of F–L–I–P are flexible environment, learning culture, intentional content and professional educator ((Hamdan, McKnight, McKnight & Arfstrom, 2013).

Flipped classrooms take into consideration an assortment of learning modes; instructors often physically revise their learning space to adjust the exercise or unit, which may include teamwork, independent study, research, performance and assessment.

In the flipped learning model, there is a purposeful move from an instructor focused classroom to a student – centered methodology, where in-class time is intended for investigating topics and issues in greater profundity and conceive bigger learning opportunities. Students are not anymore, the product of teaching but they are the center of learning, where they are effectively associated with knowledge formation through chances to participate in and assess their learning in a way that is personally significant (Hamdan et al., 2013).

Instructors that teach in a flipped classroom evaluate what content they have to teach specifically, because lectures are an effective tool for teaching particular skills

and concepts, and what materials students should be allowed to explore first on their own outside of the classroom. In the flipped learning model, skilled professional instructors are more important than ever, and often more demanding, than in a customary one.

Student perspective and performance

Studies have demonstrated that students are bound to remain in school if they have clear objectives, are active learners, and are participating actively in all the activities and exercises (Gokaydin, et al., 2017). At the end of the day, students learn more when they are strongly involved in their education and have chances to apply what they are studying and learning.

Students likewise benefit when they are occupied with the teaching and learning of their peers, for example, teamwork, peer audit, study groups and peer teaching in and out of the class (Mahmood & Hussain, 2017). The students overwhelmingly supported utilization of flipped-based (FB) teaching methodology compared to the lecture-based (LB) approach because it promoted cooperation and hands-on activities during class time (Khan & Ibrahim, 2017).

Findings revealed that students were familiar with online recordings as a learning asset; they had positive past experiences with using them and were ready to take part in a flipped classroom (Khoo, Scott, Peter & Round, 2015). That is the reason why for them it is very easy to adjust this new way of learning.

In general, the students seemed to value the flipped classroom design, despite the fact that they identify some difficulties and areas of enhancement (Cronhjort & Weurlander, 2016).

Blazquez et al., (2019), developed an educational study, with two parallel groups, one with flipped learning methodology and the other one with traditional approach. The aim of this study was to evaluate the effectiveness of a Flipped Classroom methodology in the academic performance of students of the Social Work Degree. The flipped classroom teaching methodology in comparison with the traditional methodology has shown itself to be a more effective tool regarding academic performance evaluated in a quantitative and qualitative way with regards to Social Work education at university level (Blazquez et al., 2019).

Flipped Learning in Engineering Education

If we analyze the literature narrowed only on applicability of flipped learning in Engineering Education, we can find interesting findings about the effect that flipped learning has on student achievement and perception. Knowing the fact that engineering students are closer and more prone to use technology in their everyday lives, work and study, it does ease their usage in education also.

The flipped learning methodology is especially valuable in engineering, since many issues lend themselves well to group discussions. Further, after finishing their studies, students moving into professional engineering careers are often required to work as part of bigger groups, thus preparing them with similar experiences is beneficial. It is additionally evident that many engineering issues can be approached from multiple headings; thus by having the capacity to work with others, and under the supervision of the instructor of the class, students are able to create and optimize their ways to problem-solving by watching their friends. In such manner, viewing others' perspectives on how to apply methods of working and key principles and ideas can be very gainful to the individuals who are struggling (Comerford, et al., 2017).

Critical thinking abilities are significant and fundamental for a successful career in engineering. Alkhatib (2018) in his study suggested a flipped classroom model as a pedagogical approach to fill up the learning experience in engineering courses. The most significant part of the proposed teaching method is the additional time that professor has to engage students in the interactive learning process by offering video materials. Pre- or post- lecture recordings solidified teacher efforts to engage more with students in practical exercises and for students to find extra learning assets after class. Recordings, specifically, are of crucial significance for class activities that include organized procedures, details, and rigorous repetitive tasks (Alkhatib, 2018).

Priyaadharshini and Sundaram (2018) made a research study based on an educational technology that fuses Flipped learning methodology for higher education in engineering courses. The proposed strategy distinguishes the learning style of the students before conducting the Flipped leaning pedagogy utilizing quiz activity in Moodle. The traditional teaching process conveys classroom lecture and concentrated on teacher-focused approach.

To examine the performance of the students using MATLAB toolkit is utilized the Fuzzy logic analyzer. The study was focused on 2 classifications with evaluation

marks and assignment marks for control group and competency aptitudes scores and evaluation marks for the experimental group. The Flipped classroom teaching method has proven to be a compelling methodology to improve the higher order thinking skills for higher education. This exploration work has built up that learning style based Flipped classroom has a good impact on the performance of the students. The proposed Flipped classroom strategy has enhanced the performance of the students and turned out to be a positive learning procedure for the engineering courses (Priyaadharshini & Sundaram, 2018).

Park, Kaplan & Schlaf designed and analyzed two flipped engineering classrooms, one including only engineering students who worked on individual design assignments, and the other involving teams of an engineering student and an art major student that did design tasks cooperatively. There were 51 engineering students, 29 from the individual flipped classroom and 22 from the interdisciplinary flipped classroom participated in the experiment.

During the semester, all students listened pre-recorded video lectures before the class and after that took part in weekly engineering design exercises either separately or in a group. Students' motivational experiences and engineering design accomplishment were evaluated at the end of the semester. The outcomes demonstrated that students' inclinations in utilizing motivational regulation between the two flipped classrooms were different. Likewise, the students that took part in the interdisciplinary flipped classroom exhibited higher aesthetic design achievement. Prior to the main data investigation, we compared engineering students' computer skills and course – related prior knowledge/ abilities in Arduino programming, CAD design, 3D printing, and coding between the two courses. As students had different engineering backgrounds, the procedure was expected to affirm the group equivalence. Independent samples t-test analyses showed that the two flipped classrooms were equivalent with respect to the students' level of computer skills (Park et al., 2018).

To support an ideal software engineering education, Lin (2019), applied flipped learning approach to study the learner-centered learning environment in a software engineering course. In addition since students' self-learning performance before class is important in influencing their prior knowledge while doing high-order thinking activities in class, this investigation builds up an intelligent learning diagnosis framework to support the flipped classroom to help students in learning and diagnosing the theoretical concepts of software engineering and help professors in managing the

students' learning status. To assess the effectiveness of the proposed methodology, an experiment was conducted on a software engineering course at a university in Taiwan.

The experimental results demonstrated that, comparing with the traditional-classroom learning approach, the proposed methodology altogether improved the students' learning performance, learning motivation, and learning behavior. Moreover, the students who learned with the proposed methodology had stronger problem-solving skills than those who studies with the traditional classroom learning methodology. What's more, most students in the experimental group agreed on the helpfulness of the proposed framework in the flipped classroom software engineering course. These findings give proof that the proposed methodology can help students in terms of software engineering learning (Lin, 2019).

From the aspect of learning achievement, the proposed framework gives a strong learning and diagnosis tool for professors and students since appropriate learning and assessment activities significantly affect learning accomplishment in a flipped classroom (Wang, 2017).

Students' Perception of Flipped Learning

Most of the studies on perceptions of flipped learning had pretty much positive results towards this new methodology which have affected students' performance, motivation, teamwork, etc. According to students, flipped learning gives them a better study atmosphere, more opportunity to interact with other students, more control over what they learn, how they learn, and investigating content at their own pace. (Afrilyasanti, Cahyono, and Astuti, 2016; Baker, 2000; Butt, 2014; Chao, Chen, and Chuang, 2015; Johnson, 2013; Maher, Lipford and Singh, 2013; Mosher, 2016; Tohei, 2018; Roehl, Reddy and Shannon, 2013; Wanner and Palmer, 2015; Zainuddin and Attaran, 2016).

Chivata & Oviedo on their study exploring students' perceptions of activeness during the implementation of a Flipped Learning approach as part of an EFL course at a Colombian university found out that students' perceptions were generally positive. In general, students agreed that this pedagogical approach provided them with the opportunity to take an active role in their learning process. (Chivata & Oviedo, 2018).

Fisher and her colleague's analyzed students' perceptions of their learning results, commitment, and fulfillment with flipped methodology using technology, in a third-

year core subject at an Australian university during 2014. In this pilot study, outcomes reveal that students preferred the flipped approach to the traditional teaching and reported increased commitment, fulfillment, and learning results because of both flipped learning approach and the use of digital technologies in the delivery of the lecture. All participants showed a preference towards the flipped learning methodology and the use of video lectures in contrary of traditional teaching because the online approach is more in line with how students learn today (Fisher, et al., 2017).

Castilla, Escribano & Romana made an experiment in flipped classroom for two consecutive semesters in the year 2014 at the Universidad Europea de Madrid (UEM). There was a total of 85 students in three groups of engineering students studying the second course subject of statistics. Two of the groups had the second half of the subject flipped and the third group would serve as a control group to test the methodology. The study revealed student's perception of their learning, methodology itself, the number of potential dropouts from the course etc. The general results showed that there was an average of 10% less dropouts during the course in those groups where Flipped Learning was practiced (Castilla et al., 2015).

Ponikwear & Patel made a study about implementation and evaluation of flipped learning in a topic of analytical chemistry within a subject taken by biomedical students for 3 years. They compared the flipped learning approach with traditional lectures given within the same module. Flipped learning content and traditional lecturing were compared for commitment and performance. They have effectively implemented and assessed the effectiveness of flipped classroom for the delivery of analytical chemistry content. There was high commitment with all the flipped learning materials. Their measured data suggest that 96% of students would have contemplated the online video lectures for an adequate term to effectively become familiar with the substance.

Students stated that video lectures made it easier to get familiar with the material and suit their individual learning needs. Students found the problem-based workshops the most helpful component, as a result of the interactivity in the classroom environment. The students were satisfied with the flipped learning when compared with conventional lecturing (Ponikwear & Patel, 2018).

Moreover, the major repeating remarks from students were that video lectures can be assessed many times (especially referenced by international students), and that they could check/practice e their comprehension and information of the scholarly video material with the teacher in the taught problem-based workshop. Other key remarks are

all indicative that this approach to teaching makes students commit more actively and effectively in the learning process (Ponikwear & Patel, 2018).

In a study conducted by Dirgahayu, flipped learning is implemented in Software Engineering course which gives students more time for doing their work under teacher supervision during in-class learning. In this study it is presented student perceptions toward the use of flipped learning in Software Engineering course. The results show that this approach gives a good impact on students' understanding and practical skills. The perceptions were measured on several aspects, i. e. (i) the suitability of flipped learning for the course, (ii) student's engagement to the course, and (iii) the quality of teacher supervision during the in- class time. Students indicate positive perceptions on all those aspects. (Dirgahayu, 2017). Blazquez's study (2019) has also been evaluated more positively in terms of the perception of difficulty of the content. However, no significant differences have been found regarding satisfaction with the subject and the methodology used, long-term learning and the time spent preparing for the exam (Blazquez, et al., 2019).

Cardetti, Pon & Christodoulopoulou (2013) assessed students' perceptions of the flipped classroom by examining students' responses to Likert-scale items as well as open-ended questions eliciting their teaching and learning preferences. A perceptions survey demonstrated that more than 70% of students revealed that the videos helped them comprehend the concepts, as well as allowed them to learn at their own pace. While practically 60% of students agreed that the video recordings helped them prepare to solve the in-class problems. In general, these results show that students see flipped learning approach as beneficial to their learning and their preparation for class. According to their in-class experience, almost 70% of the students stated that starting class with a summary about the videos was beneficial to their learning. In addition, more than 50% of the students found the interactions with the professor and their classmates during the flipped experience to be valuable and almost 50% felt that the flipped classroom experience helped them get ready for quizzes and tests (Cardetti, Pon & Christodoulopoulou (2013). In addition, students in the flipped group agreed that the classroom helped to promote their learning motivation, improve their understanding of the subject materials, and meliorate their communication skill and clinical thinking (Tang et al., 2017).

Findings in the related studies

In this literature review, most of the studies were on the undergraduate program, first year, second, third and fourth and few of them on high school and master's degree. The studies also included a range of subjects such as electrical engineering, circuits, computer science, mathematics, robotics, systems design, descriptive geometry, computer graphics, and so on.

In one experiment conducted by Chao (2018) two K11 classes with ninety-one 17-year-old students were divided randomly in two groups, one experimental and the other one control group for the study. An 8-week pre - and post-test quasi experimental study was structured and designed to evaluate the students. The outcomes confirmed the effectiveness of the flipped learning approach because there were found significant differences between the experimental and control groups in terms of students' results. In the experimental group, students' learning attitudes, motivation and self-evaluation were improved. In conclusion, the outcomes demonstrate that the flipped learning approach positively affects the exchange of learning. Based on the findings obtained, given are recommendations for the improvement of future K12 engineering education instruction using the flipped learning approach.

Another study by Munoz-Merino et al. (2017), says that the utilization of Massive Open Online Courses (MOOCs) is expanding worldwide and brings a revolution in education. MOOCs are typically driven by short video lessons, automatic correction exercises, and the technological platforms that can implement gamification or learning analytics techniques. The results demonstrate that students enhanced their grades significantly when utilizing MOOCs technology, and the student fulfillment was high regarding the experience and for most of the distinct provided features, and there were great dimensions of interaction with the platform (e.g., the number of completed videos or proficient exercises), and furthermore the activity distribution for the different themes and types of activities was appropriate (Munoz – Merino, et al., 2017).

To overcome the issues found in the existing flipped classrooms and asses' flipped classroom using a database engineering course in a master's program, Chiang and Wang directed a study that utilizes the College and University Classroom Environment Inventory to investigate the learning performance of the newly proposed in-flipped classroom strategy. The outcomes demonstrate that students in an in-flipped classroom manifest better individualization than those in a traditional classroom and

have increased interest in collaborative learning. The study additionally finds that students are more easily engaged in lectures and develop self-directed, self-regulating, and self-determined skills through this strategy (Chian & Wang, 2015).

Voronina made an experiment with 25 students that were on first year of their studies on the Faculty of Electromechanical and Mining and with four professors from the Department of Descriptive Geometry and Graphics in St. Petersburg University. The outcomes demonstrated that since 2012, flipped learning has become very popular not only among school instructors, but also among professors of engineering universities. She presented a combination of qualitative and quantitative research of flipped learning models in the field of engineering education: students' attitude towards flipped classroom, the importance of teaching materials, as well as the role of professors' identity have been recognized. The research demonstrated that there are not scientifically based and tested programs, projects, instructional materials, for teaching students' descriptive geometry engineering and computer graphic and computer geometry utilizing flipped learning approach (Voronina, et al., 2017).

Khan and Ibrahim (2017) have made a long-term experimental study to see the impact of flipped learning strategy in college technology courses. This experiment is used to evaluate self – efficacy and perception based on their preferences of learning. To compare the adequacy of flipped classroom versus traditional one selected topic was taught utilizing the two techniques. The learning materials in the flipped classroom included video recordings, post-tests and surveys. These materials were accessible online for the students. The results show that flipped classroom approach made a statistically significant difference in the self – efficacy. The discoveries from this study can be utilized to implement flipped learning approach in other college-level technology and engineering courses (Khan and Ibrahim, 2017).

Johnson (2015) analyzed how using flipped classroom, peer communication, and just-in-time teaching are used to make learning of a programming subject easier. He led an experiment trying to enhance further the learning condition in a basic campus course on object – oriented programming and design given to students that are studying computer science and engineering, first year. He analyzed the quantitative impacts of the experiment to a class comprising of 70 students taking the course with flipped learning methodology and a control class of 57 students taking the course in the conventional way. The final exam was the same for both groups, also the marks, and the results were: 81% of the students in the experiment class passed compared to 60%

in the control class. Additionally, the share of students' having good grades was 58% in the experiment class compared to 32% in the control class. In this manner, not only did the share of students passing the course increase by a third, but also the share of students passing with good grades almost doubled (Johnson, 2015).

Another example of research that showed that flipped learning has been effectively implemented and both teachers and students saw some benefits in terms of improving students' learning experience is the project conducted on Middle East. It included 11 modules at undergraduate and postgraduate studies drawn from seven departments across a wide variety of subjects including Engineering, IT and Business studies. Assessing the pilot project has involved a triangulation of data gathering instruments including utilization of semi-structured interviews with the module leaders, lesson observations and focus group discussions held with students (Gomez, et al., 2015).

Barral, Ardi – Pastores & Simmons (2018) compared a flipped-classroom setting with the conventional ("control") setting for quickened lower-division general biology course. Student self-announcing and video analytics functions indicated ample and variable video viewing among individual students. Student learning was assessed through test controlled after a set of concepts were covered (post 1) and at the end of the course (post 2). Students in the flipped classroom had significantly higher test scores than students in the control group for both post 1 and post 2. Examine of variance analyzing the impact of and associations between type of instruction, in-class exercises, time, and Bloom's level of the test questions found huge contrasts in the general model and all the factors, except for the presence and level of exercises. Significant differences between students in the flipped group and control group were investigated for low-level Bloom's questions only. Thus, the positive effect of the flipped-classroom approach on student learning may be because of enhancements in review of fundamental ideas and a superior comprehension of biology vocabulary in their first biology course (Barral et al., 2018).

The use of the technology to improve the appropriation of knowledge, multiplied this with innovative techniques in the learning processes, are a guarantee of a significant improvement in education, this is the case in the study of (Prada et al., 2019) where the application of the Flipped Classroom technique to the course of financial analysis for the program of business administration, obviously led to improve not only the notes of the students, but to implement self-taught methodologies by the student, along with a

marked discipline in pursuit of your own learning; in this way, the main variable of the educational equation is linked to its formation process, which is the student along with the level of appropriation of knowledge at a particular speed of each individual; The study showed that the technique worked in synergy with the technological element showed positive results in each one of the study groups, and additionally I see that there is no statistically significant evidence of discrepancy between the perceptions of the groups under study (Prada et al., 2019).

Missing gap in the literature

There are numerous of studies related to flipped learning usage in elementary and high school (Toh, Tengah, Shahrill, Tan, & Leong, 2017; Yang, 2014; Lo, 2017; Finkenberg & Trefzger, 2017, Villalba, Castilla, & Redondo-Duarte, 2018; Hulten & Larson, 2018, etc.) but few corresponding studies at a university level.

This work tries to conclude that flipping a classroom does affect students 'achievement and perception in a positive way. Moreover, it is of an extraordinary significance as far as being one of few investigations identified for flipped learning usage at a university level with computer science students to expand the adequacy of flipped learning in engineering courses.

Despite this increasing interest, there does not seem to be an agreement on what flipped learning is and how effective it is in improving students' learning in engineering education. Therefore, when flipped learning is applied in engineering education, it is wondered what the results will be, and it is seen as a necessity to be taken as a research problem and to present its results.

METHODOLOGY

In this section, the model of the study, participants, data collection technique and data analysis are given. Also, according to the purpose of this research, the educational effectiveness and student achievement and perception of flipped classroom instruction consisting in class activities and video lectures to traditional classroom instruction in a university-level Introduction to Programming course for engineers were compared.

Research Method and Model

In this research, in order to evaluate and compare the perceptions of students who receive Introduction to Programming course based on flipped learning, experimental method was used with qualitative and quantitative approaches. This method involves collecting, analyzing and combining qualitative and quantitative data (Hesse - Biber, 2010). In this study, the explanatory pattern design described by Creswell and Plano Clark (2011) was used. In the explanatory pattern, quantitative and qualitative data take place in two stages and sequentially. First, quantitative data that are prioritized to answer the questions of the study are collected and analyzed. In the second stage, qualitative data is collected and analyzed to complete this data.

In this study conducted by the researcher, to collect quantitative data are evaluated students' academic achievement and their perception in both, the experimental group and control group where pre-tests and post-tests are performed.

In the experimental model, the researcher provides the research area by producing the data that he wants to observe among the variables he controls to explore cause-effect relationships. Pre-test and post-test are part of the experimental designs used in the social sciences. First, subjects are randomly assigned to groups from the universe that is considered suitable for the experiment. Then, the subjects in the experimental groups have measurements of the dependent variable before they begin to apply. In the application process, the experimental process whose effect is tested is applied to the experimental groups / groups. Finally, the measurements of the dependent variable of the subjects in the groups are obtained by using the same tool or co-form (Büyüköztürk, 2001; Karasar, 2005).

The study was conducted by the researcher to evaluate and compare the perceptions of students who receive Introduction to Programming with Java course based on flipped leaning methodology.

The experimental research model was created as follows:

Table 2.

Experimental Research Model

Group	Pretest	Learning Approach	Post-test
Experimental Group	T1, T2, T4, T5	Flipped Learning	T1, T2, T3, T4, T5
Control Group	T2, T4	Traditional Learning	T2, T4

T1: Flipped Learning Technology Acceptance Scale

T2: Self-directed learning readiness scale

T3: Course Evaluation Questionnaire

T4: Introduction to programming with Java achievement test

T5: Student Perceptions of Flipped Learning in Engineering Education Questionnaire

Between the experimental and control groups, Introduction to programming with Java achievement test [$t(172) = 0.455$ $p>.05$] and Self-directed learning readiness scale [$t(172) = 0.403$, $p>.05$] there was no statistically significant difference between the pretest results. So, one can be said that both groups are equivalent, and the results are shown in the Table 3 and Table 4.

Table 3.

Independent samples t-Test Results for Pre-Test Introduction to programming with Java achievement test scores of the experimental and control groups

Group		M	SD	Df	t	P
Experimental Group	87	9.46	9.393	172	.455	.650
Control Group	87	8.85	8.236			

Table 4.

Independent samples t-Test Results for Pre-Test Self-directed learning readiness scale scores of the experimental and control groups

Group	N	M	SD	Df	t	P
Experimental Group	87	3.73	.440	172	.403	0.897
Control Group	87	3.72	.569			

Participants

The participants in the research study are Software Engineering students at the subject of Introduction to Programming with Java. The research took place at a University in the Republic of Kosovo in fall semester of the 2018/19 school year.

The students are divided in two equal groups, one control group and one experimental group. Later, at the beginning of the academic year, 87 students who took this course were assigned randomly to the experimental and control groups with a total of 174 people.

In the experimental group there are 74 males and 13 females and in the control group there are 82 males and only 5 females. 94% are younger than 25 and 3% between 25 and 30 years old. More than 77% of them have never used or heard about flipped learning.

Variables of the study

Independent variable

As independent variables in this study are flipped learning instructions for the course Programming with Java. This variable has two levels. One level is the traditional instruction and the other level are the instructions with video lectures presented in the experimental group.

Dependent Variable

There are two significant parts of this study, the knowledge in Introduction to Programming language and student perception of the flipped learning approach. The knowledge about programming is measured with five instruments along two dimensions, conceptual understanding and the ability to create a project application with Java programming language. Conceptual understanding is measured with first midterm, second midterm and a final exam and in the other hand the skills to create by their selves an application is measured with the scores of the project.

The second part is student perception of the flipped learning approach. This was measured with four instruments: Technology Acceptance Model (with 4 sections: Perceived Ease of Use, Perceived Usefulness, Attitude Toward Usage, Behavioral Intention to Use and Job Relevance), Self-Directed Readiness Scale and Course Evaluation Questionnaire and activities and Student Perceptions of Flipped Learning in Engineering Education Questionnaire.

Application

Experimental group

Introduction to Programming with Java course, in the experimental group was implemented based on flipped learning methodology for 14 weeks (2 hours a week lectures + 2 hours a week lab work). Lectures were shared online via Edmodo platform by the researcher and lab courses are held by two assistants of the course.

Control group

In the control group the application was implemented based on traditional instruction. The duration of the course was the same as in the experimental group, one semester, 14 weeks. Control group and experimental group have classes in the same day, first the experimental group then control group.

Approving the experiment and Permission grant by the participants

The management of AAB College reviewed the proposal for this research and approved to proceed with flipped learning approach. Participants in this study were presented a consent form for approval so they voluntarily will participate in this experiment. In the consent form they are informed that whether they agree to participate or not this will have no impact on their grads and their identity will not be revealed in any case to third parties. The data collected during this study will be used only for the doctoral thesis on flipped learning and may be presented at national/international academic meetings and publications. They can quit participating in this study at any time by contacting us.

Setting

The research took place at a University in the Republic of Kosovo. The University name is ‘AAB College” and serves students in more than 50 programs and has a population of approximately 25 000 students and 700 academic staff. The study took place from the beginning of the first semester of 3-year faculty program on the department of Software Engineering in fall semester of the 2018/19 school year.

The university AAB College was founded in 2002 and is the first non-public institution of higher education and the biggest investment in Kosovo in the field of education and the largest university in the region according to student numbers.

At Pristina campus, it has a modern architectural design with 6 physical buildings, which is considered above average in the district. Classes at the school are equipped with the latest technology making students learning process easier, have creative teaching and contemporary technology.

Information about the course

The name of the course: Introduction to Programming with Java, it is a mandatory course, taught in the first semester and has 6 ECTS.

This subject is about programming. So, what is programming? The term programming means to create (or develop) software, which is also called a program. In basic terms, software contains the instructions that tell a computer or a computerized device - what to do.

Software is all around you, even in devices that you might not think would need it. Of course, you expect to find and use software on a personal computer, but software also plays a role in running airplanes, cars, cell phones, and even toasters.

This subject teaches students how to create programs by using **the Java programming language**. Each language was invented for a specific purpose—to build on the strengths of a previous language, for example, or to give the programmer a new and unique set of tools.

Experienced programmers know that one language might work well in some situations, whereas a different language may be more appropriate in other situations. See appendix C for the syllabus of the course.

Teaching plan for 14 weeks

WEEKS	Chapter/Theme	Material	Literature
WEEK 1	Introduction to Programming with Java	Books & PPT Presentations for both groups *Survey filling (TAM, CEQ, SDLR, Student perception*	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 1
WEEK 2	Variables Data Types Constants Strings Comments	Pre-recorded video lectures before the class for Experimental Group Chapter of the book/PPT Materials	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 2
WEEK 3	Simple Programming in Java Write a simple Code Print text Print results Read input from keyboard Format Results	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 2
WEEK 4	Operators, mathematical functions	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 4
WEEK 5	SELECTIONS If conditions If/else conditions Embeded if/else	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., Introduction To Java Programming Comprehensive version, Tenth Edition, 2015, Pearson Education, Inc. Chapter 3
WEEK 6	FIRST MIDDTERM		
WEEK 7	Advance Selections SWITCH conditions	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 3
WEEK 8	LOOPS While Do – While	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 5
WEEK 9	Advance LOOPS - FOR cycle - Embedded FOR	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 5
WEEK 10	Methods / Functions	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 6
WEEK 11	Single – Dimensional Arrays	Pre-recorded video lectures before the class for Experimental Group	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. Chapter 7
WEEK 12	SECOND MIDTERM + *After experiment survey fulfillment*		
WEEK 13	PROJECT PRESENTATIONS		
WEEK 14	FINAL EXAM		

In class activities

In class activities for the experimental group

There are different activities that take place during class with the experimental group, because it is supposed that student already know the topic because they have video lectures to listen to and learn before classes. These activities include:

- Group Learning Activities (dividing students in group of 3 and preparing solutions for given programming examples with Java language)
- Exercises (in the beginning of the class to see if they know how to solve exercises and to see if they watched the videos at home)
- Lab work with Eclipse or jGrasp
- Student centered work
- Discussion
- Summarizing topics

In class activities for the control group

Students in the control group are taught in traditional way, meaning, they come to classroom in the defined schedule, for 90 minutes each lecture, and learn the content of the lectures from the professor. They are not actively involved in the process of lecturing; they can ask questions anytime during the lectures but don't have problem solving activities. Even though the subject is programming and it involves mostly coding and small programs, they are all written by the professor at the whiteboard and explained line by line, alongside with PowerPoint presentations where all the programs are stated. Students take notes or ask questions. Also, after the coding is explained, professor solves programming examples directly in one of the editors used jGrasp or Eclipse. After writing the codes they are executed and see the answer and performance right away. Students outside the classroom work on their own, on their laptops and practise at home everything they worked in class.

Out of class activities

There are different out of class activities for both groups.

Out of class activities for the experimental group

The general idea behind the flipped learning concept is flipping the classroom, meaning they learn the lectures at home and do the homework and in class activities in the classroom. So, the experimental group, have 1 week before the lecture the pre-recorded video materials uploaded in Edmodo platform, they can listen and see the video lectures online or can download it on their personal computer, laptop, tablet or mobile phones. They can listen to the videos as many times as they want, take notes, write down questions and prepare for the next lecture.

Out of class activities for the control group

For the control group as out of class activities are considered reading the books provided in the course management system of AAB College as e-books as stated in the syllabus. They know on each lecture what is going to be lectured. They can read before lectures if they want, but they are not obliged to. Also, after the lectures, they get exercises of coding for homework. Some of them are mandatory and they must send to the professor via e-mail for checking, and some of them are only for practice.

Communication platform

Experimental group

As a communication platform is used Edmodo which is a great educational application for collaboration and coaching where the professor have the possibility to create a class, modify it according to their needs and upload all the materials, video lectures, textbooks, exercises etc. It is easy to use, to connect the students and it has more than 87 million users. You can create polls, quizzes, discussion forums etc. It is very similar to other social media that youngsters use in their everyday life. The good part of it is that it offers a mobile version where every student can download it from the play store and use it continuously.

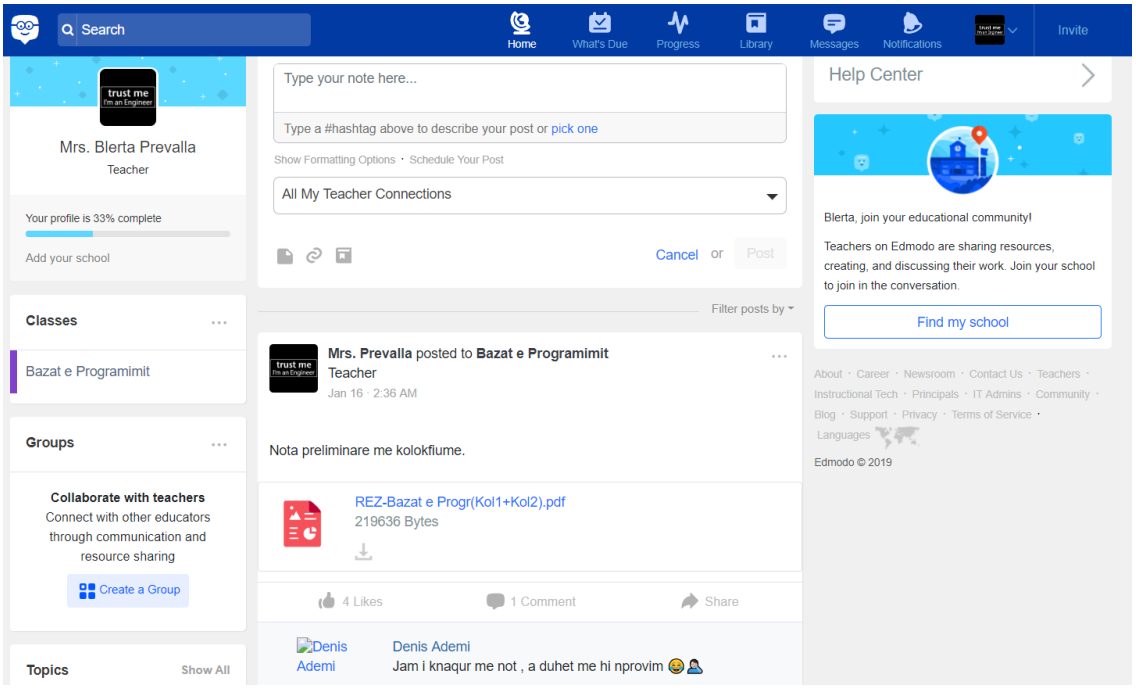

Figure 5. Interactive platform Edmodo Screencast

Messages

The feel of using Edmodo is like using social Medias, and in this era, when social Medias are very popular and widely used, this gives the students a comfortable place to talk to their peers or their professor. This communication platform gives them self-confidence, they can easily ask questions, feel that are more connected knowing that they have their professor just a click away. In the Figure 13 it is shown how student feel free and not hesitate to write to the professor for every detail they don't know.

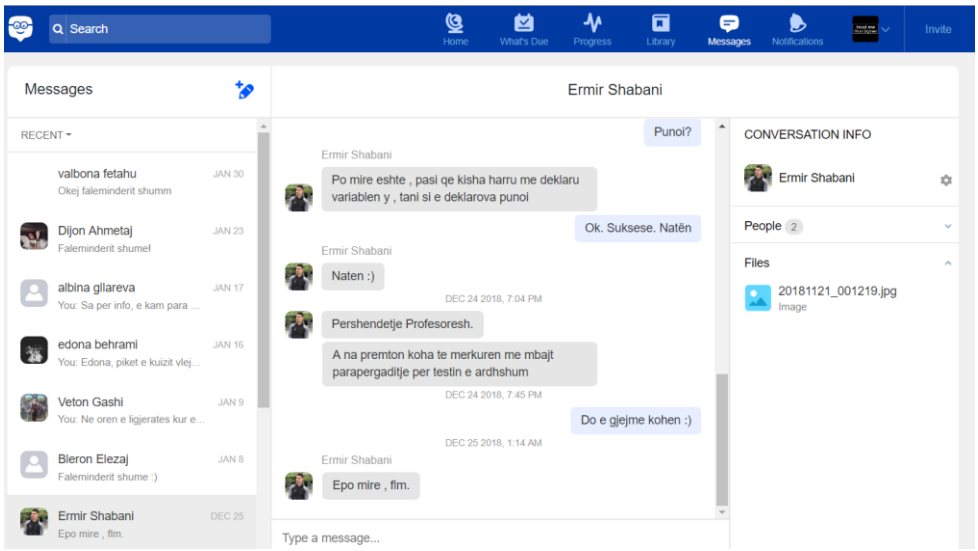

Figure 6. A Screencast from Edmodo – Messaging part

Polls & Quizzes

A very significant part on Edmodo are also Polls & Quizzes. In this experiment polls & quizzes are used to follow their state of knowledge during a period. Polls are used to get the feeling how the students are accepting flipped learning approach and quizzes to check rather they opened the video materials and learned the corresponding chapter.

In the Figure 14 there is a poll made after 5 weeks of using flipped learning approach and it is a simple question:" *Do You think that flipped learning will ease your studies"* and 100% of the students said Yes (alb. Po).

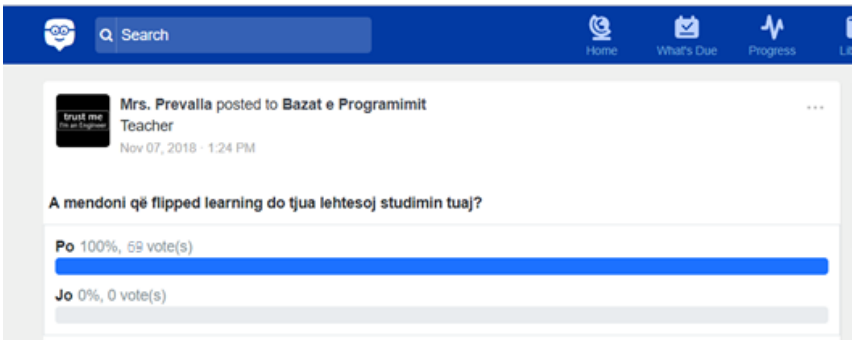

Figure 7. Polls in Edmodo

Quizzes are used as an instrument to evaluate students' progress week by week and to gather information's about students' retaining knowledge and attaining better problem-solving performance. In the Figure 15 it can be seen one example of a quiz held on the first week and the result was almost excellent.

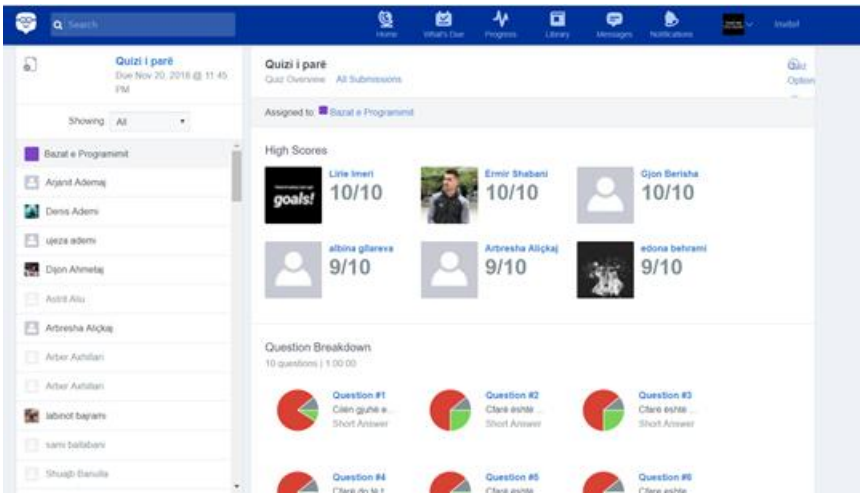

Figure 8. A quiz example in Edmodo

Mobile version

The strong side of Edmodo platform is the mobile version of it. During the first lecture, all the students in the experimental group were asked to download from play store the mobile version of Edmodo and install on their phones. The professor of the subject creates the class in Edmodo and generates a pin which afterwards is shared with students of the experimental group and they all enroll in the virtual class.

In the figure 16 we can see the home screen of the Edmodo mobile version.

Figure 9. Feeds of Programming course in Edmodo mobile version

This mobile version is very easy to use, in both sides, professor side is very easy to handle as well as student side. Professor can create a group code and share with the students, can lock or unlock group code, can limit new members to read only, to moderate all posts and replies, hide all posts from Parents, archive class or delete class. Professor can see all the members that are enrolled, change their permission to read write or read only, can reset student's password, invite Parents to Edmodo or Remove Students from class like in the figure 10 and 11.

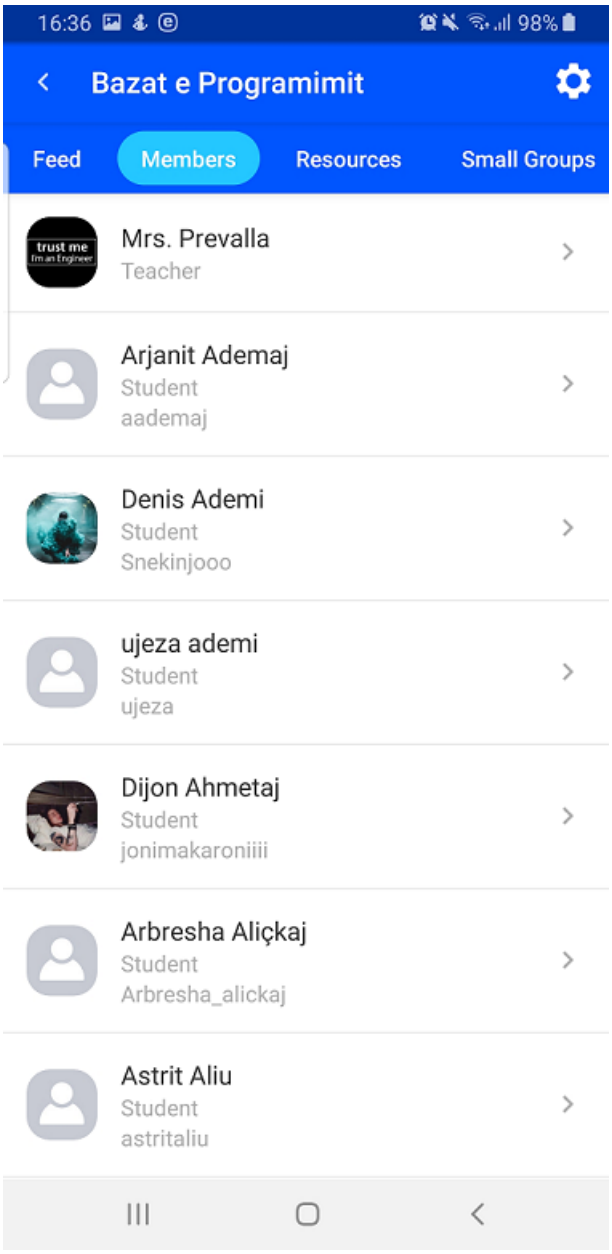

Figure 10. How members on a class are shown in mobile version of Edmodo

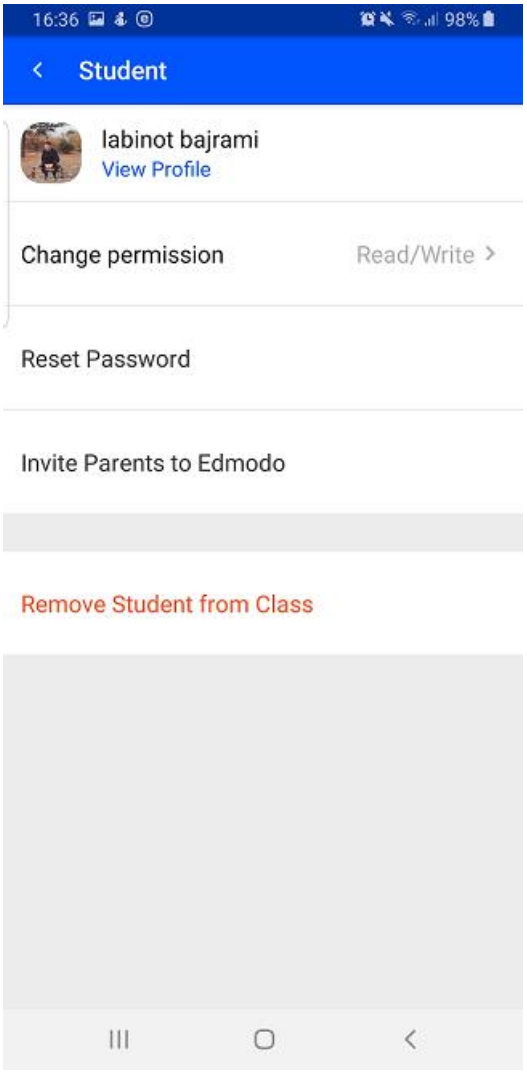

Figure 11. Options for members of a class in Edmodo mobile version

There is also a notification part when professor can see all the activities inside the class like comments, likes, posts, replies, requests, etc. like in the figure 12.

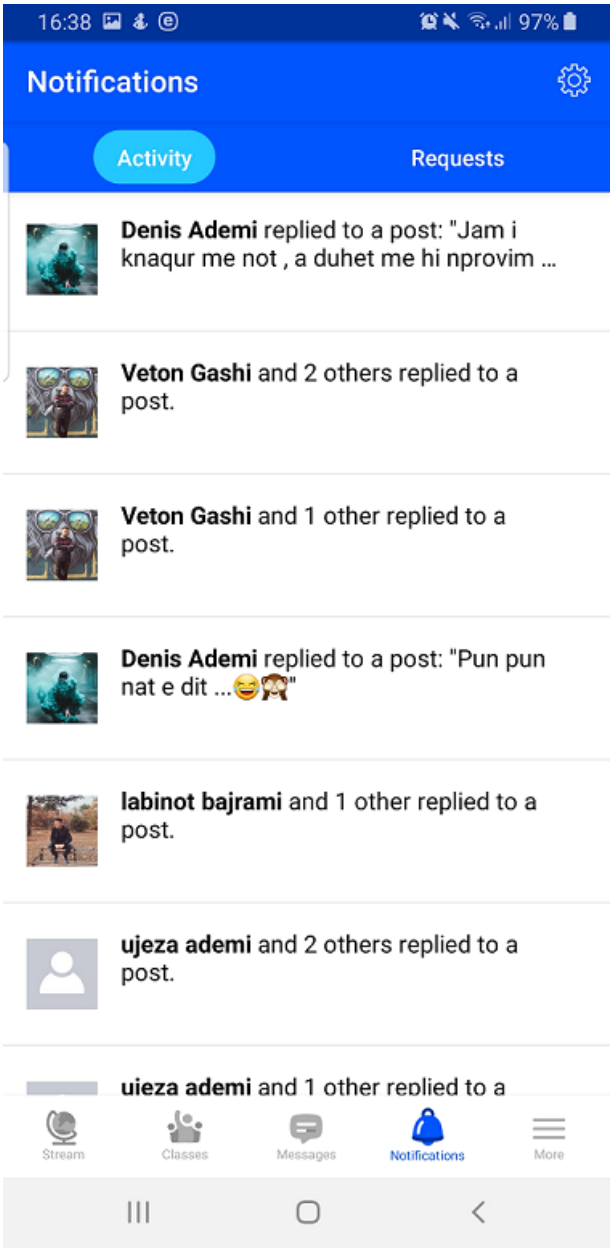

Figure 12. How notifications are shown in professor side of Edmodo mobile version

Control group

All the materials for the control group are shared by the AAB College Course Management System called “E – Professor” as seen on the Figure 13.

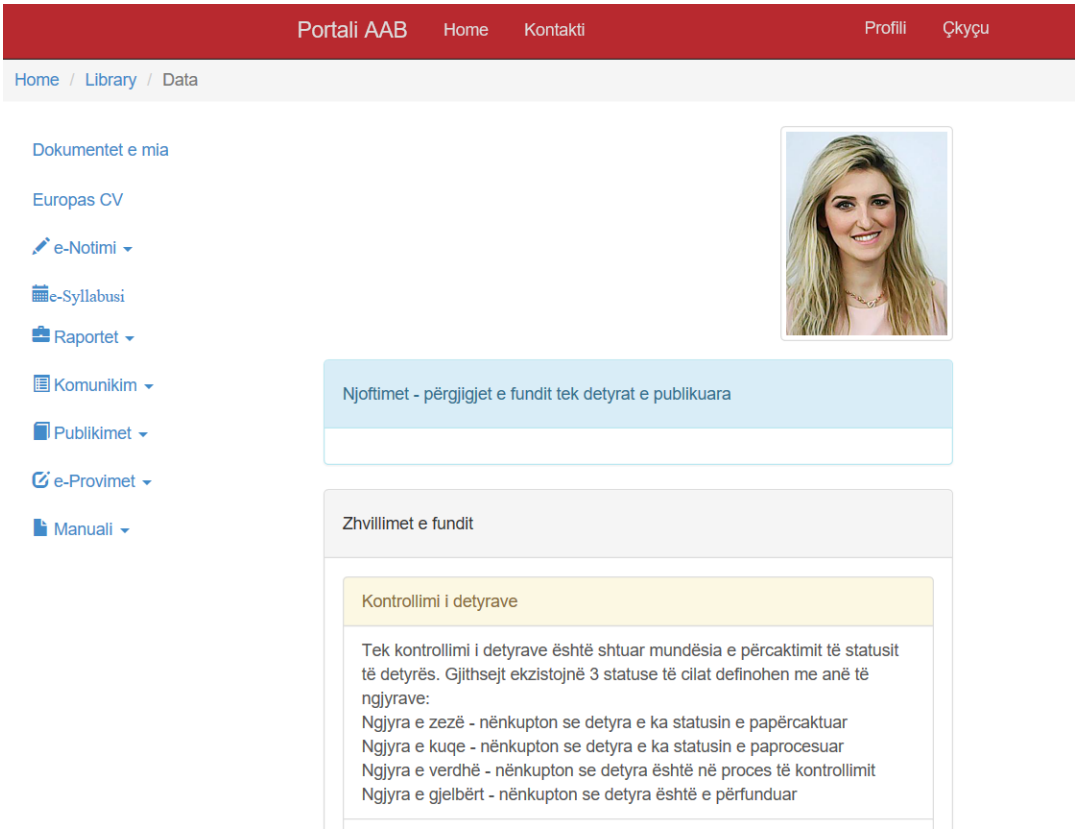

Figure 13. CMS for Control Group

There are seven options for uploading: exercises, lectures, quiz, homework's, literature, URL addresses or other, see Figure 14.

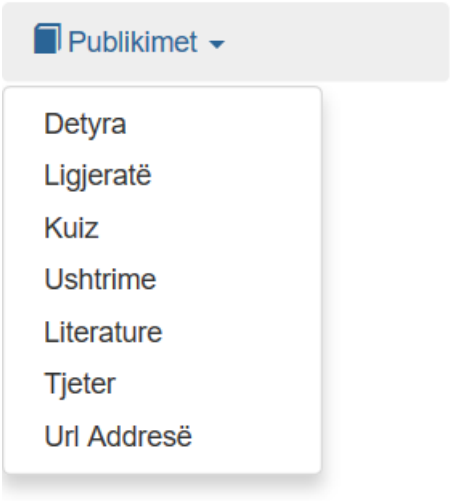

Figure 14. Options for upload

Additional Instruments

In this study, as additional instruments for following their retain knowledge are used, summative evaluations cross a first midterm, second midterm, final exam and a project.

First Midterm

First midterm is held after 5 weeks of lecturing, in the 6th week, to control how student development process on the subject is going. First midterm covers the beginner material, consisting of Introduction to Programming with Java, Variables, Data Types, Constants, Strings, Comments, Simple Programming in Java, writing a simple code, print text, print results, read input from keyboard, format results, operators, mathematical functions, selections, if - conditions, if/else conditions and embedded if/else. The first midterm test had 1 question with theoretical sub questions, 3 problems/exercises to solve with Java programming language and a bonus question/exercise. There were six groups of tests, group 1, 2, 3, 4, 5 and 6 and the duration was 90 minutes. An example is attached on the appendix I.

Second Midterm

The second midterm is held on the 12th week of the semester, controlling their knowledge on the second part of the material consisting of advance selections, SWITCH conditions, loops, while, do – while, advance loops, FOR cycle, embedded FOR, methods, functions, single – dimensional arrays. Knowing the fact that the students on this phase of the subject already know the basics of Introduction to Programming their test didn't had theoretical questions, only 4 problem solving exercises. Same as first midterm, there were 6 combinations of groups, from 1 to 6 and the duration was 90 minutes.

Final Exam

Final exam is held on the 14th week of the semester, and it covers all the material about the course Introduction to Programming with Java. The test is consisted of 4

exercises and the duration is as previous tests, 90 minutes. These exams typically required students to solve relatively more complex programming problems related from the material for each section.

Project

Project is very important part of the summative assessment of the student because it gives 30% of the final mark to the student, its equal in percentage with first and second midterm. In this project student should program an application using Java programming language.

It can be seen as practical part of the subject where students show their ability and skills to program something on their own.

Final marks

Final marks are obtained by two options. The first option is: 30% first midterm + 30% second midterm +30% project +10 % presence and activity and the second option is for the student that didn't achieve to accumulate passing points, or for the student that are not satisfied with their marks, they have to enter to the final exam for the whole material and get 60% of the total because the other 40% come from the project 30% and 10% presence and activity. All the marks are processed and entered in the CMS as in the Figure 7.

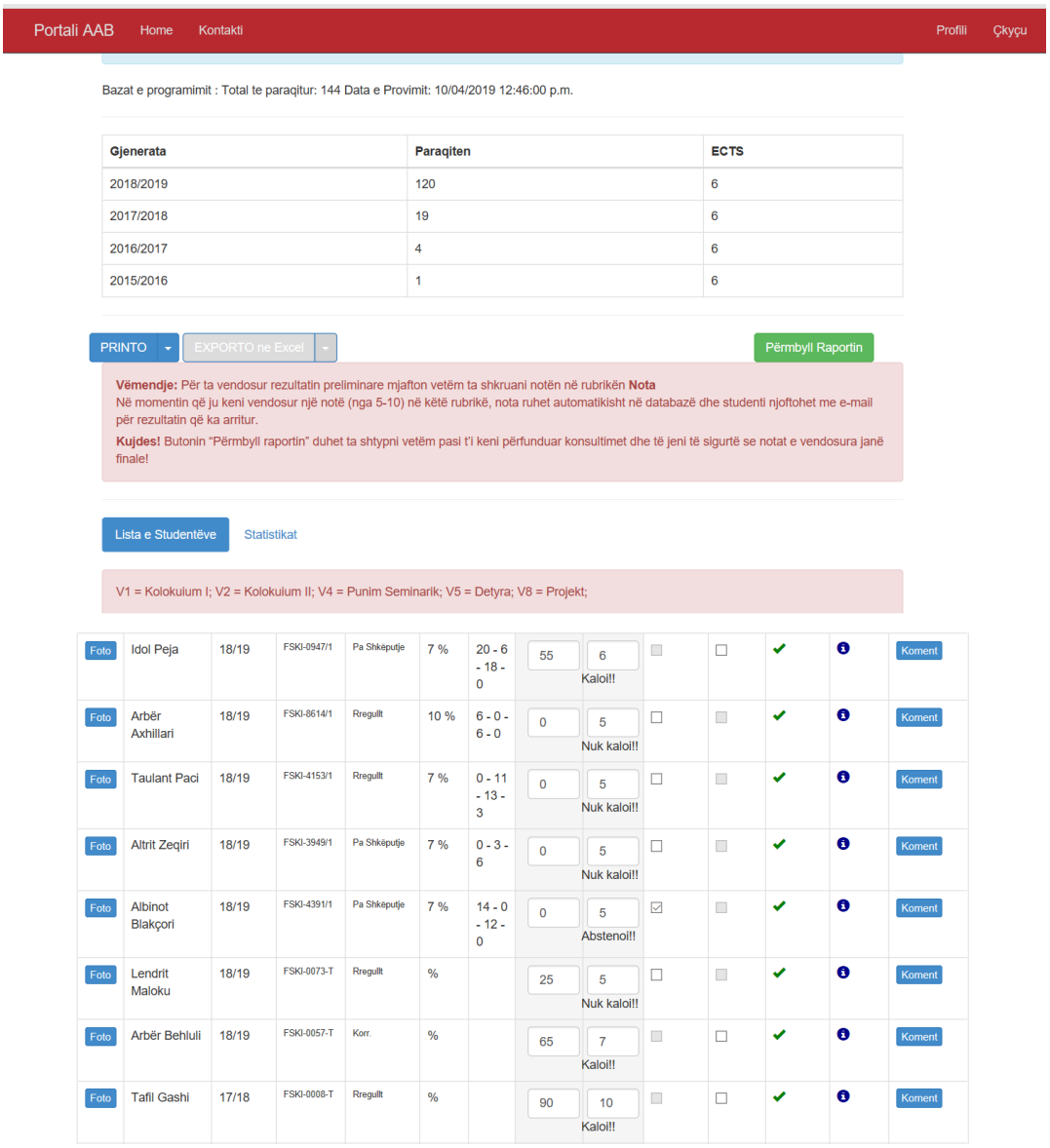

Figure 15. Entering final marks on CMS

Video recordings

The video lectures are recorded with Screencast-o-matic and are 15 minutes long. According to literature review this amount of time it's ideal. Also, I can say it's the optimal time because in the survey I made on the last day of the semester more than 74% answered that the video length was about right, for more see the chart in Figure 16.

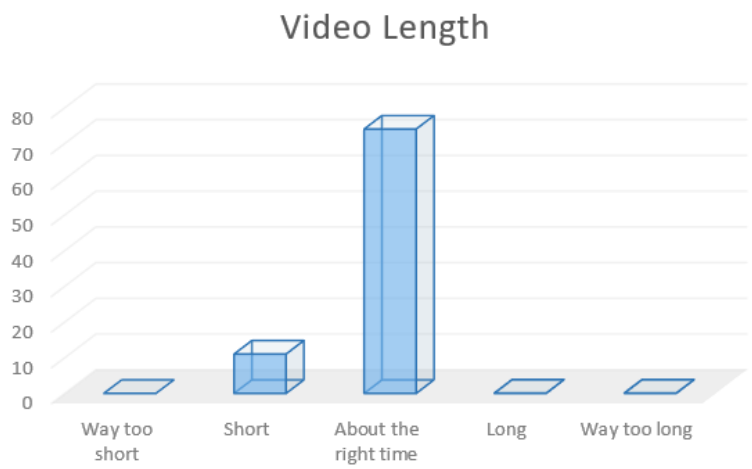

Figure 16. The review of the video length

Examples of video recordings

The video recordings are combined videos with slides, voice and face. Every week before classes they are distributed to students via Edmodo interface. Students can download or listen to them online and prepare for the next classes. They can comment, like or discuss with professor or other classmates. Some examples can be seen in the figure 17, 18 and 19.

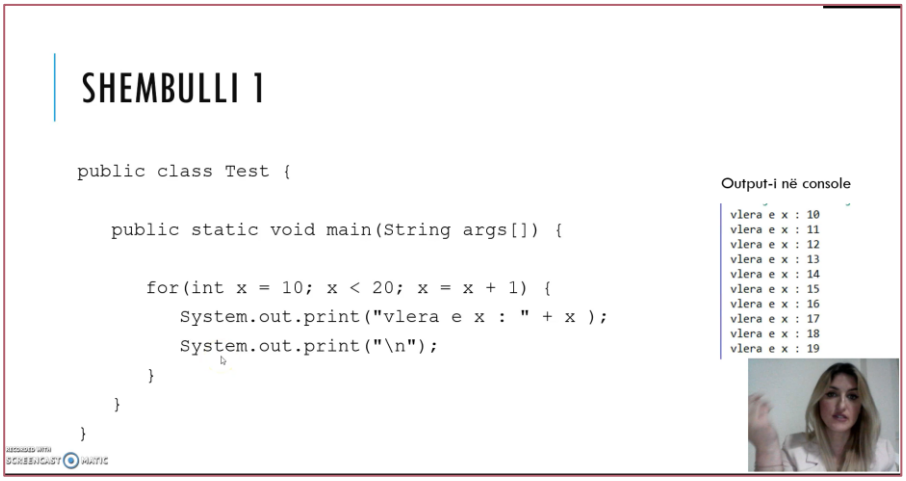

Figure 17. Sample video recording Screencast

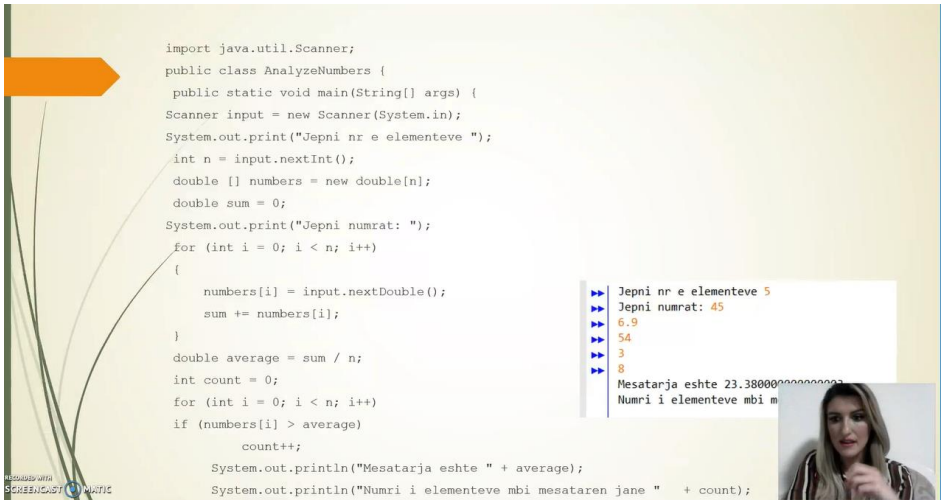

Figure 18. Sample video recording Screencast

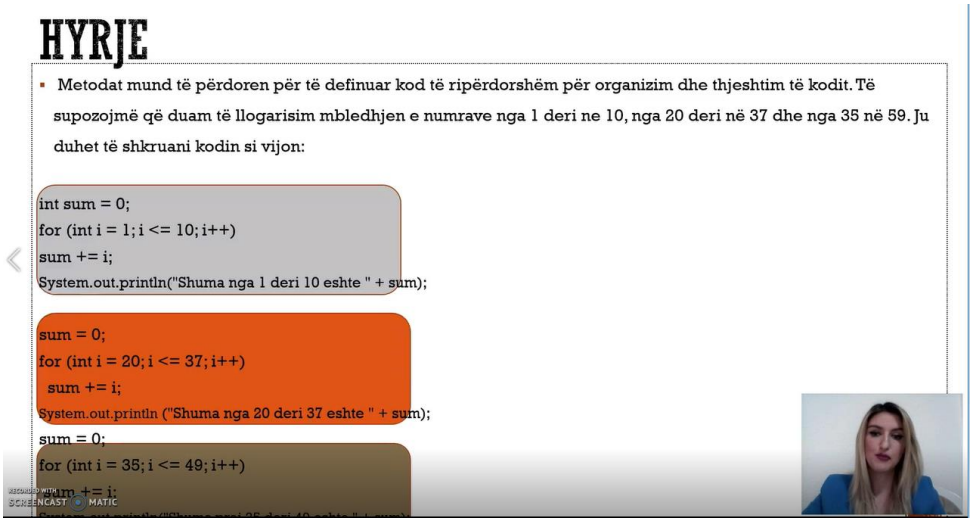

Figure 19. Sample video recording Screencast

Data collection tools

In order to collect the quantitative data within the instruction of Introduction to Programming with Java course with flipped learning and got the students' perceptions then four data collection tools were used in this research. These are respectively:

- Flipped Learning Technology Acceptance Scale
- Self-directed learning readiness scale
- Course Evaluation Questionnaire
- Introduction to programming with Java achievement test
- Students' perception on flipped learning questionnaire (SPFLQ)

Flipped Learning TAM Scale (FLTAM)

FLTAM scale was developed on the basis of Davis's technology acceptance model (Davis,) by researchers. There are 5 basic factors in this model. These factors are also the factors of the technology acceptance model, Perceived Ease of Use (PEU), Perceived Usefulness (PU), Attitude Toward Usage (ATU), Behavioral Intensity (BIU) and Job Relevance (BIU).

In the pool of substances created by the researchers, 7 items in the first factor, 6 items in the second factor, 3 items in the third factor, 2 items in the fourth factor and 2 items in the fifth factor. (See Appendix D). Questionnaire form 5-point Likert-type grading was selected and graded and absolutely agree (5), agree (4), undecided (3), disagree (2) and absolutely disagree (1). Validity and reliability studies were conducted after these procedures.

Development of the Scale

For the development of the FLTAM scale, a detailed literature review was done first. In this sense, a pool of 20 items based on theoretical foundations for the scale was created. In order to test the scope and appearance validity of the scale, 5 subject area experts and 1 language expert were consulted. Then, a questionnaire form was created for the pilot application which made the necessary arrangements. The pilot study on the validity and reliability of the scale was carried out with 270 (240 females, 30 male) students taking the Introduction to Programming with Java course. False or incomplete filled questionnaires were not taken into consideration.

In order to test the validity and reliability of the scale, all analyzes were performed in SPSS 24 package program and the level of significance in the analysis was taken as 05.

Construct validity analysis and exploratory factor analysis (EFA) were performed to test the structure of the scale items on the selected study group. Before the EFA, the KMO and Bartlett Sphericity test values of the SPSS were examined. Common factor variance and factor load values were analyzed. In order to calculate the reliability of the scale, Cronbach Alpha internal consistency reliability coefficient was determined. According to the obtained data, it was found that the scale had a single factor structure consisting of 20 items.

Validity of FLTAM Scale

In order to test the validity of the FLTAM acceptance scale, face, content and construct validity were examined. For the face and content validity of the scale, 5 subject area experts and 1 language expert were consulted.

EFA was performed to analyze the construct validity. As a result of EFA, 5 factor structure consisting of 20 items with an eigenvalue greater than 1 explains 44,945% of the total variance. The fact that the variance explained in single-factor designs is greater than 30% is considered enough (Büyüköztürk, 2013).

EFA and Reliability Analysis of FLTAM

In order to perform factor analysis, KMO value should be over ,60 and Bartlett test result should be significant (Büyüköztürk, 2013). In determining the scale items, the factor load is based on a minimum of ,30 criteria. According to the statistical experts working in the subject area, the reliability coefficient increases to 1 and the reliability increases. The coefficient indicates that it is better over the value ,80 (Fraenkel & Wallen, 2006).

Table 5.

KMO and Bartlett's Tests Results

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.828
Bartlett's Test of Sphericity	Approx. Chi-Square	1153.284
	Df	190
	Sig. (*P*)	.000

As shown in Table 5, KMO value was determined as 0.828. Based on Bartlett's test (χ^2 = 1153.284, df = 190, p <0.01)) it is seen that it is significant. Thus, we can say that the data are suitable for exploratory factor analysis.

Construct Validity of FLTAM SCALE

Finally, in order to explain the construct validity of the 20-item scale, the number of factors and the total variance were determined. 20 items of the scale were taken into factor analysis and varimax axis rotation was performed. The tabular representation for this process, and related findings are given below:

Table 6.

Factor Analysis Results

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
1	4.961	24.806	24.806	4.961	24.806	24.806	3.202	16.012	16.012
2	2.704	13.521	38.327	2.704	13.521	38.327	2.806	14.028	30.040
3	1.258	6.290	44.616	1.258	6.290	44.616	1.913	9.564	39.604
4	1.131	5.654	50.270	1.131	5.654	50.270	1.640	8.199	47.803
5	1.000	4.900	55.170	1.000	4.900	55.170	1.473	7.367	55.170
6	.967	4.836	60.006						
7	.899	4.496	64.502						
8	.800	3.999	68.501						
9	.766	3.828	72.330						
10	.705	3.527	75.857						
11	.673	3.364	79.221						
12	.612	3.061	82.282						
13	.565	2.826	85.108						
14	.552	2.759	87.867						
15	.513	2.566	90.433						
16	.463	2.314	92.747						
17	.442	2.212	94.959						
18	.374	1.871	96.830						
19	.335	1.676	98.506						
20	.299	1.494	100.000						

When the table 6 is examined, it is seen that the FLTAM Scale consists of a five-factor structure. The factor in the scale explains 55.170% of the total variance. The values of the items under five factors and the total variance explained show that the Flipped Learning Technology Acceptance Scale has a good explanation of students' perceptions. Screen Plot also supports the five-factor structure (Çokluk, Şekercioğlu and Büyüköztürk; 2010: 193). Based on these results, it was decided that the Flipped Learning Technology Acceptance Scale should be five-dimensional.

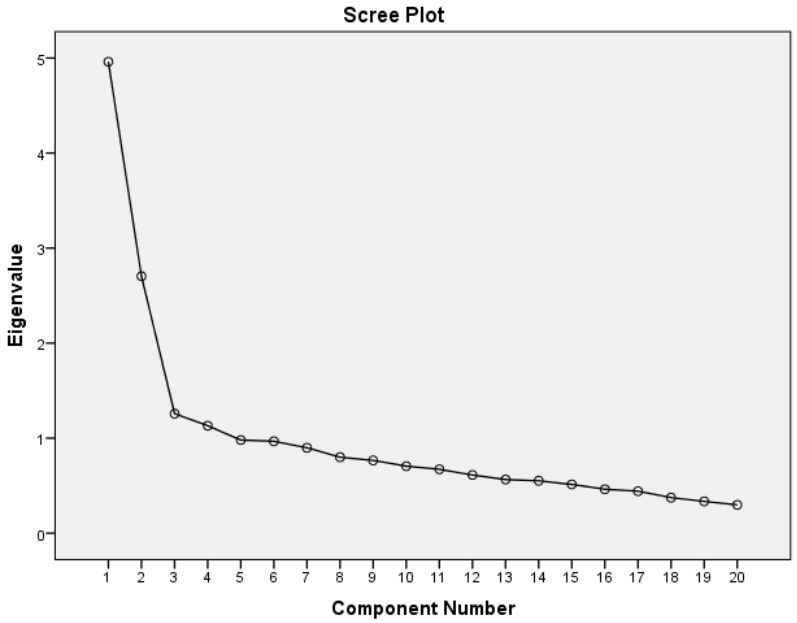

Figure 20. FLTAM's Scree Plot Graphic

The developed FLTAM Scale was applied to the experimental and control group students. Factor load values of the items of the scale are given in the Table 7.

Table 7.

Scale Items and Rotated Factor Loadings

	Items and Factors	Rotated Factor Loads
	Perceived Ease of Use (PEU)	
1	I feel that using Flipped Learning would be easy for me	.752
2	I feel that my interaction with FL would be clear and understandable	.708
3	I feel that it would be easy to become skillful at using FL	.665
4	I would find FL to be flexible to interact with	.663
5	Learning to operate FL would be easy for me	.632
6	it would be easy for me to get FL to do what I want to do	.583
7	I feel that my ability to determine FL ease of use is limited by my lack of experience	.459
	Perceived Usefulness (PU)	
8	Using FL in my job would enable me to accomplish tasks more quickly	.715
9	Using FL would improve my job performance	.670
10	Using FL in my job would increase my productivity	.630
11	Using FL would enhance my effectiveness on the job.	.599
12	Using FL would make it easier to do my job	.525
13	I would find FL useful in my job	.448
	Attitude Toward Usage (ATU)	
14	I believe it is a good idea to use Flipped Learning	.784
15	I like the idea of Flipped Learning in engineering education courses	.770
16	Using Flipped Learning in engineering education is a positive idea	.407
	Behavioural Intention to Use (BIU)	
17	I plan to use Flipped Learning in the future	.745
18	Assuming that I have access to FL, I intend to use it	.725
	Job Relevance (BIU)	
19	In my job, the usage of Flipped Learning is important	.865
20	In my job, the usage of Flipped Learning is relevant	.664

The items of the FLTAM scale and the rotated factor load values of each item are given in Table 7. Accordingly, the rotated factor load values calculated in 20 items are between 0,407 and 0,865. As a result, it can be said that Flipped Learning Technology Acceptance Scale is a valid and reliable scale and it will contribute to the literature.

Self-directed learning readiness scale

In the study, "Self-directed learning readiness scale" (which was developed by Fisher, King and Tague (2001) was used as data collection tool. This scale was developed due to the need for a valid and reliable measuring instrument for the scale of the students' self-directed learning readiness. Such a scale allows students to identify their attitudes, abilities and personality traits necessary for their learning situations. In addition, the scale helps students to identify the learning needs of the students for the instructors in implementing the most appropriate teaching strategies. The internal consistency for each component was estimated using Cronbach's coefficient alpha. The computed values of Cronbach's coefficient alpha for the total item pool (n = 40), self-management subscale (n = 13), the desire for learning subscale (n = 12) and the self-control subscale (n = 15) were 0.924, 0.857, 0.847 and 0.830 respectively. The reliability coefficient of .70 and higher is generally enough for the reliability of the test scores (Büyüköztürk, 2017). The scale is 5-Likert type with Strongly Agree (5), Agree (4), Unsure (3), Disagree (2) and Strongly Disagree (1).

Course Evaluation Questionnaire

As another data collection tool, the "Course Evaluation Questionnaire" (CEQ) was used. Each item on the questionnaire was answered using a 5-point Likert scale ranging from a score of 1 ("strongly agree with the statement") to 5 ("strongly disagree with the statement"). The theoretical and empirical basis of the CEQ is the development work of Ramsden & Entwistle (1981) and subsequent studies with British and Australian students which have demonstrated aggregate-level associations between the quality of student learning and students' perceptions of the learning environment (Broomfield & Bligh, 1998; Entwistle & Tait, 1990; Moffett & Mill, 2014; Ramsden, 1991; Ramsden et al., 1989). These studies indicate that the CEQ offers a reliable, verifiable and useful means of determining the perceived teaching quality of academic

units in institutions of higher education. The questionnaire consists of 25 items scored on a 5-point Likert-type rating scale from ‘strongly agree’ to ‘strongly disagree’. Twenty-four of the items combine to form five scales (Good Teaching, Clear Goals and Standards, Appropriate Assessment, Appropriate Workload and Generic Skills) plus there is an Overall Satisfaction Item. Raw scores are recoded as follows: a raw score of 1 (‘strongly disagree’) is recoded to –100, 2 to –50, 3 to zero, 4 to 1 50, and 5 (‘strongly agree’) to 1 100, eliminating the need for decimal points. The scoring of negatively worded items is reversed. In interpreting CEQ results, a negative value corresponds to disagreement with the questionnaire item and a positive value to agreement with the item. Positive high scores indicate high course quality as perceived by graduates. Cronbach’s alpha on the remaining 196 responses for the questionnaire was 0.833, which suggested that the survey tool had a good level of internal consistency and reliability (Moffett & Mill, 2014).

Introduction to programming with Java achievement test

In order to measure the levels of the students before the experimental procedure, 25 open-ended questions were developed according to the content of the university curriculum. Developed questions; Introduction to programming with Java In the achievement course, students have been prepared by considering the skills of writing and understanding the program, and a different skill has been sought for each question. Open-ended questions, the validity of the questions was tested by applying to expert opinions. It was also revised and approved by the Dean of Computer Science faculty at AAB College and also by the educational and science council of the Faculty. It was also used as a posttest in order to measure the students' level after the experimental procedure. The reason for using open-ended questions in the test; Supported by the results of the research conducted by Moreno-Marcos et al. (2018), open-ended questions are more effective types of questions in measuring students' programming skills. A copy of the achievement test is attached on Appendix H.

Student Perceptions of Flipped Learning in Engineering Education Questionnaire

In order to have student perceptions of flipped learning in engineering education then a questionnaire form contains 23 items was developed by the researchers inspired from Alsowat (2016), Awidi & Paynter (2019), Barua et al. (2014), Johnson (2013), Pavanelli, R. (2018) and Schilling (2014). After the expert opinions were taken during the development of the questionnaire form then the pilot study with 10 students of different faculties was considered to have the final form. The researcher was asked to answer the questions by distributing the questionnaire form to the students. The average time for students to complete the questionnaire was 20 minutes. Forms were collected and evaluated from the students who answered the questions in the data form.

Before finalizing the questionnaire form, the items to be listed were listed and submitted to the opinions of three field experts, one of which is measurement and evaluation. In the light of expert opinions, some controlled substances were removed from the list and some of them were rewritten in terms of language and intelligibility.

During the development of the questionnaire, expert opinion was consulted for the scope validity and as a result of the regulations, the questionnaire form was finalized. The Cronbach Alpha internal consistency coefficient of the questionnaire was 0.83.

Qualitative Section of Research

The aim of this qualitative research is to describe the experiences of a group of students who participated in a flipped classroom at the subject Introduction to Programming with Java and to reveal the perception about flipped learning video materials, in class activities, homework, quizzes, team work, and interaction with the professor, peer communication etc.

Research Group

As a research group for the qualitative research is taken only the experimental group that was taught with flipped learning approach. Moreover, there were chosen 21 students according to their results in the subject Introduction to Programming with Java

Achievement Test (AT). Students chosen for the qualitative section of the study were selected according to maximum variation sampling method. The sample was selected in order to represent the heterogeneity of perspectives and perceptions (Ozudogru 2018; Fraenkel & Wallen, 2009; Gall, Gall, & Borg, 2003)

In this way, the strength and richness of the data, their applicability and interpretation were ensured better (Cohen et al., 2007). The students that were interviewed were selected on purpose based on their achievements and final marks in the Introduction to Java course to understand how programming with Java is seen and understood among different people, in flipped learning setting. High Achievers are students that their final mark is 10, (four males AA, AG, ESH, GJB and three females HN, LI, UA) medium achievers are students that their final mark is 8 or 7 (6 males, SHR, LB, MS, FO, BK, EB and 1 female PC) and low achievers are students that didn't manage to pass this subject and got negative results (6 males GM, HH, RN, TP, FK, AG and 1 female ER) Selected students and their marks are seen in Table 8.

Table 8.

Interviewees and their marks

Selected Students	Points	Final Marks
AA (High Achiever)	100	10
AG (High Achiever)	96	10
ESH (High Achiever)	95	10
HN (High Achiever)	100	10
GJB (High Achiever)	100	10
LI (High Achiever)	100	10
UA (High Achiever)	90	10
PC (Medium Achiever)	76	8
SHR (Medium Achiever)	78	8
LB (Medium Achiever)	62	7
MS (Medium Achiever)	65	7
FO (Medium Achiever)	66	7
BK (Medium Achiever)	65	7
EB (Medium Achiever)	65	7
GM (Low Achiever)	14	5
ER (Low Achiever)	33	5
HH (Low Achiever)	29	5
RN (Low Achiever)	31	5
TP (Low Achiever)	11	5
FK (Low Achiever)	25	5
AG (Low Achiever)	27	5

Data Collection Tool

Data were collected via two sources: student questionnaires and student interviews. Student questionnaires were given at the end of the semester and the interviews content was created based on the existing instruments or were newly developed by the researcher (Alsancak-Sırakaya, 2015; Clark, 2013; Gaughan, 2014; Turan, 2015) to answer the research questions.

The schedule of the interviews was three days after they finished the semester. The aim of these interviews was to reveal the perception of the students in the experimental group about flipped learning materials, quizzes, professor – student communication, retaining knowledge etc. Hence 11 interview questions were prepared (Appendix G). The duration of the interviews in total was 1 hour and 45 min and were held in the meeting room of the Department of Software Engineering.

Data Collection Procedure

Qualitative data was analyzed through content analysis. Answers of the questionnaires and student interview transcripts were reread, but more systematically to create categories of key concepts, phrases, commonalities, differences, and patterns (Avery 2018; Marshall & Rossman, 2011; Merriam, 2009).

Analysis of the Data

SPSS (Statistical Package for Social Sciences) version 24 was used to evaluate the data obtained from the study and to create tables. Percentage (%), mean (X), frequency (f) and standard deviation (Sd) were used for the analysis of the data collected to answer the sub-objectives. In the Kolmogorov-Smirnov test conducted prior to the comparison of the experimental groups and the control group according to the scores before and after the training, it was accepted that the data showed a normal distribution as p>, 05 was obtained. Since the data shows normal distribution then independent samples t-test, paired t-test and MANOVA tests were used in this research.

In all statistical analyzes, the value 05 was accepted as the level of significance. The mean and standard deviation values of the items for the evaluation of the responses of the students to the scale and questionnaires were determined with the help of tables.

The qualitative part of research is analyzed through content analysis.

Limitations of the Study

The findings of this study must be seen in light of the following limitations:

1. This research study was limited to the data obtained from the students that were enrolled on the course: Introduction to Programming with Java during the fall semester of 2018 – 2019 at a university located in Kosovo, 174 students in total.
2. The study was limited to 28 hours in-class implementation of flipped learning methodology and 28 lab classes in Introduction to programming with Java course.
3. The study experiment was conducted only by one teacher (the researcher), therefore, to generalize the results for further studies it can involve a variety of different leveled course from different teachers.
4. The members of both experimental and control group were randomly selected by the University, but the good thing is that the independent samples t-Test results showed there were no significant differences between the experimental and control group.
5. All interviews were conducted by the researcher. The answers might have been influenced by the fact that students want to satisfy the professor, although steps were taken to ensure students that their answers won't affect their evaluation.

RESULTS AND DISCUSSION

The findings and findings obtained in line with the objectives and sub-objectives set out in this chapter are included.

Results of the Quantitative Data

Evaluation of the Pre – Test, Post-Test Introduction to Programming with Java Achievement Test Scores of The Experimental Group and Control Group

After the achievement test was applied to both groups as pretest, the students who formed the experimental and control groups were instructed for 10 weeks in accordance with the principles of teaching practices. At the end of the instruction, the pre-test achievement test was applied to both groups again as a posttest. In the study, it was investigated whether there was a significant difference between the experimental and control groups according to pre-test and post-test scores.

Since the data shows normal distribution, then two-factor repeated measures ANOVA test was used to determine whether there was a significant difference between posttest "Introduction to programming with Java achievement test" scores of the experimental and control group students. There is a significant difference between the experiment and control group [$F(1,172) = 6.385$, $p < 0.01$, $\eta 2 = 0.036$]. Thus, we can say that the "Introduction to programming with Java achievement test" scores of the experimental group students were higher than the control group (M =26.25) according to the post-test (M =31.69).

Table 9.

Experiment and control group Introduction to programming with Java achievement test results

	Group	*M*	**SD**	**N**
Pre-test	Experiment	9.46	9.393	87
	Control	8.85	8.236	87
	Total	9.16	8.813	174
Post-test	Experiment	31.69	11.351	87
	Control	26.25	9.017	87
	Total	28.97	10.578	174

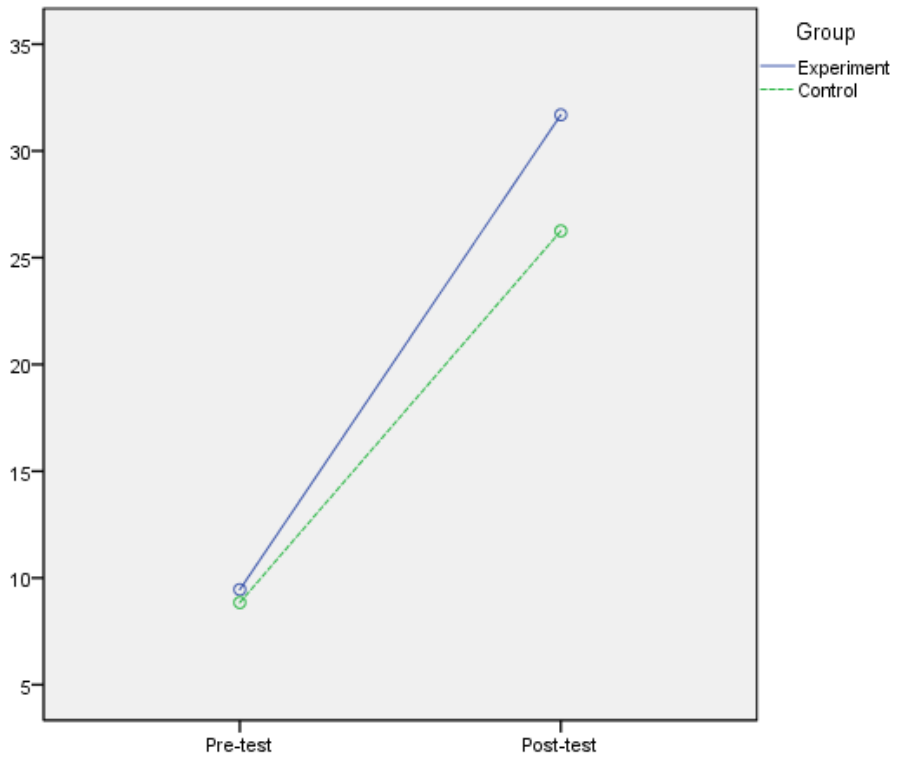

Figure 21. Comparison of Pretest-Posttest Scores for the Introduction to programming with Java achievement of Experimental and Control Group Students

As seen in the graph above, it was seen that there was a significant difference between the Introduction to programming with Java achievement test average scores of the experimental and control groups. Thus, we can say that the posttest achievement

scores of the experimental group students were significantly higher than the pretest success scores.

Evaluation of the Pre – Test and Post-Test Self-directed learning readiness scale of The Experimental Group and Control Group

After the "Self-directed learning readiness scale" was applied to both groups as pretest then at the end of the instruction, the pre-test "Self-directed learning readiness scale" was applied to both groups again as a posttest.

Again, two-factor repeated measures ANOVA test was used to determine whether there was a significant difference between posttest "Self-directed learning readiness scale" scores of the experimental and control group students. There is a significant difference between the experiment and control group [$F(1.172) = 4.644$, $p < 0.05$, $\eta 2 = 0.026$]. Thus, we can say that the "Self-directed learning readiness scale" scores of the experimental group students were higher ($M = 4.25$) than the control group ($M = 4.13$) according to the post-test, the pre – test of both groups was pretty much the same.

Table 10.

Experiment and control group Self-directed learning readiness scale results

	Group	***M***	**SD**	**N**
Pre-test	Experiment	3.73	.440	87
	Control	3.72	.569	87
	Total	3.72	.507	174
Post-test	Experiment	4.25	.430	87
	Control	4.02	.308	87
	Total	4.13	.390	174

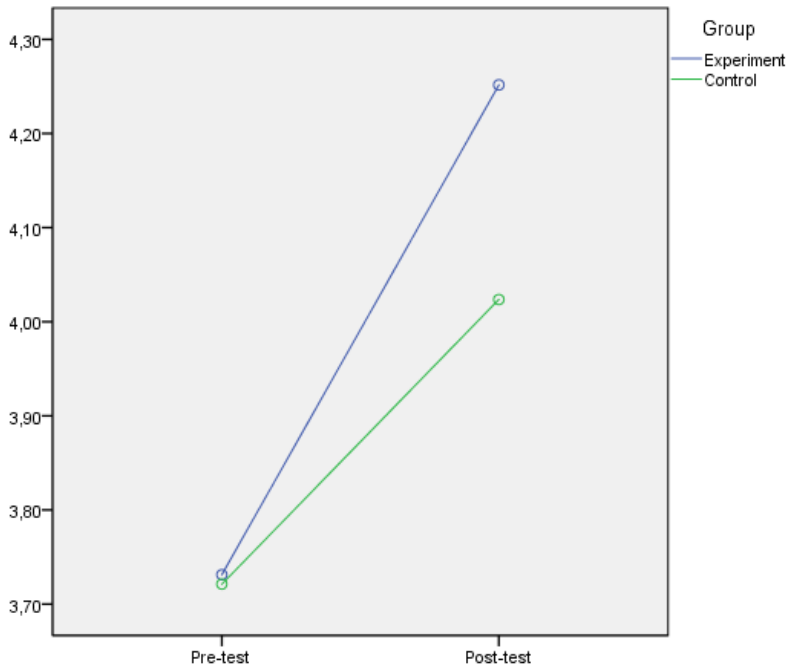

Figure 22. Comparison of Pre-test - Post-test Scores for the Self-directed learning readiness scale results of the Experimental and Control

As seen in the graph above, it was seen that there was a significant difference between the "Self-directed learning readiness scale" average scores of the experimental and control groups. Thus, we can say that the post-test "Self-directed learning readiness scale" scores of the experimental group students were significantly higher than the pre-test "Self-directed learning readiness scale" scores.

Comparison of Pre – Test Post – Test FLTAM Scores of Experimental Group

In order to compare the pre-test post-test FLTAM scores of the experimental group, the paired samples t-test was used. The related test is used to determine whether there are differences between the two measurement results obtained from the same data source (Büyüköztürk, 2013).

In the study, it was investigated whether there was a significant difference in the experimental group according to FLTAM pre-test and post-test scores (Table 11).

Table 11.

Comparison of FLTAM pre-test and post-test scores of Experimental Group Students

Group	N	*M*	Sd	Df	t	P
Pre-test	30	4.20	0.545	86	-4.324	0.01
Post-test	30	4.38	0.366			

As a result of the paired samples t-test, as shown in the Table, the average of the FLTAM scores applied as post-test were significantly higher than that of the pre-test FLTAM scores ($t(86) = -4.324$, $p < 0.05$, $\eta 2 = 0.463$). In this case, it can be said that the students' FLTAM scores increased after the application.

Examining the Student Perceptions of Flipped Learning in Engineering Education

In order to determine the students' perception about the course before the experimental process, the student perceptions of flipped learning in engineering education questionnaire was applied to the experimental group. This questionnaire was then re-applied as post-test after the experimental procedure. The paired samples t-test was used to examine the pre-test and post-test course evaluation scores of the experimental group (Table 12).

Table 12.

Pre-test and post-test course evaluation scores of the experimental group

Item	Pre/Post Test	N	Mean	Std. Deviation	Df	t	p
1	Pre-test	87	3.74	0.982	86	8.939	0.001
	Post-test	87	2.68	0.982			
2	Pre-test	87	3.17	1.025	86	2.422	0.018
	Post-test	87	2.82	0.995			
3	Pre-test	87	3.98	0.792	86	-2.380	0.020
	Post-test	87	4.23	0.872			
4	Pre-test	87	3.84	0.819	86	-3.150	0.002
	Post-test	87	4.18	0.656			
5	Pre-test	86	3.20	0.733	86	2.440	0.017
	Post-test	86	2.91	0.713			
6	Pre-test	87	3.79	0.917	86	-2.462	0.016
	Post-test	87	4.09	0.709			
7	Pre-test	87	3.75	0.750	86	-3.488	0.001
	Post-test	87	4.13	0.775			
8	Pre-test	87	3.87	0.775	86	-2.752	0.007
	Post-test	87	4.17	0.719			
9	Pre-test	87	3.72	0.802	86	-2.996	0.004
	Post-test	87	4.13	0.925			
10	Pre-test	87	3.89	0.784	86	-2.419	0.018
	Post-test	87	4.18	0.843			
11	Pre-test	87	3.93	0.938	86	-2.338	0.022
	Post-test	87	4.23	0.773			
12	Pre-test	87	3.68	1.006	86	-2.808	0.006
	Post-test	87	4.06	0.812			
13	Pre-test	87	3.75	0.918	86	-3.366	0.001
	Post-test	87	4.21	0.780			
14	Pre-test	87	4.07	0.832	86	-2.171	0.033
	Post-test	87	4.33	0.742			
15	Pre-test	87	3.89	0.689	86	-3.763	0.000
	Post-test	87	4.28	0.817			
16	Pre-test	87	3.61	0.768	86	-2.633	0.010
	Post-test	87	4.03	1.017			

17	Pre-test	87	3.71	0.714	86	-2.511	0.014
	Post-test	87	3.98	0.747			
18	Pre-test	87	3.56	0.898	86	-2.087	0.040
	Post-test	87	3.85	0.922			
19	Pre-test	87	3.71	1.033	86	-2.569	0.012
	Post-test	-87	4.07	0.860			
20	Pre-test	87	3.98	0.762	86	2.372	0.020
	Post-test	87	3.69	0.980			
21	Pre-test	87	4.18	0.800	86	2.439	0.017
	Post-test	87	3.90	0.836			
22	Pre-test	87	3.71	0.714	86	-4.737	0.000
	Post-test	87	4.26	0.799			
23	Pre-test	87	3.72	0.858	86	-3.519	0.001
	Post-test	87	4.15	0.800			

When the Table 12 is examined, it is observed that there is a significant difference in all items according to the paired samples t-test ($p<0,05$). Therefore, the student perceptions of flipped learning in engineering education scores of the students for the course Introduction to Programming with Java was further increased after the experimental process and the perception of the students become more positive.

According to the results, student perceptions became more positive on the items that this course was not significantly harder than their other SE courses. Also, their perception became more positive on that they did not spent significantly harder than their other software engineering courses. Also, they felt that the usage of videos and online material in advance of class helped to prepare them for lecture better than traditional textbook readings. By this course, they preferred the "flipped classroom" approach to a traditional classroom approach, they felt that the videos lengths were not way too long.

If given the opportunity, they will enrol in another class taught using the "flipped classroom" approach is one of the positively increased view for the students. Also, by this course they felt that the quizzes in the video forced them to pay attention and watch the videos, in class activities are helping them to better understand the subject introduction to programming, learning introduction to programming with flipped learning took them less time to prepare rather than if it was taught in traditional way, they felt very accomplished when engaging in problem solving activities in class, they

preferred working in groups, preferred listening the lectures at home at their own pace etc.

By Paired sample t-test results students became more positive also on that they liked the idea that they can re-listen the videos and online materials before exam as much as they want, they liked when the professor supervised us during problem solving activities, it was easier for them to do exercises at class rather than at home, they didn't need to be well prepared for the flipped approach, they liked interacting with the lecturer and peers in the workshops, If they were far behind the material cause of non-attending classes, it's no problem for them to catch up with the material, they thought that flipped learning can be easily adopted in every engineering courses, they felt that mastery learning has improved their programming understanding, they were more motivated to learn programming in the flipped classroom, they found it easy to pace their self successfully through the course and the flipped classroom gave them greater opportunities to communicate with other students.

Examining the Pre-Test and Post-Test Course Evaluation Scores of the Experimental Group

In order to examine the students' course evaluation in general, at the end of the experimental process a questionnaire form was implemented to the students. Evaluation results were interpreted in the Table 13 by using paired samples t-test.

Table 13.

Pre-test and post- test CEQ results

Item	Pre/Post Test	N	Mean	Std. Deviation	Df	t	P
1	Pre-test	87	3.06	1.135	86	-3.515	0.001
	Post-test	87	3.67	1.245			
2	Pre-test	87	2.51	1.140	86	-3.631	0.000
	Post-test	87	4.31	4.639			
3	Pre-test	87	1.98	0.964	86	-7.841	0.000
	Post-test	87	3.54	1.461			
4	Pre-test	87	2.69	1.306	86	1.389	0.168
	Post-test	87	2.45	1.043			
5	Pre-test	86	2.24	1.120	86	-7.269	0.000
	Post-test	86	3.39	1.233			
6	Pre-test	87	2.60	1.094	86	-2.809	0.006
	Post-test	87	3.11	1.205			
7	Pre-test	87	2.25	0.979	86	-5.708	0.000
	Post-test	87	3.26	1.146			
8	Pre-test	87	3.22	1.333	86	4.732	0.000
	Post-test	87	2.29	1.130			
9	Pre-test	87	2.15	1.084	86	-8.873	0.000
	Post-test	87	3.74	1.359			
10	Pre-test	87	2.63	1.058	86	-8.557	0.000
	Post-test	87	3.99	1.234			
11	Pre-test	87	2.29	1.109	86	-8.038	0.000
	Post-test	87	3.71	1.389			
12	Pre-test	87	2.40	1.005	86	-2.333	0.022
	Post-test	87	2.91	1.582			
13	Pre-test	87	2.17	1.014	86	-26.011	0.000
	Post-test	87	5.00	0.000			
14	Pre-test	87	2.26	1.083	86	-12.331	0.000
	Post-test	87	4.15	1.126			
15	Pre-test	87	2.16	1.140	86	-11.598	0.000
	Post-test	87	4.13	1.159			
16	Pre-test	87	3.11	1.205	86	4.203	0.000

	Post-test	87	2.41	1.073			
17	Pre-test	87	2.25	1.123	86	-7.615	0.000
	Post-test	87	3.54	1.371			
18	Pre-test	87	2.55	1.097	86	-4.252	0.000
	Post-test	87	3.34	1.328			
19	Pre-test	87	3.05	1.554	86	2.752	0.007
	Post-test	-87	2.48	1.150			
20	Pre-test	87	2.45	1.336	86	-12.058	0.000
	Post-test	87	4.33	0.996			
21	Pre-test	87	2.34	1.160	86	-12.578	0.000
	Post-test	87	4.33	1.053			
22	Pre-test	87	2.21	1.080	86	-8.441	0.000
	Post-test	87	3.86	1.304			
23	Pre-test	87	3.55	1.274	86	7.008	0.000
	Post-test	87	2.36	1.056			
24	Pre-test	87	3.40	1.325	86	3.830	0.000
	Post-test	87	2.55	1.265			
25	Pre-test	87	2.23	1.227	86	-14.429	0.000
	Post-test	87	4.32	0.946			

When the Table 13 is examined, it is observed that there is a significant difference in all items according to the paired samples t-test ($p<0,05$). Therefore, the student perceptions about the course evaluation scores for the course Introduction to Programming with Java was further increased after the experimental process and the perception of the students become more positive.

According to the results, student perception become more positive on the items that it is always easy here to know the standard of work expected. Also, their perception became more positive on their problem-solving skills increased by this course. By this course, they motivated by the teaching staff on this course to do their best work. They gave more positive feedback about works were less heavy, the course sharpened their analytic skills, staff on this course put a lot of time into commenting on student's work, they usually have a clear idea of where they're going and what's expected in this course, to do well in this course all really need is not really a good memory, the course helped them to develop their ability to work as a team member, as a result of their course, they felt confident about tackling unfamiliar problems, the course improved their skills in

written communication, staff on this course seem more interested in testing what they've memorized than what you've understood.

Also students gave more positive perception on the staff on this course make it clear right from the start what they expect of students, teaching staff on this course normally give helpful feedback on how they're doing, the staff on this course make a real effort to understand difficulties students may be having with their work, the course is not overly theoretical and abstract, they were generally given enough time to understand the things they have to learn, it is not often hard to discover what's expected in this course, not too many staff on this course ask them questions just about facts, their lecturers are extremely good at explaining things to us, teaching staff on this course work hard to make their subjects interesting, their course helped them to develop the ability to plan their own work, the sheer volume of work to be got through in this course means to them they can comprehend it all thoroughly, there was not a lot of pressure on to do well in this course and overall, they were satisfied with the quality of this course.

Results of the Qualitative Data

On qualitative analysis of answers from our interviewees and the answers of the form of student perceptions on Flipped classroom and activities, four issues emerged. Below, we describe the four issues in four categories that are identified, along with codes that we grouped according to the issues, and comments from interviewees that we feel best illustrate these issues. These categories are: Learning process out of classroom, Engagement in Flipped Classroom and Negative aspects of flipped learning approach.

1. Learning process out of classroom
    - Increased students' autonomy
    - Learning at their own pace
    - Re-listening to lectures every time they need
    - Pausing and taking notes
    - Fewer Distraction

2. Engagement in Flipped Classroom
   - Group Work
   - Closeness with the professor
   - The advantage of being pre-prepared for the next lecture
   - Monitored process of solving problems
   - Enriched relationships
   - Increased enjoyment of the learning experience

3. Negative aspects of flipped learning approach
   - Skepticism
   - Stressful process of learning
   - Increased effort
   - Difficulty in adaptation

Learning process out of classroom

During the interviews with the three groups of achievers they mostly point it out the learning process out of classroom with five subcategories explained below.

Increased students' autonomy

Students mostly point it out the autonomy of the learning process. They felt more comfortable watching videos at home, not being ashamed to ask for things that they don't understand to be repeated, they just rewind and replay that part. Some of the responses of the students are:

> *AA (High achiever) I felt freer in my studying process. I didn't have the pressure of taking notes in class, the pressure of not understanding things because everything gets clear in class after we gain the knowledge at home. I was in control of my own learning.*
>
> *GJB(High achiever): The section of listening videos at home made me more independent learner and made me take more responsibility about my studies because I knew that If I don't listen to the videos I won't know how to solve the problems in class and that would be embarrassing in front of my teacher and my classmates.*

FO (Medium achiever): I like the fact that we have our lectures in all our digital devices, we can access them from PC, tablets even on our phones.

HH (Low achiever): I always forget to take books with myself, this was a great option for me, and everything I needed about a subject was in my pocket.

Learning at their own pace

This category was mostly mentioned by high achievers and students that prefer studying alone. Some of the students preferred calling their friends and listening to the lectures together, taking notes and preparing for classes.

ESH (High achiever): I loved the idea studying from my home and having all the materials to be served for me electronically. I loved also the fact that I could choose my learning environment rather my room, balcony, outside, all I needed was my tablet or mobile phone.

LB (Medium achiever): I enjoyed a lot to listen to the videos at home, pausing whenever I want, drinking coffee and taking notes.

GM (Low achiever): I could find a quiet place at my home and listen to the video materials but sometimes I needed a friend to come over and listen together so we c discuss some topics that weren't familiar to me in the beginning.

Re-listening to lectures every time they need

This subcategory was mostly preferred by students that needed more time to study and had more difficulty to understand the course material in first place. They needed to replay the video lectures many times till they understand the topic. Also, it was preferred by students that work and study because they don't have much time to listen to the videos every single night gather videos and listen many lectures together.

LI (High Achiever): I used to re-listen to the lectures especially before midterms, before quizzes, and before the final exam. It helped me a lot. I totally love this methodology.

TP (Low Achiever): I like the idea of re-listening to video materials before the midterms and exam because sometimes I couldn't manage to listen to them before every class.

FK (Low Achiever): I'm not used to study systematically because I ran a family business, that's why I used to listen the videos before exams. It helped me in a way but still I couldn't participate in all classes to do the coding part with the professor because introduction to programming with Java was pretty hard for me.

Pausing and taking notes

AA (High Achiever): The best part of having to listen videos at home is the pausing part, you can't pause the teacher in a class ☺. I use the pause option all the time, after each presented problem with coding in Java I open my laptop and Jgrasp, write the program and execute by myself so I gain the experience in running the code by myself, as it is said by some psychologist, writing by yourself is like reading it 10 times, you remember it longer and better.

Fewer Distraction

One of the problems pointed out many times was distraction that is avoided when they listen to the lectures at home. Some of the answers are written below:

AG (High Achiever): There are sometimes some students that make noise in the classroom and distract me. Or when we work in groups not always all participants of the group are willing to work on a problem and can defocus all the group. Listening to the video materials at home in our own pace made me be more concentrated and took me less time to understand the material.

PC (Medium achiever): For the learning in a quiet place is crucial because I can easily get distracted, so this methodology was very convenient for me.

RN (Low Achiever): There are always students in a class that make a distractive atmosphere and doesn't let others listen to the lecture, that's why I prefer to listen to the videos all by myself.

Engagement in Flipped Classroom

When they were asked what kind of activities you prefer doing in class they said: interactive collaboration with their peer, active learning environment where the

communication between the professor and students is more open and friendlier, debates, writing code while their teacher monitors the solving problem process etc.

Group Work

A lot of students stated like Cavus, Uzunboylu and Ibrahim (2007) that working in groups is their favorite thing because when they have to solve a programming problem is easier in group where everyone has an idea and can help one another in finding mistakes in the code. Their answers mainly supported the idea of improving communication between students as it can be seen below:

> *LI (High Achiever): I frankly enjoyed working in groups, because everyone has their own way of solving a problem, and when u get stuck somewhere in the code there is always someone that sees the bug better than the other, in programming even a semicolon or a point changes everything.*
>
> *SHR (Medium Achiever): Sometimes when I don't manage to listen to the video lectures at home because I work part time at a store, I can hide this information behind my friends work.*
>
> *LB (Medium achiever): When I see my group mates how they solve programming problems motivates me to work harder and get better points.*
>
> *TP (Low Achiever): I was motivated to express my perception and I also liked the changed atmosphere, not as the other boring subjects when u can easily fall asleep while professor is talking all the time and all u do is listen.*

Closeness with the professor

Students favorite part of the flipped learning methodology is being close with the professor in all parts of the course, rather online, connected all the time thanks to the edmodo platform, rather face to face doing activities together. The online platform gave them the possibility to share ideas, comment on specific content, do likes, message directly the professor via messages from their phones etc. Face to face activities were mostly while solving problems and sharing solutions with the professor and comparing them with their peers. Some of their perception we can read below:

> *HN(achieve): Having this online platform which is very easy for us to use because we have a sense in computer science aspects makes us feel really close and connected with the professor because it's like other social networks and we are pretty familiar with them. Also, in class, I always wanted to solve the*

programming exercises in the white board while the professor corrects me, and this was possible in this course thanks to flipped learning.

ESH: I totally love this communication method and this approach. For example, whenever I was studying at home and my code wasn't working well, I sent to you professor and You corrected it like saying this row is wrong correct it etc. Or, one time I wrote to You are we going to have time in class to do preparations for the midterm and You answered me within minutes.

Monitored process of solving problems

Most of the answers are summated in this sub – category saying that the presence of the professor while they solve problems made them feel more comfortable in writing and easily find errors. Some of the answers are written below:

UA (Medium Achiever): Every time we try to write code on Jgrasp or Eclipse there are a lot of problems/bugs that appear. If they are syntax error, it's easy to find because the compiler tells you exactly on which row is the error appearing but when the error is logical we often get stuck with a program. But when we solve exercises while You monitor us everything goes very easy and less problems appearing if we write code in your presence.

LB (Medium Achiever): You know professor We always say to You, you have magical hands, when u touch the keyboard you immediately find the error, because there are sometimes all the group try to find where the problem is hidden we can find it, and the struggle is real, and You with your experience find it in a second, and we don't lose time and continue writing.

GM (Low Achiever): I totally support this way of studying because You can learn easily while the professor is by your side and corrects You immediately and monitors the process of writing code. So, when u explain on the table and we follow you it's the perfect combination to learn programming.

Enriched relationships

From the interviewees answers we can see this category in two contexts, in the context of teacher student relationship and student to student relation.

Almost all the answers were in favor of flipped classroom promoting better relationships between all the participants on the class and critical thought about the material. Some on the answers are presented below:

HN (High Achiever): Using this methodology made us felt more close with the professor, also connected via the online platform in which You (the researcher) were available 24/7 and when u feel more close you feel more free to ask questions during the class time. Also, working in groups with our classmates this helped us now better between ourselves, be friends, exchange learning experiences between ourselves etc.

UA (High Achiever): During this flipped classroom learning experience I didn't see you (the researcher) as an authoritarian figure but rather an approachable person open to address all our questions and concerns.

BK (Medium Achiever): The experience in this flipped classroom made me have a positive opinion in working with groups because I always wanted to work all by myself, but when I see the results on working in a team I see that I'm better when I work with others.

RN (Low achiever): This class has made me feel more open and express myself freely because there were always my mates that corrected me whenever I said something wrong.

Increased enjoyment of the learning experience

Knowing the fact that this was the very first case of flipped learning methodology in computer science faculty and the first in the whole university the students were pretty excited to be part of this flipped learning process and they really enjoyed it. Even though they might have been a little skeptical in the beginning, they all had a mutual opinion on how they enjoyed all the elements during this semester. Some of their answers are written below:

GJB (High Achiever): When u first told us during the first class that You are going to do something different with our group we all were excited and I said to You (the researcher):" so this means we are the chosen ones, yeah". Later on, as the weeks passed by, and we get to know the material better, the in class activates started to become really fun, and all the process in total.

GM (Low achiever): As u know professor, I'm not a very hard-working student, but from all the courses we had this semester, I enjoyed yours the most.

Negative aspects of flipped learning approach

There were only some negative aspects that students mentioned during the interviews, mostly concerned with the workload, with the stress and adapting the new learning process.

Skepticism

Most of the answers of the students about their first impression about flipped learning and in the beginning of the course with flipped learning approach were that they were skeptical about this new learning process in the university. Some of the answers are written below:

> *AA (High Achiever): To be frankly, on our first class when you (the researcher) presented the flipped learning approach I was kind of confused and skeptic about this new methodology, because I hadn't heard before it and I was scared that it might get pretty complicated for me. But week by week I got on track and everything was going great.*
>
> *MS (Medium Achiever): I had listened about flipped learning from my friend and he told me that this methodology doubles the work and the effort that you should put on your studies on a subject and I was a bit scared because programming is an important subject but we also had other subject and didn't want to increase the work load on this subject and get lower grades on other subjects but it was totally the contrary. I think the workload was less that I would have had in different circumstances.*
>
> *ER (Low Achiever): I knew that programming is my weak side that's why I wasn't so happy that exactly on this subject we will do some experiment.*

Stressful process of learning

Many times, students during the interview mentioned the word stress, stressful situations and it can be concluded that facing new things can always be stressful, especially for students that didn't cope well this changes or that are afraid of experiencing new ways of teaching. This category assembles some of their answers.

> *LI (High Achiever): I can say that it was stressful the process of flipped learning. Especially when I didn't had time to prepare for the next session due*

to personal issues and the next class I would feel very bad for not knowing the subject and ashamed in front of the professor because most of the time I was prominent student and she would expected from me to be all the time well prepared.

AG (High Achiever): This is very dynamic way of learning and needs a lot of effort and time to success. It can get pretty stressful sometimes. For me it was.

FK (Low Achiever): I think this is the reason why I didn't had success in this subject because It was very stressful and needed a lot of commitment from our side.

Increased effort

Most of the students stated that to pass this course with flipped learning methodology you should work harder, it makes you more responsive, you should work systematically, under pressure etc., like the comments below:

ESH (High Achiever): In this course I needed systematically extra effort because at other subjects I cannot study every weak and before midterm and exam take all the materials and still get maximum points. In this subject with flipped approach I had to study every week, and this is sort of working under pressure.

AG (Low Achiever): There were times that I didn't manage to solve not a single exercise in class and this made me feel bad but I couldn't dedicate that much time to this flipped classroom subject, it needed more, I knew that it will be complicated.

ER (Low achiever): I didn't succeed in this subject. I guess it needed more effort from my side. Next time I will.

Difficulty in adaptation

Switching from traditional learning to flipped learning can take some time to adapt. This was said by many students which needed an extra effort to cope with these changes. Even though they were all positive about flipped learning, still, adoption they mention it as a negative aspect of flipped learning. Some of them also argued rather it was time to introduce flipped learning or it should be done in later semesters when they

already have some baggage in computer science aspects. We can read their comments below:

EB (Medium achiever): When a methodology changes also your expectations change. It needs some time to adapt with the new process of learning, a process that we hadn't heard before, hadn't experience on learning from video materials, hadn't experience on working with groups and it takes some time to adapt, it's not an easy job.

FO (Medium Achiever): Starting our studies at a university, is a big change towards our career and our future, we had to adjust with this and in your subject, we had to adjust and adapt with other way of studies.

HH (Low Achiever): I think this new way of studying should have been introduced later our studies.

Discussion

Is there a significant difference between academic achievements of the students in the experimental and control group?

Knowing the fact that there was a normal distribution, meaning that the results of the pre-test of both groups was almost the same, according to the results, there was a significant difference between the experimental and control group in the post-test achievement results. Taking into consideration also the other additional instruments to form the achievement mark of the subject, the experimental group got higher marks compared with control group.

The reason for these results might be the fact that students felt excited about this new methodology, they were more motivated to try new form of teaching and learn by their selves with video materials at home. Also, the time spent in class for exercises and problem-solving activities, group work, was all an additional asset for students to gain better marks (Cavus, Uzunboylu & Ibrahim, 2006). They were all happy with their results and would prefer other courses with flipped learning as well. Students of flipped classroom got higher scores in tests on previous studies as well. (Pellas 2018; Chun and Heo, 2018; Thai et al., 2017; El-Banna et al., 2017; Al-Zahrani, 2015; Tune, Sturek & Basile, 2013, Findlay-Thompson and Mombourquette, 2014).

The achievement test results in this study are in line with other previous studies examining the flipped model that found a significant positive impacts on overall scores (e.g. Bergmann & Sams, 2012; Ponikwear & Patel, 2018; Ozudogru 2018; Park, Kaplan & Schlaf, 2018; Castilla, Escribano, & Romana, 2015, Wilson 2013; Moravec, Williams, Aguilar-Roca, & O'Dowd, 2010; Pierce & Fox 2012;; Day & Foley 2006). The flipped classroom teaching methodology in comparison with the traditional methodology has shown itself to be a more effective tool regarding academic performance evaluated in a quantitative and qualitative way at the university level. (Blazquez, et al., 2019), and turned out to be a positive learning methodology for the engineering courses. (Priyaadharshini & Sundaram, 2018).

Still, there are studies that show no difference between two groups like the study of Shiau et al., (2018), which indicates that there was no significant difference in students' performance on quantitative assessments comparing the traditional format to the flipped classroom format. Or some studies go even further showing negative effects in students learning effectiveness in technical and vocational colleges\ (Lin & Chen, 2016; Yan & He, 2001; Wu, 2013).

Is there a significant difference between the students in the experimental and control group in Self Directed Learning Readiness Scale (SDLRS)?

According to the results, we can say that the "Self-directed learning readiness scale" scores of the experimental group students were higher than the control group according to the post-test, the pre – test of both groups was pretty much the same. In this section students answered about their learning skills, management skills, learning goals, readiness for new ideas, new learning opportunities, confidence of their ability to find out information they need, organizational skills and the way they accept challenges.

We can say that flipped learning methodology positively impacts all the above-mentioned criteria, making students responsible for their actions, managing their time, pursuing their own way of learning, and taking control of their studies.

The integration of technology in education and the way of learning with video and online materials increased student outcomes in terms of enhancing their memory skills, creativity and critical thinking skills (Wagner et al., 2013) Moreover, creates an interactive , engaging learning environment (Mason, 2013) and enhance

the high-order thinking abilities of students in higher education (Tune et al., 2013).

Is there a significant difference in the pretest and posttest of the experimental group in terms of Flipped Learning Technology Acceptance Model (FLTAM)?

According to the results, the average of the FLTAM scores applied as post-test were significantly higher than that of the pre-test FLTAM scores. In this case, it can be said that the students' FLTAM scores increased after the application because they saw the benefits of introducing technology into the learning process. Most of the students during the interviews answered that having lectures online made their studies easier, learning at their own pace, rewinding the videos as many times as they needed.

Technology based flipped learning approach has better learning results over the conventional lecture-based approach and yielded the determinant role of attitude about the acceptance of such technology and their behavioral intention to use it (Hsieh, Huang & Wu, 2016).

Flipped learning positively affects perceived ease of using technology and perceived usefulness of technology in the classroom and their intention to use technology. (Joo, Park & Lim, 2017). Same, student's belief about the manner through which they are been taught (Teaching method) has a great influence on their performance (Ireti et al., 2017).

Is there a significant difference between students' perception in the experimental group in terms of their perceptions about flipped learning in engineering education at the beginning and in the end of the course?

It is observed that there is a significant difference in all items according to the paired samples t-test. Therefore, the student perceptions of flipped learning in engineering education scores of the students for the course Introduction to Programming with Java was further increased after the experimental process and the perception of the students become more positive.

Even though in the beginning they were a little bit sceptical about the new methodology of the course but in the end, they said that, if given the opportunity, they will enrol in another class taught using the "flipped classroom".

The course "Introduction to programming with Java" itself is not an easy subject, but having the lectures with flipped learning approach made them pass the tests easier, because they can watch over and over again, took less time to prepare rather than if it was taught in traditional way, felt very accomplished when engaging in problem solving activities in class and closeness with the professor was the most beneficial aspect of the flipped learning methodology.

The study results are in accordance with most of the studies on perceptions of students about flipped learning which are pretty much positive results toward this new methodology affecting students' performance, motivation, teamwork, etc. According to students, flipped learning gives them a better study atmosphere, more opportunity to interact with other students, more control over what they learn, how they learn, and investigating content at their own pace. (e.g. Chivata & Oviedo, 2018, Tohei, 2018; Fisher, Ross, LaFerriere and Maritz, 2017; Tang et al., 2017; Dirgahayu, 2017; Afrilyasanti, Cahyono, & Astuti, 2016; Zainuddin and Attaran, 2015; Wanner and Palmer, 2015; Chao, Chen, and Chuang, 2015; Johnson, 2013; Roehl, Reddy & Shannon, 2013; Cardetti, Pon & Christodoulopoulou 2013).

Still, we should be very careful when we generalize things because for example, in a research made by Tang et al. (2017) even though students in flipped group performed better than students in traditional groups still there were some drawbacks that should be reconsidered because students reported more burden and pressure during their flipped classroom. The implications are that students may require extra support in the initial stages of delivery of a flipped class to assist them to understand and take up the challenge of the approach. (Shiau et al., 2018).

Is there a significant difference in course evaluation in the beginning and in the end of the course?

According to the data obtained from the course evaluation questionnaire in the beginning and in the end of the course it is shown that there is a significant difference in all items according to the paired samples t-test. Therefore, the student perceptions

about the course evaluation scores for the course Introduction to Programming with Java was further increased after the experimental process and the perceptions of the students become more positive.

Students indicated that the course was more attractive because of the learning through video materials methodology. Same as in the research study of Aydin, (2016) where students stated that they could learn the content according to their own learning speed thanks to video materials.

Umutlu (2016) prepared different video materials which by following students learning style which was the most important asset when examining the impact of flipped learning on student's achievement. In the current study, students indicated that learning from video materials is fun rather than learning from various books, same as in the research study of Boyraz (2014).

According to Abeysekera & Dawson (2015) flipped learning methodology even though it has learning at home, working in groups and face to face during class makes them more active in learning the subject. In the current study, the inclusion of Edmodo interface might have motivated students and increased their performance. Moreover, they might have increased students' collaboration and involvement in the class because it was not often hard to discover what's expected in this course and they have clear goals how to achieve it.

Flipped learning methodology has positive reviews from the students for delivering the teaching material and positive evaluation of the course itself because it invokes active learning among the students, resulting in better performance (Barua et al., 2014, Tucker, 2012). In comparison with the traditional methodology has shown itself to be a more effective tool regarding academic performance evaluated in a quantitative and qualitative way at the university level. (Blazquez, et al., 2019), and turned out to be a positive learning methodology for the engineering courses. (Priyaadharshini & Sundaram, 2018).

CONCLUSION AND RECOMMENDATIONS

In this chapter, the results and suggestions developed based on the findings obtained from the research are included.

CONCLUSION

After the flipped learning approach - based Introduction to programming with Java instruction, the results of students' achievement on this course, SDLR levels, acceptance of technology, perceptions and evaluations of the course are given below.

In this research, it was determined that there was a significant difference between the introduction to Programming with Java achievement scores of the experimental group students taking the lesson in the flipped learning environment before and after the education. Furthermore, after the research, it was found that there was a significant difference between the achievement scores of the students in the experimental group and the achievement scores of the control group. The significance different was in favor of the experimental group.

Likewise, according to qualitative data collected it can be concluded that students are mostly satisfied with the flipped learning method, giving them autonomy in their learning, better cooperation with the professor and classmates while only being a little skeptic at the beginning of the course and afraid of adaption towards this new methodology. So that, it can be said that Flipped learning can be used as a learning method in Engineering education.

The flipped classroom did create a higher level of satisfaction for the students and did appear to engage the students more actively as measured by statistically significant higher student evaluation results in the flipped classroom as compared to the control in traditional format. So, according to the findings of the study, students in the experimental group outperform students in the control group in all the measuring instruments. Still, studies need to continue to provide details regarding the integration of out-of-class and in-class activities so that there is more information regarding good practices and guidelines for flipped classes in engineering education.

RECOMMENDATIONS

In this section, suggestions were made for the practitioners and researchers based on the results obtained from the research.

Suggestions for Researchers

This research was carried out on a working group of 174 students within the scope of the Introduction to programming with Java course which is available in the courses of different departments of the University in the Republic of Kosovo. These results are valid only for this study group. In order to achieve different and/or similar results, the same research can be repeated by different researchers, different educational settings and different working groups.

2. Studies on the flipped learning approach, theory, and implementation and evaluation methods in the faculties of education or in other teacher training institutions can be carried out.

3. Finally, in line with the developments in the field, it is advisable to update the learning content and materials and conduct similar studies.

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APPENDICES

A. APPROVAL FROM ETHICS COMMITTEE OF NEAR EAST UNIVERSITY

YAKIN DOĞU ÜNİVERSİTESİ

BİLİMSEL ARAŞTIRMALAR ETİK KURULU

Dear Blerta Prevala Etemi

Your application titled "**The difference that flipped learning makes in academic achievement of students in programming course**" with the application number YDÜ/EB/2018/283 has been evaluated by the Scientific Research Ethics Committee and granted approval. You can start your research on the condition that you will abide by the information provided in your application form.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee

Direnc Kanol

B. An investigation for applying flipped learning in Engineering Education.

Case study – Introduction to Programming with Java

Dear Participant,

This scale is part of a research study that we are carrying out in order to understand if flipped learning as a new pedagogical method, which employs asynchronous video lectures, practice problems as homework, and active, group-based problem-solving activities in the classroom will arise the number of graduates in software engineering courses. The primary reason for examining this teaching method is that it holds the promise to be a very successful method for retain learning, arise the number of students that pass in engineering courses and to get higher outcomes from educational institutions.

By filling in the following scale, you agree to participate in this study.

Please note that your participation in the study is voluntary and whether you agree to participate or not will have no impact on your grades for the courses you are enrolled in. Your identity will not be revealed in any case to third parties. The data collected during the course of this study will be used for the doctoral thesis on flipped learning, and may be presented at national/international academic meetings and publications. You may quit participating in this study at any time by contacting us. If you opt out of the study, your data will be deleted from our database and will not be included in any further steps of the study. In case you have any questions or concerns, please contact us using the information below.

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C. Syllabus of the Course: Introduction to Programming (in Albanian Language)

BPRAL *AAB*

Modeli i Programit mësimor të lëndës (Syllabusi)	
Fakulteti:	Fakulteti i Shkencës Kompjuterike
Drejtimi:	Inxhinieri Softverike
Niveli:	Bachelor
Kodi i lëndës:	
Lënda:	Bazat e programimit me Java
Statusi:	E detyrueshme
Semestri:	1
Fondi i orëve:	2+2
ECTS:	6
Viti akademik:	2018/2019
Mësimdhënësi:	Blerta Prevalla, PHD candidate

QËLLIMI	Bazat e Programimit është lëndë bazike në Shkencat Komjuterike, dhe është një lëndë e rëndësishme si parakusht për modulet tjera të avancuara të programimit. Kjo lende tenton të ofroj hyrje në konceptet e programimit që t'iu mundësoj studentëve siguri në shkruarjen e programeve ne gjuhen programuese Java, gjithnje duke vene theksin ne principet e programimit.		
PROGRAMI	**Javët**	**Tema**	**Literatura**
	Java - I	**Njoftim me lëndën**	
	Java - II	**Hyrje ne Programim dhe Java** • Historia e gjuhës Java • Principet dhe arkitektura e Java-s • Elementet e gjuhës Java • Krijimi, Kompajlimi dhe Ekzekutimi i nje programi Java	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 1**
	Java - III	**Variablat, tipet e te dhenave** • Identifikatoret • Variablat : Deklarimi dhe Inicializimi	Liang, Y.D., *Introduction To Java Programming*

		• Konstantat • Tipet primitive • Konvertimi ndërmjet tipeve • Stringjet • Komentimet e kodit	*Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 2**
	Java - IV	**Programimi i thjeshte ne Java** • Shkruarja e nje kodi te thjeshte • Shtypja e tekstit • Shtypja e rezultatit • Leximi i inputeve nga tastatura • Formatim i rezultateve te shtypura	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 2**
	Java - V	**Operatorët, shprehjet aritmetikore dhe funksionet matematikore** • Aritmetika e numrave te plote • Aritmetika e numrave racionalë • Operatorët relacional • Operatorët logjik • Operatorët tjerë • Diagnostifikimi i gabimeve në shprehje dhe variabla • Funksionet matematikore	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 4**
	Java VI	**Strukturat e kontrollit (Degezimet e thjeshta)** • If kushtezimet • If – Else • If – Else te nderthurura	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 3**
	Java VII	**Kolokfiumi i pare**	

	Java - VIII	**Degezimet e avancuara** • Shprehjet kushtezuese te nderthurura • Kushtezimet Switch	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 3**
	Java - IX	**Unazat 1 (Loops)** • Unaza while • Unaza do – while	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 5**
	Java – X	**Unazat 2 (Loops)** • Unaza for • Unazat e nderthurura	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 5**
	Java - X	**Metodat (Funksionet)** • Thirja e funksioneve • Funksionet *void* • Kodi i modularizuar	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 6**
	Java - XI	**Vargjet nje dimenzionale (Vektoret)** • Vektoret bazik • Kopjimi i vargjeve • Pasimi i vargjeve ne funksione	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc.

			Chapter 7
	Java - XII	**Vargjet nje dimenzionale (Vazhdim)** • Vargjet e kerkimit • Vargjet e sortimit	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 7**
	Java - XIII	**Vargjet shume dimensionale** • Vargjet dydimenzionale (Matricat) • Matricat ne funksione • Vargjet shumedimensionale	Liang, Y.D., *Introduction To Java Programming Comprehensive version*, Tenth Edition, 2015, Pearson Education, Inc. **Chapter 8**
	Java - XIV	**Kolokfiumi i dyte**	
	Java - XV	**Provimi**	
ARRITSHMËRIA	Pas përfundimit me sukses të këtij moduli, studenti është në gjendje të: •Të analizoj dhe përdor konceptet fundamentale të gjuhëve programuese •Të definoj konceptet bazike të konstrukteve dhe strukturave programuese. •Të përdor teknikat përkatëse •Të dokumentoj kodin burimor duke përdorur tool-at dhe procedurat Tëshkruaj testimet për programe dhe komponente •Të përdor gjuhët dhe dokumentimin e librarive		

LITERATURA	Literatura bazë: - Daniel, Y. Liang, *Introduction To Java Programming Comprehensive version*, 10th Edition, 2015, Pearson Education, Inc. Literatura plotësuese: - arry A. Burd, *BeginningIntroduction to Programmingfor Dummies*, 5th Edition, 2017, John-Wiley & Sons Inc. - itsunori Ogihara, *Fundamentals of Java Programming*, 2018, Springer - Sharma & Ashish Sarin, *Getting started with Java programming language*, 2017, CreateSpace Independent
METODOLOGJIA E MËSIMDHËNJËS	Ky modul realizohet përmes ligjëratave javore, laboratoreve dhe ushtrimeve. Në ushtrime studentët do të kuptojnë më mirë materialin dhe do të marrin njohuritë e nevojshme në mënyrë strukturore para se të filljnë të shkruajn kod. Maximum 60 orë formale janë orë kontaktuese time (ligj. dhe lab.) . Studim i pavarur janë : 90 orë Total kohë studimi për modul: 150 orë
VLERËSIMI	Pjesëmarrja - 10% Project - 30% Kolokfiumi i pare - 30% Kolokfiumi i dyte - 30% Provimi (nese nuk kalohet me parametrat e lartpermendur, apo nuk jane te kenaqur me noten) – 60 %
POLITIKA T	Caktohen kriteret për vijueshmëri të rregullt dhe rregullat e mirësjelljes gjatë organizimit të mësimit.

Vendi, data **Bartësi i lëndës:**

Prishtine,2018 **Blerta Prevalla Etemi, PHD Candidate**

D. Flipped |Learning Technology Acceptance Model Scale (TAM)

Section I: Demographic Characteristics Information

Q1- Gender:

1. Male
2. Female

Q2- Age

1. Less than 25
2. 25-30
3. 30-40
4. 40-50
5. Above 50 years old

Q3- Experience in higher Education(In general, not only at AAB University)

1. Less than 1 year
2. More than 1 year and less than 3 years
3. More than 3 years and less than 5 years
4. More than 5 year and less than 10 years
5. More than 10 years

Q4- Experience at AAB University

1. Less than 1 year
2. More than 1 year and less than 2 years
3. More than 2 years and less than 5 years

Q5 - Academic Rank

1. Professor
2. Associate Professor
3. Assistance Professor
4. Lecturer
5. Instructor

Q6 - Your Academic administrator position

1. Vice-rector or deputy vice-chancellor
2. Dean
3. Associate Dean
4. Department chairman
5. Centre director
6. None

Q7- Your academic field

1. Humanities & Social Sciences
2. Natural Sciences
3. Applied Sciences(e.g. engineering, computing& IT)
4. Medical & Health Sciences

Q8- What is your Faculty?

Q9- What is your department?

Q10- How long have you used, or have been using Flipped Learning(FL)?

1. Have not used a System Management System
2. Less than a year
3. 1-3 years
4. 3-5 years
5. More than 5 years

Section II: Perceived Ease of Use (PEU)	
B1. I feel that using Flipped Learning would be easy for me	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
B2. I feel that my interaction with FL would be clear and understandable	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
B3. I feel that it would be easy to become skillful at using FL	(5) Strongly Agree (4) Agree

	(3) Ambivalent (2) Disagree (1) Strongly Disagree
B4. I would find FL to be flexible to interact with	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
B5. Learning to operate FL would be easy for me	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
B6. it would be easy for me to get FL to do what I want to do	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
B7. I feel that my ability to determine FL ease of use is limited by my lack of experience	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
Section III: Perceived Usefulness (PU)	
C1. Using FL in my job would enable me to accomplish tasks more quickly	
C2. Using FL would improve my job performance	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
C3. using FL in my job would increase my productivity	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
C4. Using FL would enhance my effectiveness on the job.	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
C5. Using FL would make it easier to do my job	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
C6. I would find FL useful in my job	(5) Strongly Agree (4) Agree (3) Ambivalent

	(2) Disagree (1) Strongly Disagree
Section IV: Attitude Toward Usage (ATU)	
D1. I believe it is a good idea to use Flipped Learning	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
D2. I like the idea of Flipped Learning in engineering education courses	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
D3. Using Flipped Learning in engineering education is a positive idea	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
Section V: Behavioural Intention to Use (BIU)	
E1. I plan to use Flipped Learning in the future	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
E2. Assuming that I have access to FL, I intend to use it	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
Section VI: Job Relevance (BIU)	
F1. In my job, the usage of Flipped Learning is important	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
F2. In my job, the usage of Flipped Learning is relevant	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree

E. Self-directed learning readiness scale for engineering education

1	I solve problems using a plan	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
2	I prioritize my work	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
3	I like to solve (answer) puzzles/questions	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
4	I manage my time well	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
5	I have good management skills	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
6	I set strict time frames	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
7	I prefer to plan my own learning	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
8	I prefer to direct my own learning 4	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
9	I believe the role of the teacher is to act as a resource person	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
10	I am systematic in my learning	(5) Strongly Agree (4) Agree (3) Ambivalent

		(2) Disagree (1) Strongly Disagree
11	I am able to focus on a problem	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
12	I often review the way lab practices are conducted	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
13	I need to know why	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
14	I critically evaluate new ideas	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
15	I prefer to set my own learning goals	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
16	I will ask for help in my learning when necessary	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
17	I am willing to change my ideas	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
18	I am willing to accept advice from others	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
19	I learn from my mistakes	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
20	I will alter my practices when presented with the facts	(5) Strongly Agree (4) Agree (3) Ambivalent

		(2) Disagree (1) Strongly Disagree
21	I am open to new learning opportunities	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
22	When presented with a problem I cannot resolve	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
23	I am open to new ideas	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
24	I will ask for assistance I am responsible	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
25	I like to evaluate what I do	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
26	I have high personal expectations	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
27	I have high personal standards	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
28	I am aware of my own limitations	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
29	I have high beliefs in my abilities	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
30	I am assertive	(5) Strongly Agree (4) Agree (3) Ambivalent

		(2) Disagree (1) Strongly Disagree
31	I am confident in my ability to search out information	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
32	I enjoy studying	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
33	I have a need to learn	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
34	I enjoy a challenge	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
35	I want to learn new information	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
36	I enjoy learning new information	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
37	I set specific times for my study	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
38	I am self disciplined	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
39	I like to gather the facts before I make a decision	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
40	I am organized	(5) Strongly Agree (4) Agree (3) Ambivalent

		(2) Disagree (1) Strongly Disagree
41	I am logical	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
42	I am methodical	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
43	I evaluate my own performance	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
44	I prefer to set my own criteria on which to evaluate my performance	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
45	I am responsible for my own decisions/actions	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
46	I can be trusted to pursue my own learning	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
47	I can find out information for myself	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
48	I need minimal help to find information	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
49	I like to make decisions for myself	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
50	I prefer to set my own goals	(5) Strongly Agree (4) Agree G51(3) Ambivalent

		(2) Disagree (1) Strongly Disagree
51	I am in control of my life	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
52	I need to be in control of what I learn	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree

F. Student Perception of flipped learning in engineering education Scale

H1.Overall, this course was _____ my other SE courses.	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
H2. Overall, I spent _____ my other SE courses.	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
H3.I felt that the usage of videos and online material in advance of class helped to prepare me for lecture better than traditional textbook readings.	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H4.I prefer the "flipped classroom" approach to a traditional classroom approach.	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H5. Overall, I felt that the videos lengths were.	(5) Way too long (4) too long (3) about right (2) too short (1) way too shor
H6.If given the opportunity, I would enroll in another class taught using the "flipped classroom" approach.	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H7.I felt that the quizzes in the video forced me to pay attention and watch the videos.	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree

	(1) Strongly Disagree
H8. In class activities are helping me to better understand the subject software engineering	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H9. Learning software engineering with flipped learning took me less time to prepare rather than if it was taught in traditional way	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H10. I felt very accomplished when engaging in problem solving activities in class	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H11. I prefer working in groups	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H12. I prefer listening the lectures at home in my own pace	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H13. I like the idea that I can re-listen the videos and online materials before exam as much as I want	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H14. I like when the professor supervised us during problem solving activities	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree

H15. It was easier for me to do exercises at class rather than at home	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H16. I didn't need to be well prepared for the flippe approach	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H17. I liked interacting with the lecturer and peers in the workshops	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H18. If I'm far behind the material cause of non-attending classes, it's no problem for me to catch up with the material	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H19. I think that flipped learning can be easily adopted in every engineering courses	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H20. I feel that mastery learning has improved my software engineering understanding	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H21. I'm more motivated to learn software engineering in the flipped classroom	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree

H22. I find it easy to pace myself successfully through the course	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree
H23. The flipped classroom gives me greater opportunities to communicate with other students	(5) Strongly Agree (4) Agree (3) Ambivalent (2) Disagree (1) Strongly Disagree

G. The Course Evaluation Questionnaire (CEQ)

I1. It is always easy here to know the standard of work expected	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I2. The course developed my problem-solving skills	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I3. The teaching staff on this course motivated me to do my best work	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I4. The work was too heavy	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I5. The course sharpened my analytic skills	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I6. Staff on this course put a lot of time into commenting on student's work	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I7. You usually have a clear idea of where you're going and what's expected of you in this course	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I8. To do well in this course all you really need is a good memory	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I9. The course helped me to develop my ability to work as a team member	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier

I10. As a result of my course, I feel confident about tackling unfamiliar problems	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I11. The course improved my skills in written communication	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I12. Staff on this course seem more interested in testing what you've memorized than what you've understood	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I13. The staff on this course make it clear right from the start what they expect of students	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I14. Teaching staff on this course normally give helpful feedback on how you're doing	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I15. The staff on this course make a real effort to understand difficulties students may be having with their work	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I16. The course is overly theoretical and abstract	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I17. I was generally given enough time to understand the things we have to learn	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I18. It is often hard to discover what's expected of you in this course	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I19. Too many staff on this course ask us questions just about facts	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier

I20. Our lecturers are extremely good at explaining things to us	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I21. Teaching staff on this course work hard to make their subjects interesting	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I22. My course helped me to develop the ability to plan my own work	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I23. The sheer volume of work to be got through in this course means you can't comprehend it all thoroughly	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I24. There was a lot of pressure on me to do well in this course	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier
I25. Overall, I am satisfied with the quality of this course	(5) Significantly harder than (4) harder than (3) about the same as (2) easier (1) significantly easier

H. ACHIEVEMENT TEST

Kolegji AAB
PRISHTINË
CILËSI. LIDERSHIP. SUKSES!

ACHIEVEMENT TEST

SUBJECT: INTRODUCTION TO PROGRAMMING WITH JAVA

STUDENT ID _____

NAME, LASTNAME _____

DATE: _____

[1] What is computer programming ?

_____

_____

_____

_____

_____

_____

[2] Give the boolean values of the following expressions.

a. 01<2e-1
b. 8+0.0 >= 8.0
c. ‘a’>’b’
d. 2+3*2-6 == ((2+3)*2)-6
e. ‘a’>’$’||’b’<’$’
f. !(true||'6'>'#')&&!false

[3] What is source code?

_____

_____

_____

_____

_____

[4] Explain why the following code segment causes a compilation error.

```
int x1,x2;
 double y = 1.0;
x1 = (int)y;
x2 = 1L;
```

[5] Declare and initialize a variable z with a value 99,99;

[6] Can it be declared like this: byte x=60000; If Yes/No why?

[7] What is JDK and IDE?

[8] Determine the resulting values of x and y in the following code.

```
public class Ex3_5
{
public static void main(String[] args)
{
int x=0,y=0;
x = y + 1;
 y = x + 1;
}
}
```

Answer:

[9] What are syntax errors (compile errors), runtime errors, and logic errors?

_____

_____

_____

_____

_____

[10] Give the reason why the following code will not be compiled successfully.

```
public class Ex3_6
 {
  public static void main(String[] args)
  {
  int x, y, z =3;
  y = x;
  z = y;
  }
 }
```

Answer:

[11] Suppose you write a program for computing the perimeter of a rectangle and you mistakenly write your program so that it computes the area of a rectangle. What kind of error is this?

_____

_____

_____

_____

[12] Is the following statement correct or not: int x=999,0001; If Yes/ No why?

[13] Are tools like NetBeans and Eclipse different languages from Java, or are they dialects or extensions of Java?

_____

_____

_____

_____

_____

[14] What is going to be printed in console for the following code:

```
public class Llogaritja
{
public static void main(String[] args)
   {
System.out.print("Llogaritja (2 + 1 * 3) / (5 – 0) eshte");
System.out.println((2 + 1 * 3) / (5 – 0));
   }
}
```

CONSOLE

[15] Assume that x and y are valid int variables. Consider the following code segment:

```
if(x!=y){
System.out.println("1");
}
if(x>y){
System.out.println("2");
}
if(x%y == 0){
System.out.println("3");
}
```

What is the output if:

a) x = 2, y = 6
b) x = 1, y = 1
c) x = 9, y = 4
d) x = 10, y = 5

[16] (Convert feet into meters) Write a program that reads a number in feet, converts it to meters, and displays the result. One foot is 0.305 meter. Here is a sample run:

```
Enter the radius and length of a cylinder: 5.5 12 Enter
The area is 95.0331
The volume is 1140.4
```

[17] Comment the following Java code:

```
import java.util.Scanner;
 public class Mesatarja {
  public static void main (String args[]) {
 Scanner lexo = new Scanner(System.in);
 int a,b,c;
 double mesatarja;
 System.out.println("Jepni tre numra");
 a=lexo.nextInt();
 b=lexo.nextInt();
 c=lexo.nextInt();
 mesatarja = (double)(a+b+c)/3;
System.out.println("Mesatarja eshte" + mesatarja);
}
 }
```

[18] Determine the resulting value of the variable x in the following code segment.

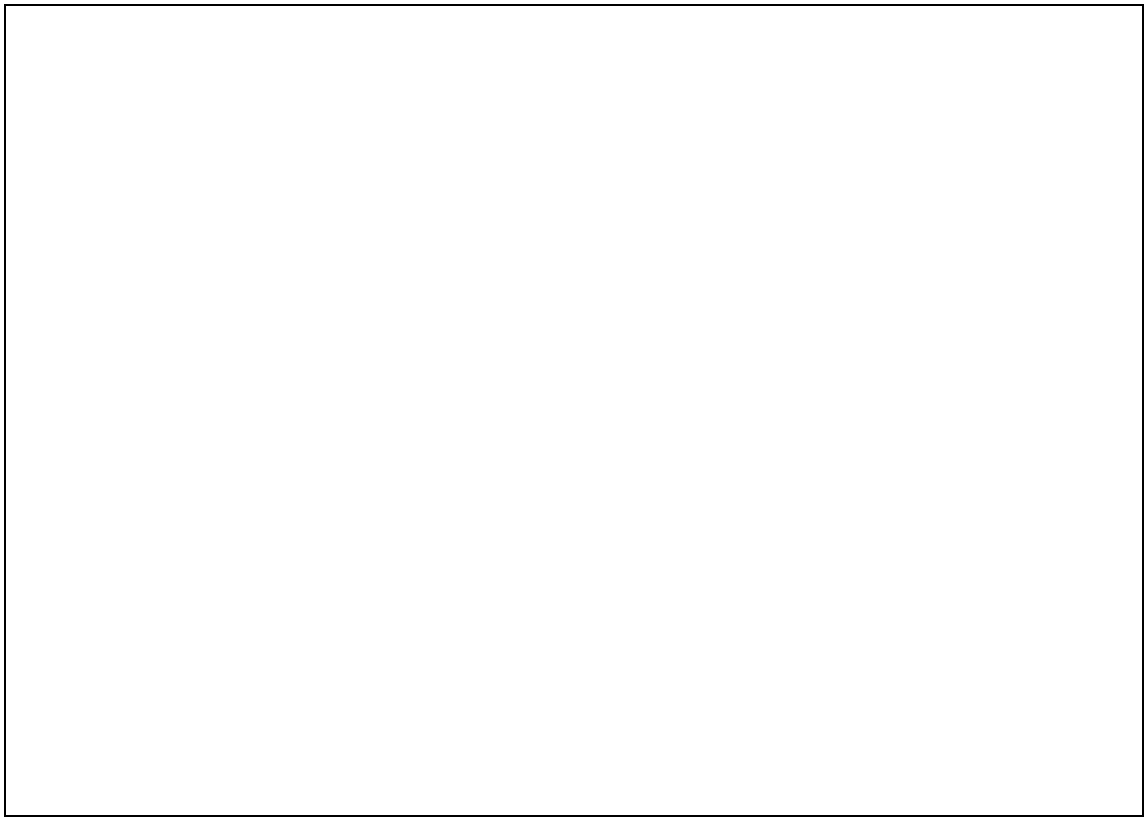
```
double x;
int y = 90;
x = y/100;
System.out.println("x="+x);
```

[19] Write the code in Java for $\boxed{y = 5a + 4b - 3}$, where a and b are read from keyboard.

[20] Write the code in Java for the following system: $c = \begin{cases} a + b + 6 & \text{nëse } a < b \\ a - b - 7 & \text{nëse } a > b \\ 100 & \text{nëse } a = b \end{cases}$

Where the values of a and b are given directly in the code. (no need for scanner)

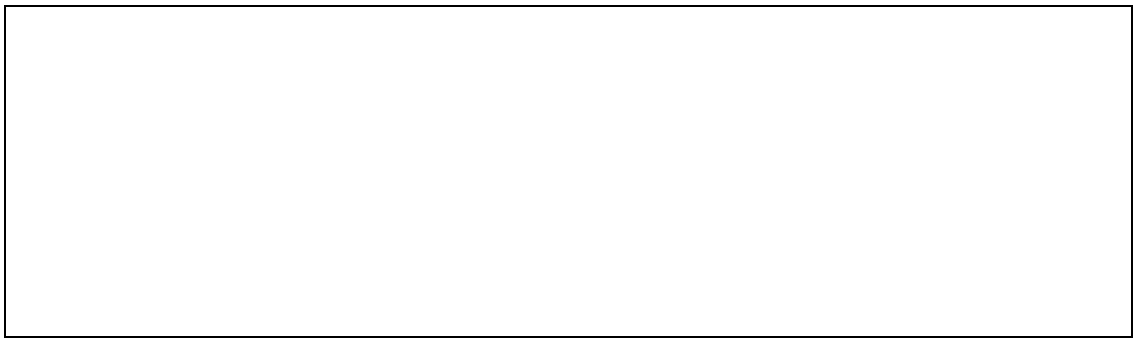
[21] Using the SWITCH option, write the code which gives us the following output in console: *Give a number from 51 to 55: 53*
You have given the number 53



[22] What is going to be printed in console for the following code:

```
public class UnazaDoWhile {
public static void main(String args[]){
 int i=28;
  do{
     System.out.print(i);
   i--;
     }
  while(i>21);
    }
    }
```

CONSOLE



[23] What is the output of the following code segment?

```
String s = "tachygraphometry";
System.out.println(s.charAt(1));
System.out.println(s.charAt(5));
System.out.println(s.charAt(12));
System.out.println(s.charAt(s.length()-1));
```

[24] What is the output of the following code segment?

```
String s = "1999";
System.out.println(String.valueOf(s));
System.out.println(String.valueOf(s)+1);
System.out.println(String.valueOf(s+1));
```

[25] Using the FOR cycle calculate the sum of even numbers from 1 to 11?

I. An example of first midterm

GRUPI 1

Emri _____

Mbiemri _____

ID _____

1.

a) Çfarë është programimi kompjuterik?
b) Deklaroje dhe inicializoje me vlerën 99,99 një variabël me emrin z;
c) A mund te deklarohet keshtu: byte x=60000; Nëse Po/Jo, pse?

2) Cfare do te shtypet ne console me detyren ne vijim:

```
public class Llogaritja
{
public static void main(String[] args)
  {
System.out.print("Llogaritja e shprehjes eshte");
System.out.println((10 + 2 * 3) / (5 - 3));
  }
}
```

CONSOLE

3) Të komentohet kodi në vijim:

```
import java.util.Scanner;
public class Rrethi{
   public static void main(String[] args){
     double rrezja, perimetri, siperfaqja;
 Scanner lexo = new Scanner(System.in);
System.out.print("Shkruanirrezen e rrethit ");
rrezja = lexo.nextDouble();
perimetri = 2 * 3.14 * rrezja;
siperfaqja = 3.14 * rrezja * rrezja;
System.out.println("Perimetri i rrethit eshte " + perimetri
+ " kurse siperfaqja eshte " + siperfaqja);
}
}
```

4) Te shkruhet kodi ne Java per $y = 5a + 4b - 3$ ku a dhe b lexohen përmes tastaturës.

5) BONUS DETYRË

Te llogaritet sistemi $z = \begin{cases} x + y + 3 & \text{nëse } x < y \\ 5x - 5y - 3 & \text{nëse } x > y \\ 100 & \text{nëse } x = y \end{cases}$

Ku vlerat e x dhe z jepen direkt ne kod. (nuk ka nevoj scanner, qe te jete detyra me e shkurt)

J. An example of second midterm

GRUPI 1

Emri _____

Mbiemri _____

ID _____

1) **Duke përdorur opcionin SWITCH të shkruhet kodi i cili jep këtë console**:

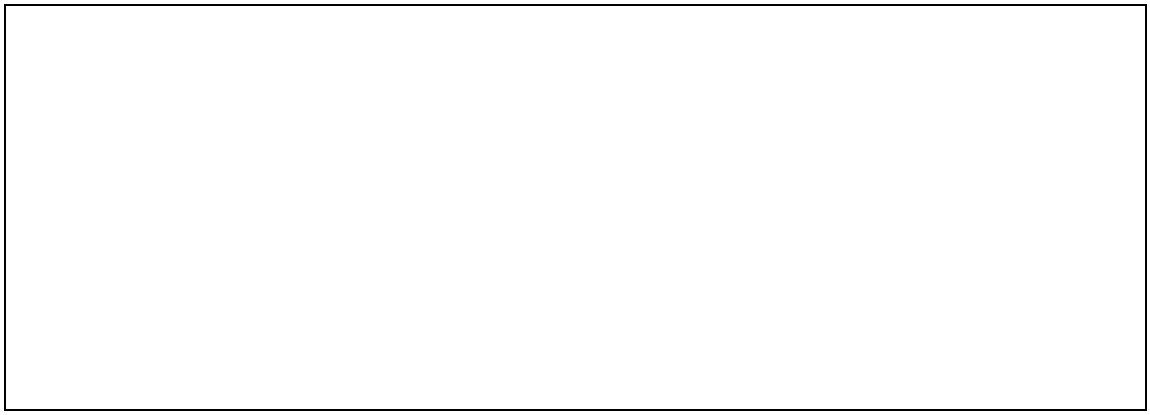
Jepni një numër prej 51 deri në 55: 53
Ju keni shtypur numrin 53

2) Çfare do te shtypet ne console me detyren ne vijim:

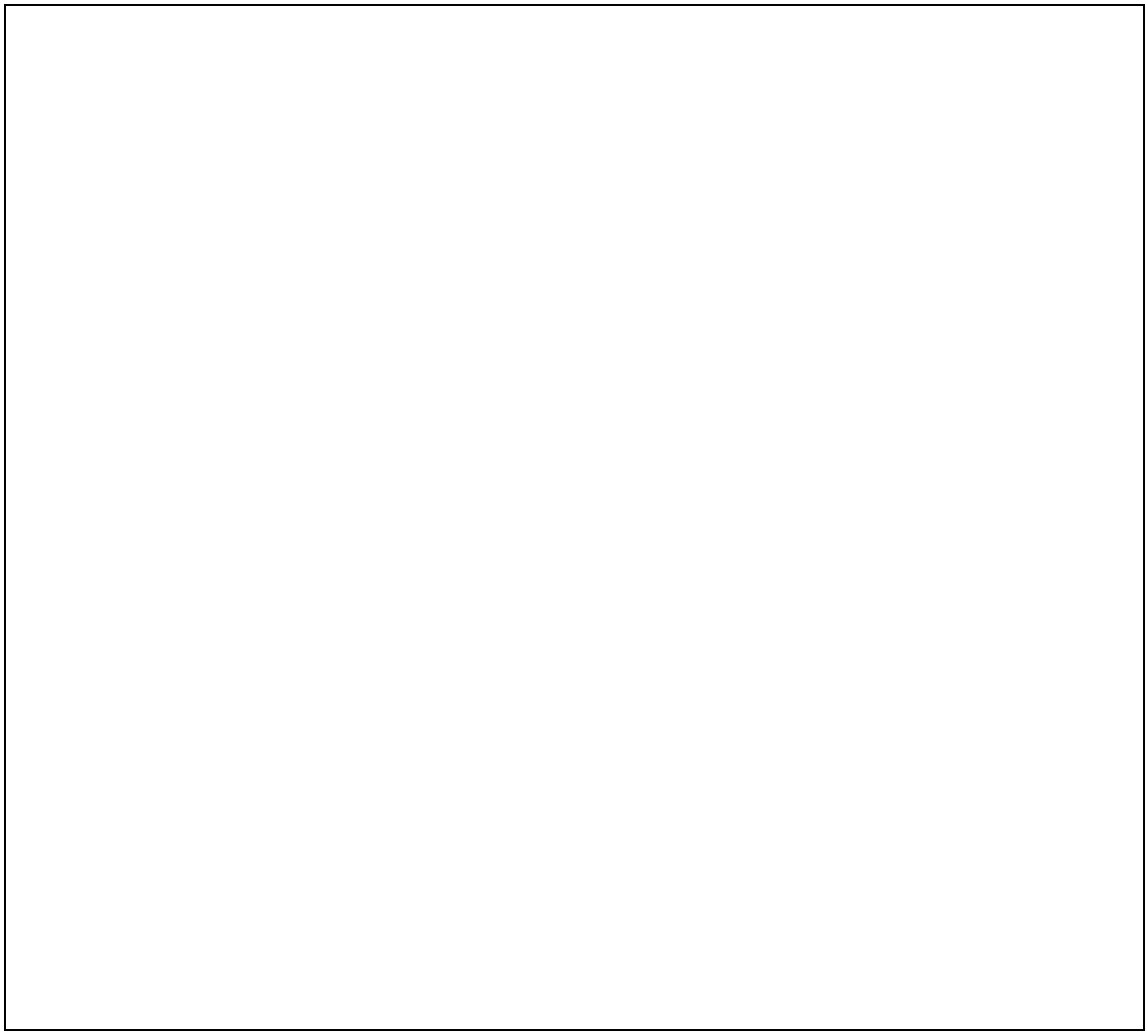
```
public class UnazaDoWhile {
public static void main(String args[]){
 int i=28;
  do{
     System.out.print(i);
   i--;
     }
  while(i>21);
    }
    }
```

CONSOLE

3) Duke përdorur ciklin FOR të llogaritet shuma e numrave *tek* prej 1 deri 11?



4) Duke perdorur funksionet te gjindet max i dy numrave. Pra, të krijohet një funksion MAX dhe të thirret në main me dy parametra aktual.



K. An example of final exam

GRUPI 1

Emri _____

Mbiemri _____

ID _____

1. Cfare do te shtypet ne console me detyren ne vijim:

```
public class Llogaritja
{
public static void main(String[] args)
  {
System.out.print("Llogaritja");
 System.out.print("Llogaritja");
 System.out.print (" e shprehjes eshte");
System.out.println((10 + 2 * 3) / (5 – 3));
  } }
```

CONSOLE

2. Te shkruhet kodi ne Java per $y = 5a + 4b – 3$ ku a dhe b lexohen përmes tastaturës.

3. Duke përdorur ciklin FOR të llogaritet shuma e numrave *tek* prej 1 deri 10?

4. Duke perdorur funksionet te gjindet max i dy numrave. Pra, të krijohet një funksion MAX dhe të thirret në main me dy parametra aktual.

L. Interviews

1. Does flipped learning methodology facilitated your studies in the course Introduction to Programming with Java?
2. How was the atmosphere in the classroom? Was it fun?
3. Were You skeptical in the beginning? Were You afraid? Curious?
4. Did You like the materials? Were they enough? Were they more than it should have been?
5. Is flipped learning a method that increases communication with the instructor?
6. What are your suggestions for making videos better?
7. Did you compare the lessons you learned with Flipped Learning method with the other course lessons? Were they better or worse?
8. What are your opinions about your duties in a course taught with flipped learning?
9. Have the tasks to be done before, during and after the course been clearly stated?
10. When you compare this course with other courses you have taken in terms of post-lesson tasks do you find any similarities or differences? Can you explain what and why?
11. How does the option to watch videos over and over again affect your learning? Please explain.

CV

PERSONAL INFORMATION Blerta Prevalla Etemi

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00389 (0)31 423 026 00389 (0) 71 387
149 blerta.prevalla@universitetiaab.com;
blertap (skype)
Female | 09/07/1985 | Albanian

WORK EXPERIENCE

01.03.2018 - Present
Teaching Professor

AAB University , **Pristina, Kosovo** – www.aab-edu.net

Modules:

- Software Engineering
- Advanced Software Engineering
- Programming Fundamentals
- Object Oriented Programming
- Algorithm & Data Structures
- IT Projects II
- Software Economics

01.09.2015 – 01.09.2017

Dean of Computer Science Faculty
AAB University , **Pristina, Kosovo** – www.aab-edu.net

01.10.2014 - 07.09.2015

Vice Dean of Computer Science Department
AAB University , **Pristina, Kosovo** – www.aab-edu.net

01.10.2013 – 01.10.2014

Teaching Professor (full time)

AAB University , **Pristina, Kosovo** – www.aab-edu.net

- Management of Information Systems
- Business Informatics
- Applied Informatics

01.10.2012 – 31.09.2013 (1 year)

AAB University , **Ferizaj , Kosovo** – www.aab-edu.net

01.09. 2007 – 31.09.2013 (6 years)

Teaching and Research Assistant

FON University, **Skopje Former Yugoslav Republic of Macedonia** - www.fon.edu.mk

Teaching modules at bachelor degree:

- Design and development of Data Warehouse
- Human - Computer Interfaces
- Information Technologies
- Trends and Development of Information Systems
- Managing Information Systems
- E – commerce
- Math
- Statistics

Teaching modules at master degree:

1) Pattern Recognition
2) Intelligent Information Systems
3) Software verifications

Duties: Teaching the abovementioned modules, practical work with students, admin-istrative and executive work on graduate and postgraduate level.

2008 – 2009

Web developer and maintainer

Financial Union Skopje former Yugoslav Republic of Macedonia – www.ufs.com.mk

2006 – 2007

Assistant of a school software

South East European University, Tetovo Macedonia (work and study program)

EDUCATION AND TRAINING

January 2017 - Present

PHD Candidate
Faculty of Computer Education and Instructional Technology
Near East University, Nicosia, Cyprus
Doctoral field of research "Flipped Classroom in Engineering Education"

February 2012 – present (VI semester)

PHD student
Faculty of Electrical Engineering and Information Technologies
State University 'St Cyril and Methodius' , Skopje, former Yugoslav Republic of Macedonia

PHD program: Automatics and System engineering
Doctoral field of research " ***The drive of autonomous unmanned ground vehicles along with unmanned aerial vehicles in unknown environments"*** as part of NATOs project fot "Secure Autonomous Vehicle Embedded Computing and Sensing" (1 august 2013 – 31 july 2016, Brussels, Belgium)

November 2007 – June 2010
Master in Computer Sciences (MSc)
Faculty of Contemporary Sciences and Technologies, South East European Univer-sity, Tetovo, Macedonia (Software and Application Development program)
Master thesis: "Performance Analysis of Programs Through Time and Space Complexity"
GPA: 9.7 (max 10)

October 2003 – July 2009
Bachelor of Science (BSc)

Faculty of Contemporary Sciences and Technologies, South East European Univer-sity, Tetovo, Macedonia
Graduation theme: "Database security (Analyze of examples in Oracle)" \
GPA : 9.95 (max 10)

ADDITIONAL INFORMATIONS

PUBLICATIONS

1. **Blerta Prevalla,** Huseyin Uzunboylu, "*Flipped Learning in Engineering Education"*, TEM JOURNAL - Technology, Education, Management, Informatics. (2019) ISSN: 2217-8309; e-ISSN: 2217-8333

2. Edona Doko, Lejla Abazi Bexheti, Mentor Hamiti, **Blerta Prevalla Etemi, "***Sequential Pattern Mining Model to Identify the Most Important or Difficult Learning Topics via Mobile Technologies"* International Journal: Interactive Mobile Technologies (iJIM), Vol 12, No 4, ISSN: 1865-7923

2. Faton Bajçinca, Huseyin Uzunboylu, **Blerta Prevalla Etemi**, "*Specification of a System for Electronic testing*", Current Proceeding on Technology, 7th WORLD CONFERENCE on INNOVATION and COMPUTER SCIENCE (INSODE-2017) 20 – 22 April 2017, AAB College, Pristina Republic of Kosovo , Apr 2017, ISSN/ISBN2421-8022

3. Huseyin Uzunboylu, **Blerta Prevalla Etemi**, Edon Bublaku, Arbon Qorri,Application of scientific tools and methods for a software system which is intended to result in a higher quality , Current Proceeding on Technology, 7th WORLD CONFERENCE on INNOVATION and COMPUTER SCIENCE (INSODE-2017) 20 – 22 April 2017, AAB College, Pristina Republic of Kosovo , Apr 2017, ISSN/ISBN2421-8022

4. Blerta Prevalla, Mentor Hamiti, Edona Doko, Arsim Susuri,Ethical Perception of Information Technologies at Computer Science Faculties, 8th World Conference on Educational Sciences (WCES-2016, Madrid, Spain, Apr 2017, ISSN/ISBNISSN: 2301-2617

5. Sabrije Osmanaj, Altin Shala, **Blerta Prevalla,** *"The Effect of Bandwidth on Speech Intelligibility in Albanian Language by Using Multimedia Applications like Skype and Viber",* International Journal of Electrical and Computer Engineering (IJECE), iaes journal, Vol 7, no 5, 2017.

6. **Blerta Prevalla,** Altin Shala, "*Intelligibility of spoken Albanian language by using multimedia applications like skype and viber", Thesis Scientific Review "Thesis", nr.1 2016*

7.**Blerta Prevalla**, Mentor Hamiti, Edona Doko, Arsim Susuri, "*Ethical Perception of Information Technologies at Computer Science Faculties*", 8th World Conference on Educational Sciences (WCES-2016) 04-06 February 2016 Madrid, Spain

8.Krenar Kepuska, **Blerta Prevalla**, Valdete Daku, Arlind Llullaku "*Integrimi i Teknologjisë së Informacionit dhe Komunikimit në ngritjen e cilësisë së arsimit në institucionet e arsimit të larte*" Second International Conference on: "Interdisciplinary Studies" (ICIS II – 19 December 2015) , Tirana, Albania

9. Krenar Kepuska, **Blerta Prevalla** "*Aplikimi i shërbimeve digjitale e-student dhe e-profesor në ngritjen e cilësise së arsimit në institucionet akademike"* Balkan Journal of Interdisciplinary Research Vol 1, No. 3 - January 2016 ISSN 2410-759X (print) ISSN 2411-9725 (online)

10. **Blerta Prevalla,** Agni Dika "The impact of memory and processor in determining the performance of programs", IEEE 26-th Convention of Electrical and Electronics Engineers, Israel 2010

11. **Blerta Prevalla,** Agi Dika " Performance Analysis of Programs Through Time Complexity" , International Educational Technology Conference, IETC 2010 Istanbul, Turkey

12. **Blerta Prevalla,** Ivana Stojanovska, Agni Dika „Performance Analysis of Sorting Algorithms Through Time Complexity", International Scientific Conference on Infor-mation, Communication and Energy Systems and Technologies, ICEST 2010, Ohrid, Macedonia

13. **Blerta Prevalla**, Ivana Stojanovska, Biljana Percinkova „Modeling Complex Agents' Connections in Artificial Intelligence**",** ETAI 2009, Ohrid, Macedonia.

14. **Blerta Prevalla**, "Analiza e performancës së programeve përmes kompleksitetit kohor", Alb-Science Institute 2010 Tirana, Albania

15. Ivana Stojanovska, **Blerta Prevalla**, Biljana Percinkova Modeling and Simulating Multi-agent Model Connections – An Application to Information Paradigm", The 2nd IEEE International Conference on Computer Modeling and Simulation, IEEE ICCMS 2010, Sanya, China 2010.

16. Ivana Stojanovska, Agni Dika, **Blerta Prevalla**, „Impact of the Number of Chro-mosomes on the Fitness Value Improvement in Standard GA Applications", Interna-tional Scientific Conference on Information, Communication and Energy Systems and Technologies, ICEST 2010, Ohrid, Macedonia.

17. Sllavco Cungurski, Ivan Kraljevski, Igor Stojanovic, **Blerta Prevalla**, "Speech Syn-thesis of dissimilar languages using their phonetic superset", Digitalna Obrada Govore i Slike (DOGS) 2010 Iriski Venac Srbia

Projects & Seminars

28 – 30 June 2019

Part of the Organizational Committee of the 8th International Conference on Education ICED 2019

Tirana, Albania

20 – 22 Prill 2017

CO – president of the 7th World Conference on Innovation and Computer Science

October 2016 – October 2017

Acreditation of German School Of Competency (Coordinator of the program :*Professional programmer)*

November 2016

Editor of the magazine "Info – Tech" , AAB University

March 2014 – April 2014

Project Leader on program "Advantages and security of electronic banking system' – KosovaPress, Prishtine, Kosovo

March 2012 – June 2012

Factory of knowledge (FON University, Skopje) – Coordinator and Mentor

September 2011 – Present

Digitalization of cadastral maps of the terriory of R.Macedonia.

April 2010 – May 2010

Edubuntu 2 - Trainer for Ubuntu Linux (its application in education for primary schools in Macedonia)

Duties – Preparing the materials for teaching & training primary school professors.

March 2009 – June 2009

Edubuntu 1 - Trainer for Ubuntu Linux (its application in education for all high schools in Macedonia) Duties – Preparing the materials for teaching & training secondary school professors.

20 – 22 August2013

OPTIMIZING CONTROL OF COMPLEX PROCESSES – Lecturer Prof. Engell, TU Dortmund, Germany, Faculty of Engineering and Information Technology, SKopje

23 – 25 October 2012

Microsoft Vision 10 – Alexander Palace, Skopje

2 – 6 April 2012

Nano technology project

Udacity Course: Artificial Intelligence for Robotics – *How to create a robotic car*

TECHNICAL KNOWLEDGE

Languages: C, C++, C#, Java, ASP.NET, SQL, PHP, Python

Applications : MS Visual Studio, NetBeans, Eclipse, MatLab, Camtasia Studio

Platforms : Windows XP/ VISTA /7 /8/10, Linux

Databases : SQL Server, MySQL, Oracle, Access

Multimedia : SMIL, GIMP, Moray & Povray, Buzz, SawCutter, AnvilStudio, Photoshop, Adobe Illustrator

PERSONAL SKILLS

Mother tongue(s) Albanian language

Other language(s)	UNDERSTANDING		SPEAKING		WRITING
	LISTENING	READING	SPOKEN INTERACTION	SPOKEN PRODUCTION	
English	PROFICIENT USER	PROFICIENT USER	PROFICIENT USER	PROFICIENT USER	PROFICIENT USER
Macedonian	PROFICIENT USER	PROFICIENT USER	PROFICIENT USER	PROFICIENT USER	PROFICIENT USER
Italian	INDEPENDENT USER	INDEPENDENT USER	BASIC USER	BASIC USER	INDEPENDENT USER
Spanish	INDEPENDENT USER	INDEPENDENT USER	BASIC USER	BASIC USER	INDEPENDENT USER
Serbo - Croatian	PROFICIENT USER	PROFICIENT USER	INDEPENDENT USER	INDEPENDENT USER	INDEPENDENT USER
Bulgarian	PROFICIENT USER	PROFICIENT USER	INDEPENDENT USER	INDEPENDENT USER	INDEPENDENT USER

Plagiarism Report