

# Efficiency of eLearning Educational Process in the Course of Electronic Services in Banking

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**Abstract** Novel technologies enabled the provision of banking services through an electronic environment and the process of fast evolution of electronic banking continues. The educational process of students in the fields of finance and banking should respond to these rapid changes. This article aims to briefly introduce the course of Electronic Services in Banking and outline the possibilities of measuring the efficiency of the education process in the course. The course itself is based on eLearning methods and uses information and communication technologies to allow students to gain theoretical and practical experience with electronic services related to the field of banking. The course also focuses on the security and safe usage of electronic services in banking. The efficiency of learning in the course was measured by comparing the results of pre-course and post-course tests using absolute gain, relative gain, and *class average normalized gain over four years' period*. The effectiveness of the course was detected in all observed years. Surveys before and after the course were conducted to support the investigation of learning efficiency with results demonstrating positive improvements in participants' knowledge, skills, and acceptance of electronic services in banking. Also, the course attendees' feedback on the course was gathered indicating their highly positive perception of the course. In addition, this feedback serves as a source of suggestions for improving the educational process of the course in the following years.

**Keywords** Electronic Banking, eLearning, Education Efficiency, Learning Gain

## 1. Introduction

The fields of banking and financial services provision recorded significant changes connected to the development of Information and communication technologies (ICTs) in recent decades. New ICTs invoked the birth of electronic banking and electronic financial services. Electronic financial services are continuously developed into new forms and versions.

Virtually continuous access of clients to the financial and banking services is a key characteristic and important advantage of electronic financial services. ICTs allowed clients to check their current account balance, perform fast and safe payments, or even acquire a loan from almost anywhere. Furthermore, the access to these services is almost completely continuous (with interruptions only during maintenance or upgrades of the systems). The communication between client and service providers using ICT might be faster and simpler than in the usage of traditional financial services [1].

Electronic finance or electronic financial services allow providing and utilizing financial products (or services) using electronic ways and means. Modern electronic financial services may include electronic transfers, e-money, e-wallets, e-credit, peer-to-peer lending, financial counseling, and more. Electronic or digital financial services may include virtually any services using electronic communication between the financial service provider and its client [2]. This electronic communication uses electronic media (e.g. Internet, mobile networks, and data networks).

Electronic services in banking might be considered as a substantial part of electronic financial services. Electronic

banking services are generally provided more effectively (in terms of time and costs) for both, clients and providers when compared with traditional services. However, electronic banking services require technologies allowing their utilization and provision (specific information technologies), which incur costs for their introduction and maintenance, mostly not incurred in traditional banking [1].

When considering the usage of electronic banking services in Slovakia, it slightly lags behind the EU average. For example, the usage of internet banking (in a broader definition), has the average at the level in the EU at 58% while in Slovakia 55% [3]. According to the data of the European Central Bank, in many other e-banking services, the penetration is even lower [4]. Promotion activities and education in this field should respond to this fact.

Rapid development in the field of electronic banking services should be reflected in the education process. Our educational institution is providing the education in this field in the course named Electronic Services in Banking (ESB). The ESB course is taught for multiple years already, but it is continuously updated and reformed. The usage of ICTs allows using innovative elements in the educational process of the course.

In this paper, the course of Electronic Services in Banking (ESB) providing education in the field of electronic services in banking for the students of the economics in Slovakia is presented. Further, its effectiveness is measured to investigate if the educational process in this course was effective during the period of 2017 - 2020.

## 2. Materials and Methods

### 2.1. Electronic Services in Banking – The Course

The course of Electronic Services in Banking (ESB) is attended by students of the economics in the specialization of Finance, Banking, and Investment at our faculty for multiple years already. Due to the rapid development of information and communication technologies in recent decades, the field of electronic services in banking also recorded massive changes in the ways of their provision and usage. These changes must also be reflected in the educational process of our course. Therefore, some of the topics (including Home banking, GSM banking, WAP banking) had to be removed from the curricula of the course as they become outdated; and more novel electronic services (Mobile banking, QR payment codes, etc.) were introduced.

Currently, the course of Electronic Services in Banking represents a combination of theoretical seminars with practical exercises using the e-learning environment of the learning management system Moodle. The main topic of the ESB course represents various e-services connected

with the field of banking with an overlap to the other areas (e.g. e-government). Many topics are also presented in the form of students' essays, which is one of the assignments within the course. These essays should reflect students' real-life experience with a given topic (related to electronic services in banking). What is emphasized is the security of the e-banking services, which is also an important element of building trust in the given service [5].

Many forms of authentication and authorization of electronic services are highlighted during the course. Especially, the digital signature is emphasized due to his high security and the possibility to authorize the electronic documents. The basic rules of secure usage of electronic banking services are introduced as their adherence is an important part of a particular service's security [6].

Furthermore, the perceived usefulness of a particular electronic banking technology may significantly impact its adoption [5]. Also, the amount of information and awareness about e-banking technologies positively affect their acceptance by potential users [7],[8]. Important factors of electronic banking acceptance also include security and safety of its usage [9]. Therefore, all the above-mentioned factors are considered during the ESB course to widen their knowledge in the field and to promote acceptance of e-banking among the course participants.

To enable the e-learning practices within the ESB course, the learning management system (LMS) Moodle is used. Moodle is an open-source e-learning platform that allows providing educators, administrators, and learners with a robust, secure, and integrated system to create personalized learning environments [10]. This LMS serves as a standard e-learning platform at our institution and also other courses or study subjects use it in their process of education to various extents [11].

The course of Electronic Services in Banking is further supported by several ICT systems or technologies. For instance, the section of the course devoted to electronic communication using digital signature is relieved by using the faculty's certification authority built on EJBCA open source certification authority [12]. Our certification authority allows issuing digital signature certificates. As a tool for the management of the digital signature certificates in PCs GPG4win (open source software) and in mobile devices, OpenKeyChain is used. The virtual bank (named in the course Electronic Online Bank) is based on an older banking information system gifted to our faculty for educational purposes and serves for simulation of multiple e-banking forms, mainly internet banking using authorization with a digital signature. Older supported forms of electronic banking available in EOB (e.g. WAP banking, Home banking) might be displayed shortly. More actual electronic services in banking, such as Mobile banking or QR code payments, are demonstrated and used by students for educational purposes in "real-life" banks. In the ESB course are

concerned mainly internet banking, mobile banking, new e-banking, and e-finance forms, and digital signature in banking and electronic communication.

Furthermore, the Electronic Services in Banking course uses multiple aspects of blended learning (e.g. online assessment, virtual laboratory of electronic banking, online video learning, and during the year of 2020 also virtual classroom interaction) to provide a modern and effective form of the educational process within this field [13].

#### 2.1.1. Internet Banking

Generally, internet banking is the term used for the form of electronic banking that allows using banking services through the internet. In this part of the ESB course, students get the opportunity to use internet banking in EOB which is supported by authorization using certificates for digital signature. Theoretical references in this course topic are available for students in LMS Moodle in various forms (texts, graphics, and videos). The safety of usage and security of internet banking is highlighted. Fundamentals of secure using of internet banking (and other e-banking services) are further introduced. Multiple options of authentication and authorization (Digital signature, One-Time passwords, GRID cards) are demonstrated and tried by course participants. Banking and financial services (electronic loans, mutual funds' investments, electronic financial deposits, etc.) besides payment services available in internet banking in real banks are also outlined. Students have to fulfill mandatory exercise in the form of a pair of payment and collection transactions via EOB's internet banking using digital signature authorization in the process. The course attendees demonstrate their acquired practical skills in the part of internet banking usage by performing this task.

Several students each year indicate using internet banking for the first time in the ESB as they did not manage their finance using banking services in reality (most often parents did). However, multiple students having experienced electronic banking also indicate gaining worthy skills and new knowledge within this part of the ESB course.

#### 2.1.2. Mobile Banking

Mobile devices emerged and grew enormously in recent decades. Very soon after their appearance in common public, electronic banking services also started to be offered on these mobile devices (PDAs, mobile phones, tablets, etc.). Similarly, they found their application also in electronic commerce quickly [14]. The electronic banking services in mobile devices, commonly known as mobile banking, rapidly developed and changed to keep up with the development of the hardware of mobile devices. Mobile banking in current smart devices is one of the most used forms of electronic banking [6].

The introduction of these forms of electronic banking is another important part of the ESB course. Mobile banking in current meaning is the form of electronic banking designed for smart devices in the form of an application using data transfers via the internet. Mobile banking is not supported by the faculty's EOB, but it is presented to course participants in the form of a demo application. Furthermore, students might use real mobile banking to accomplish the optional task of performing payment using mobile banking for extra points. Rules of safe usage of mobile banking are introduced and emphasized including the use of biometric authentication.

Older forms formerly representing mobile banking (such as SMS banking, WAP banking, and GSM banking) supported by EOB are shortly outlined to course participants in order to illustrate significant technology changes during the recent two decades.

#### 2.1.3. Novel Electronic Services in Banking

Within the ESB course also multiple novel electronic services relevant to banking are overviewed. Specifically, cryptocurrencies, contactless payments, peer-to-peer (p2p) payments, and lending are noted. Participants have to prepare an essay on a topic regarding any of these electronic services and present it to the other students within their study group. Students' essays should reflect any practical experience of its author with particular electronic service (or technology). If they lack any experience with a given service, the essay should reflect their opinion on it. Further discussion on these services or technologies is aimed at comparing their advantages and disadvantages. All essays are available in LMS Moodle to the other students to share the experience among them.

#### 2.1.4. Digital Signature in Electronic Services in Banking

The technology of digital signature is introduced in this part of the ESB course. Digital signature plays an important role in secure communication necessary for the provision of electronic services in banking and also in other fields (such as e-government, e-reporting, etc.). ESB course participants get acquainted with technologies of symmetric and asymmetric encryption, Public Key Infrastructure (PKI), digital signature, and the legislation on electronic signature legislation. The role of a digital signature as an authorization and authentication element in electronic banking is also emphasized.

Encrypted communication and the processes of digital signing and verification of electronic documents are presented and practically experienced by students. Students can generate their own certificates for digital signing from faculty's certification authority built on EJBCA open source certification authority.

Several freeware software applications for digital signature management and usage (GPG4win, OpenKeychain, Decrypto) are used within the course.

Students perform the task of digitally signing and encrypting the electronic document simulating secure electronic communication between banks and clients.

#### 2.1.5. Security of Electronic Services in Banking

The secure and safe usage of electronic services in banking is the main emphasis of the ESB course. The rules of safe usage of electronic services are presented. Multiple forms of authorization and authentication in e-banking and the levels of their security are introduced and practically tried by students. Following categories of electronic authorization are included in the ESB course:

- Static passwords and codes,
- Dynamically generated codes or tokens,
- Biometric elements (e.g. biometric signature, fingerprints, voice or face recognition, etc.),
- Digital signature.

The role of predefined limits (time of inactivity, the maximum amount for payment, etc.) is mentioned. The level of safety and proper use of these security elements are also discussed. Prevention of various forms of electronic banking's security breaches and credential thefts is accentuated.

### 2.2. The ESB Course Effectiveness Measuring

With the aim to measure the effectiveness of the ESB course, the suitable method was investigated. Generally, it is difficult to prove that a learning gain has occurred as a result of an educational intervention [15]. There were controversies regarding the comparative use of pre-course and post-course assessments [16]. Also, the problems of creating control groups with which groups with an educational intervention can be compared. Furthermore, it is hard to prove the causality due to possible parallel training, retention, or normal maturation [17].

In the fields of engineering and natural sciences, multiple authors use class-average normalized gain to measure a course's effectiveness [18] [19]. Class-average normalized gain ( $g$ ) measures the ratio of a whole group's performance to the maximum achievable improvement. It is expressed mathematically as a fraction of maximum achievable pre-course/post-course gain [15]. Educators use this measure of performance to diminish the confounding effects of pre-course knowledge and other baseline group characteristics, thereby decreasing the need for a control group [20].

In this study, the comparison of pre-course/post-course tests' results will be used to assess the effectiveness of our Electronic Services in Banking course. Absolute gain, relative gain, and *class average normalized gain* were used to measure the effectiveness of this course. This method was chosen due to the design of the ESB course, which includes the initial test before the course and the test at the end of the course. In this way, the data suitable for comparing the results were obtained for several

consecutive years. Therefore, the method of pre-course / post-course test results comparison was used to evaluate the effectiveness of the educational process in the ESB course.

Absolute gain ( $g_{abs}$ ) was calculated as the ratio between average gain and maximum score achievable in the test (in this case 100 points) (2). Average gain ( $g_{avg}$ ) was calculated as the average post-course score – average pre-course score achieved by students in a given year (1).

$$g_{avg} = \text{Avg post-course score} - \text{Avg pre-course score} \quad (1)$$

$$g_{abs} = g_{avg} / \text{maximum score achievable} \quad (2)$$

Relative gain ( $g_{rel}$ ) represents the ratio of how much students improved their scores in comparison with their early test results. It is calculated as average gain divided by average pre-course score (3).

$$g_{rel} = g_{avg} / \text{Avg pre-course score} \quad (3)$$

Then *class average normalized gain* ( $g$ ) is expressed as average gain divided by the maximum possible gain (4). The maximum possible gain represents the maximum score achievable (in our case 100) minus the average pre-course score.

$$g = g_{avg} / (100 - \text{Avg pre-course score}) \quad (4)$$

The expected result was that the educational process in the ESB course will contribute to the significant gains in the knowledge of the course participants.

## 3. Results

During each year's iteration of the ESB course provision, the effectiveness of the course is measured using pre-course and post-course tests. Also, the survey regarding electronic services adoption and attitude towards them is conducted before the course and at the end of the ESB course. The survey after course completion contains also feedback on the course. Any relevant suggestions from course attendees serve for improvement of the educational process in the following years of the ESB course provision.

### 3.1. Comparison of Pre-course and Post-course Tests' Results

The course participants are obliged to attend the test of knowledge in the field of electronic services in banking at the beginning of the course and similarly at its end. Both tests contain 10 questions randomly assigned from the bank of questions, which contains 40 questions from the area of electronic services in banking. All the questions available were designed by lecturers to be of approximately the same difficulty for participants. The maximum percentage for the test was 100% and therefore 10% per question. The data from the tests' results were available from 4 years of course provision (years 2017 to

2020).

Table 1 contains the results of tests and their comparison.

The iteration of the course in the year 2020 was affected by Covid-19 pandemic prevention measures and therefore face-to-face classes were not possible since the third week of twelve weeks course duration. However, the ESB course was designed to be fully accessible and graduate-able online.

In this case, the pre-course test was conducted in a form of personal attendance in the full-time form of study. After the first quarter of the course lapse in 2020, it was necessary to switch to online education due to measures introduced in Slovakia to prevent the spread of Covid-19. As the ESB course was prepared for distant learners even before the pandemic education process switched seamlessly to the distant learning form. Lectures were distributed in both the video and the text forms within the LMS Moodle. Students had the opportunity to consult with lecturers via email, online chat, or through video calls. The absolute majority of students preferred email or chat. No serious problems in the educational process were recorded and the post-course test results were gathered in full extent.

Overall, 518 eligible tests in each group (pre-course and post-course) were gathered over a given period of four years (from 2017 to 2020). Only the same number of pre-course and post-course tests in a given year was used in the sample to avoid distortion of results.

Overall mean test score significantly improved from 56.72% ( $\pm 12.24\%$ ) in the pre-course test to 72.87% ( $\pm 11.36\%$ ) ( $p = 0.015$ ) in the post-course test. The overall absolute gain was 16.15% and relative gain represented 28.48%. The class average normalized gain ( $g$ ) was 37.32%. The educational process can be considered as effective when the class average normalized gain is above 30% (according to the studies of Hake (1998) or Prather et al. (2009) etc.). [21],[22]

Similar results were detected when considering test scores within each year's courses. In 2017, the mean test score significantly increased from 58.89% ( $\pm 13.09\%$ ) in the pre-course test to 75.80% ( $\pm 11.84\%$ ) ( $p = 0.020$ ) in the post-course test. The absolute gain in 2017 was 16.91%

and the relative gain was 28.72%. The class average normalized gain ( $g$ ) was 41.14%.

The 2018's mean test score significantly rose from 58.17% ( $\pm 11.51\%$ ) in the pre-course test to 72.10% ( $\pm 10.33\%$ ) ( $p = 0.018$ ) in the post-course test. The absolute gain in 2018 was 13.93% and the relative gain was 23.95%. The class average normalized gain ( $g$ ) was 33.30%.

In 2019, the mean test score significantly increased from 56.35% ( $\pm 11.50\%$ ) in the pre-course test to 71.53% ( $\pm 11.65\%$ ) ( $p = 0.012$ ) in the post-course test. The 2019's absolute gain was 15.17% and the relative gain was 26.93%. The class average normalized gain ( $g$ ) was 34.76%.

The 2020's mean test score significantly improved from 53.82% ( $\pm 12.34\%$ ) in the pre-course test to 71.17% ( $\pm 10.49\%$ ) ( $p = 0.031$ ) in the post-course test. The absolute gain in 2020 was 17.35% and the relative gain was 32.24%. The class average normalized gain ( $g$ ) was 37.57%.

The level of effectiveness (class average normalized gain above 30%) of the ESB course was achieved in each of the observed years. Thus, the ESB course was an effective form of education in the field of electronic services in banking.

### 3.2. The ESB Course Survey Results

With the aim to investigate any changes in attitude towards using electronic services in banking among the ESB course participants, the survey was conducted before the beginning of the ESB course and also after its completion. The survey after the ESB course completion also contains feedback on the course by participants. Any relevant suggestions of students might be incorporated into the course in the following years.

Both surveys within the 2020 iteration of the ESB course were conducted in digital form using Google Docs questionnaire distributed via LMS Moodle. All of the respondents of the survey were participants of the ESB course.

**Table 1.** Comparison of pre-course and post-course tests results in the years 2017 - 2020

|       | N   | Pre-course test scores | Post-course test scores | <i>p</i> value | Absolute gain ( $g_{abs}$ ) | Relative gain ( $g_{rel}$ ) | ( $g$ ) |
|-------|-----|------------------------|-------------------------|----------------|-----------------------------|-----------------------------|---------|
| 2017  | 126 | 58.89% $\pm$ 13.09%    | 75.80% $\pm$ 11.84%     | 0.020          | 16.91%                      | 28.72%                      | 41.14%  |
| 2018  | 119 | 58.17% $\pm$ 11.51%    | 72.10% $\pm$ 10.33%     | 0.018          | 13.93%                      | 23.95%                      | 33.30%  |
| 2019  | 138 | 56.35% $\pm$ 11.50%    | 71.53% $\pm$ 11.65%     | 0.012          | 15,17%                      | 26.93%                      | 34.76%  |
| 2020  | 135 | 53.82% $\pm$ 12.34%    | 71.17% $\pm$ 10.49%     | 0.031          | 17.35%                      | 32.24%                      | 37.57%  |
| Total | 518 | 56.72% $\pm$ 12.24%    | 72.87% $\pm$ 11.36%     | 0.015          | 16.15%                      | 28.48%                      | 37.32%  |

### 3.2.1. Pre-course Survey

The latest results of the survey from the year 2020 are presented further. There were 128 usable questionnaires gathered representing almost 95 percent of participants, giving a high return rate when considering that the course was almost completely online (i.e. in distant form of teaching) due to the Covid-19 pandemic. The demographic data of our survey participants are presented in the following Table 2.

**Table 2.** Demographic data of respondents in pre-course and post-course surveys

| Gender   | Count | Percentage |
|--|-------|------------|
| Male   | 47    | 36.7       |
| Female   | 81    | 63.3       |
| Age  |       |            |
| 18 - 25  | 110   | 85.9       |
| 26 – 35  | 16    | 12.5       |
| 36 and over                                      | 2     | 1.6        |
| Residence  |       |            |
| Large-sized municipality (over 100k residents)   | 71    | 55.5       |
| Medium-sized municipality (5k to 100k residents) | 37    | 28.9       |
| Small municipality (below 5k residents)          | 20    | 15.6       |

Over 63 percent of survey participants were women, which approximately corresponds with the share of genders among the students at our faculty. Most of our students (almost 86 percent) consisted of students of the full-time form of study, which are typically in the age of 18 to 25 years. Older course participants were students of the part-time (external) form of study. The size of the municipality of course attendees was investigated, while it might affect the availability of broadband internet in conditions of Slovakia. According to the data of the European Commission [23], the availability of faster internet (as an important prerequisite of convenient use of many electronic banking services) is lower in smaller municipalities (below 5000 residents). This might be the case for 15.6 percent of our students residing in small municipalities.

The following data represent the results of the pre-course batch of the survey. The general use of electronic services in banking was investigated in the first part of the questionnaire. Over 83 percent of the course participants stated that they use any form of electronic banking. Most of them (71 percent) adduced using mobile banking before the ESB course. Also, internet banking was used by a big proportion (65 percent) of the participants.

The causes of not using any form of electronic banking were investigated in the cases of respondents who responded in this way. Over 10 percent of survey participants stated that they distrust the electronic services due to safety concerns and therefore they do not use them. Around 4 percent of respondents mentioned not using any banking services (or not having a current account) at all.

All of these respondents were from the youngest age group and their income consisted only of pocket money from their parents in cash form. Below 3 percent admitted using only the banking services through the classic brick-and-mortar bank branches.

Further, the survey participants answered how often they use electronic banking services. Almost 17 percent of respondents do not actively use electronic services in banking. Slightly over 68 percent participants use e-banking at least once per month. Approximately 42 percent used electronic banking on a weekly basis. Around 79 percent adduced the preference of electronic payment over the cash payment in the cases where both forms are available. Above 46 percent of respondents consider electronic services important when choosing a banking services provider.

Subsequently, the questions on the security and safety of electronic banking services usage followed. Respondent's worries when using electronic banking were examined. Most survey participants, over 75 percent, concerns about the abuse of electronic banking by third-party attackers; 8 percent is afraid of possible deception by bank employees and 37 percent is worried about technical faults of electronic banking which might lead to its misuse.

Over 96 percent of the participants mention protection against harmful software as very important for the safe usage of electronic banking. However, 62 percent of the respondents conceded failing to know and adhere to the rules of safe usage of electronic banking.

Almost 65 percent of the users preferred static codes (PINs, passwords) when available and 22 percent favored biometric authorization. Dynamic codes (one-time passwords, tokens) were preferred by 13 percent of the electronic banking users. Digital signature was not adduced as a favorite authorization form by any respondent. The preference for less secure static authorization elements was high in the pre-course survey answers of our course participants.

When our respondents had to identify the most secure, almost 35 percent adduced biometric elements, 31 percent stated static codes and 20 percent dynamic codes. The remaining 14 percent marked digital signature as the most secure form of authorization. Also, the respondents' attitude towards digital signature usage was examined. Almost 58 percent consider it a proper solution for e-government. Over 38 percent of responding students adduced that digital signature is suitable for verification of electronic documents within the communication with banking institutions.

### 3.2.2. Post-course Survey Results

The following results were acquired in the survey at the end of the ESB course. Results are further used for comparison with pre-course survey results to illustrate the shifts in attitude of respondents towards electronic

banking usage. The post-course survey was answered by the exact same group of course participants.

After participation in the ESB course, almost 88 percent of the respondents reported usage of any form of electronic banking (an increase by almost 5 percent). Almost 78 percent of the survey participants use mobile banking and 69 percent the internet banking. Around 12 percent of the course participants adduced to start using more secure forms of authorization in electronic banking (from static codes to biometrics or dynamically generated codes). Only 2 percent of the survey participants still distrust electronic banking services, which represents a significant decrease from over 10 percent level from pre-course status.

Also, the frequency of electronic banking usage rose, while over 75 percent of respondents use it on a monthly basis. The course participants' concerns about safe usage of electronic banking services decreased in all observed cases. Concerns about abuse by bank employees decreased from 8 to 4 percent. Worries about third party attacks on their electronic banking used dropped from 75 percent to 56 percent. Also fear of technical imperfection of electronic banking IT solution decreased to the level of 29 percent of answers (from 37 percent in the pre-course survey).

All responding students adduced protection against harmful software as important for safe usage of electronic banking in comparison with 96 percent in the pre-course survey. Only 34 percent of the respondents still admit failing to adhere to the rules of safe usage of electronic banking, which represents a significant decrease from 62 percent in the pre-course survey. It suggests that a significant number of students recognized the safety rules and started to follow them.

All these results of comparison post-course levels with pre-course status indicate positive changes in students' attitudes and knowledge in the field of electronic banking related to their ESB course attendance.

Following Figure 1 demonstrates the main positive changes detected in the comparison of pre-course and post-course surveys' results.

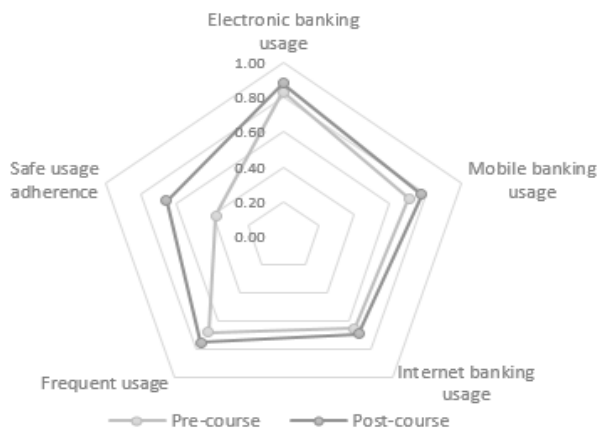


Figure 1. Selected positive results of the ESB course completion

Finally, the feedback from the course participants was gathered as a part of the post-course survey. Overall, 87 percent of students were satisfied with the ESB course. In their answers, respondents (81 percent) highlighted mainly easy transition to full online teaching process coerced by Covid-19 pandemic prevention measures applied at our institution. Students also underlined the emphasis on the safe usage of electronic services in banking and stated in many cases (in 46 percent of responses) that it highly improved the level of safety when using electronic banking. Participants (43 percent) also welcomed the possibility to get acquainted with multiple topics related to the electronic services through the elaboration and presentation of essays. Around 29 percent of the survey participants adduced that the ESB course encouraged them to try or even use any new service within the field of electronic banking.

Our respondents (53 percent) further suggested leaving out the presentation of older forms of electronic banking. On the other hand, some students (26 percent) exalted the option to get acquainted with the historical development of some forms of electronic banking briefly. Multiple participants (over 20 percent) would also welcome practical usage of the newest technologies related to the field of electronic banking (e.g. multiple forms of biometric authorization). Some of those were presented in the form of multimedia at least. Furthermore, students were encouraged to start using novel technologies related to electronic banking. The feedback from course participants is a substantial source for subsequent changes within the next years of the ESB course provision.

The results of both surveys (including feedback gathered) insinuate that the ESB course allows its participants to mend their skills and knowledge of electronic services in banking and it also contributes to their acceptance of electronic banking.

## 4. Conclusions

The course of Electronic Services in Banking (ESB) offers students the opportunity to get acquainted theoretically and practically with the field of electronic banking and related electronic services. Attendance in the course might affect students' acceptance of given services as well as help them in their potential future career in banking. The course is continuously developed by the lecturers to reflect rapid changes in the field caused by the fast development of ICTs used in electronic banking.

The course participants get to know the multiple electronic services in banking including their practical usage by the use of various technical means (e.g. certification authority, virtual bank, emulation software, demos, etc.). The course provision during the Covid-19 pandemic was not seriously disturbed, while the course was built for the distant form of learning since the

beginning of its provision. The study aimed to present the ESB course and to measure its learning efficiency.

The ESB learning efficiency was measured by comparing the results of pre-course and post-course tests using absolute gain, relative gain, and class average normalized gain during the period of four years (from 2017 until 2020). All observed years were detected effective levels (above 30%) class average normalized gains, suggesting that the ESB was an effective form of learning.

Another form of measuring the learning gains within the ESB course was a comparison of pre-course and post-course survey results (conducted on the 2020 surveys' results). This comparison indicated multiple positive shifts in participants' knowledge and skills in the field of electronic banking services. The results also suggested the growth of students' acceptance of electronic banking and related services after completing the course.

Finally, also students' feedback on the course was gathered and also indicated that the course was beneficial to course participants. It also served for collecting the suggestions for amendments within the course for subsequent years.

The ESB course uses various ICTs to provide education in the field of electronic services in banking with an emphasis on their secure usage. According to our results, the ESB course is effective and it increases the acceptance of electronic banking by its participants.

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