E-inclusion measurement by e-learning course delivery

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Abstract

Our purpose was to identify how practical uses of digital skills could be improved in the context of an e-learning course. For this purpose, we identified certain variables to be correlated for practical use probability as a guide for their effectiveness for e-learning quality assessment. The study identified the following variables: instructor support, student interest, self-evaluations performed by the students in content knowledge before and after the topics of the e-course, and a quality evaluation of the e-learning environment and materials. The study was based on evaluating a group of five hundred learners. We designed four types of questionnaires and one interview to assess different aspects of the course topics that affect the practical uses of digital skills. The authors applied knowledge management theory and statistical analysis. We developed a formula for multiple linear regression equations for practical uses of digital skills probability and as potential predictors for effective delivery of different topics of an e-learning course. The results indicated that the key factors for determining practical use probability in the e-inclusion model for an e-learning course were: the degree of quality evaluation of the e-learning environment and materials and the degree of student willingness and ability to learn.

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Keywords: Digital divide; E-inclusion; E-learning.

1. Introduction

European Union declared e-inclusion policy aims to include everybody in enjoying the benefits of information and communication technology (ICT). The problem addressed in this study relates to the delay that the e-inclusion process has encountered. The progress report EU Digital Agenda states that there still exists a sharp divide in digital

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use and competence in Europe that may be identified between nations as well as along socio-economic lines although improvements are being made². Lack of digital skills and advanced uses of digital skills are a particularly important issue in a number of countries. There is a gap between knowing and practical uses of digital skills. Learning a new skills and using them are two separate steps³. According to Eurostat, 28% of individuals in the EU have no Internet skills; only 56% of individuals use the Internet for finding information about goods and services, 40% of individuals use the Internet for reading / downloading online newspapers / news magazines, 5% of individuals use the Internet for doing an online course⁴. A lack of digital skills is also an obstacle in the learning process of new digital skills using technologies.

Previous research of e-inclusion focused on providing access to ICT⁵,⁶. Deursen and Dijk⁷ evaluated citizens’ skills to use e-services and have concluded that not all citizens with access to Internet have the skills to use e-services. Nowadays the digital divide goes beyond the issue of access to technology. Focus has shifted from access to ICT to digital skills and the meaningful use of ICT⁸,⁹,¹⁰. The 2010 OECD report stated that a second digital divide separates those with the competencies and skills that benefits from computer use from those without these advantages¹¹.

In this report the authors give a detailed follow-up of the results discussed in the article: Vitolina. I., Kapenieks A. A Study of the e-inclusion process in a real-life e-course delivery context.

2. Knowing – doing gap

We used the theory of knowledge management to conceptualize the e-inclusion process in the context of the meaningful use of digital skills. Knowing refers to knowledge in action¹². In the context of our study, it means digital skills or ability to apply knowledge to complete tasks related to ICT. Doing represents one kind of knowing activity. In our study we considered that doing is the meaningful use of digital skills for business or private needs.

By comparing the differences between digital skills and practical uses of digital skills we determined the knowing-doing gap. We assumed that in the ideal state of practical uses the number of actual users of a certain technology or service converges towards the number of all its potential users¹³.

The Knowing–doing gap is analysed in many fields; for example, industrial management¹⁴, clinical medicine¹⁵, biology¹⁶, chemical engineering¹⁷. Minimal research attention has been directed toward the overcoming of the knowing-doing gap in the area of e-inclusion. According to Nissen¹⁸, the knowing-doing gap can stem from problems with knowledge flows.

3. Knowledge flows and e-inclusion model

A knowledge flow has three crucial attributes: direction (sender and receiver), carrier (medium) and content (shareable)¹⁹. In the context of the e-inclusion process, the knowledge sender is the instructor or the expert of digital skills; the receiver is the student whose digital skills are improved by these means.

Development of ICT has enhanced the importance of technology within the learning process. Nowadays traditional forms of teaching and learning are often substituted by e-learning to achieve better learning outcomes²⁰. The carrier can be the e-learning environment and the Internet. Oye and his colleagues emphasize the role e-learning environments in knowledge transfer; the e-learning environment not only helps students make sense of content, it also enables on-going communication between students and instructors²¹.

Nissen stated that for knowledge to flow at the individual level, the instructor or expert must be willing and able to share; the student must be willing and able to learn; and the organization must be willing and able to help him/her do so²².

We proposed a model in which practical use probability for an e-learning course was determined by the following factors:

- (F1) the degree in which the instructor was willing and able to share knowledge;
- (F2) the degree in which the students were willing to learn; and the learning capacity of the students;
- (F3) the degree in which the organization supported learning development; the degree in which the organization promoted learning.
Factor 1: Instructor’s willingness and ability to share knowledge

The instructor’s willingness to share knowledge is understood as support given to students to facilitate learners’ needs. If students use an e-learning environment then the role of the instructor in sharing knowledge decreases. Knowledge sharing depends on the quality of the content, i.e. learning materials, and the usability of the e-learning environment for convenient use of content and communication with the instructor. In our model we proposed that the instructor’s ability to share knowledge determines the quality of e-course materials and e-learning environment.

Factor 2: Students willingness and ability to learn

There are no well-understood research methods for measuring a student's willingness to learn. We proposed that the willingness to learn is expressed by a student’s show of interest. Interests have been identified as an important motivational construct that influences achievement in learning. According to John Dewey learning results depend on student interests. In our model we determined student willingness to learn digital skills by four types of interests: social, intellectual, professional, private.

A student’s ability to learn was described by previous student experience, which is reflected by their knowledge level. A student previous experience has important role in the model. In constructionist theory, each student constructs new knowledge from his experiences. During learning process the knowledge level of student can increase. We used percentage of knowledge level increase to determine student ability to learn.

The European Union has determined six different basic computer and Internet skills. These include basic computer skills that consist of skills to copy or move a file or folder, copy and paste tools to duplicate or move information within a document, using a basic arithmetic formula in a spreadsheet, compressing files, connecting and installing new devices such as a printer or a modem, and writing a computer program using a programming language. We propose to evaluate these criteria for the e-inclusion model to identify the general level of students’ digital skills.

Factor 3: Organizational support and promotion of learning development

In terms of this study, we assumed that the organization is non-biased against all students. All students have the opportunity to complete an e-course for digital skill improvement. The organization actively supports all students. Therefore we excluded the organization from the purpose of our study.

4. Purpose of the study

Our purpose was to identify how practical uses of digital skills could be improved in an e-learning course. For this purpose, we identified certain variables to be correlated in practical use probability to determine their effectiveness. We used the following variables: instructor support; student interests; self-evaluations performed by students in content knowledge before and after the topic of the e-course; and usability of e-learning environment and materials.

5. Method

5.1. Participants

The participants included 500 students in the blended e-learning course “Improvement of ICT skills”. They were teachers of vocational schools.

Based on student inquiry the blended e-learning course contains the most important topics for vocational teachers to develop digital competence for the twenty-first century. The topics for the course related to the improvement of instrumental knowledge and skills for tool and media uses, advanced skills and knowledge for communication, information management, and learning and meaningful participation in a knowledge society. We analysed ten: Setup of peripherals, Image scanning, Web page design, PDF files, Computer security, MS Access, Video processing, E-learning materials, Social networks, and E-mails. Each topic included theoretical material in video and...
text format and tests for knowledge assessment. Moreover it consisted of practical exercises that are important for bridging the gap between knowing and doing.

5.2. Measures

We designed four types of questionnaires to assess different aspects that affect the practical uses of digital skills:

- One questionnaire was in the beginning of the e-learning course. It contained 22 items used in our study: 8 questions from a Likert-type scale (ranged from 1 - disagree very strong to 5 – agree very strong) questions; 13 Yes/No questions; 1 multiple-choice question. This questionnaire collects information about age, gender, students' digital skill level and interests to participate in e-learning course for digital skill improvement;
- Ten questionnaires were in the beginning of the each topic of the e-learning course. They contain only Likert-type scale (ranged from 1 - disagree very strong to 5 – agree very strong) questions to assess students' knowledge level before learning of specific topic. Number of questions depended upon the specific topic;
- The next ten questionnaires were given at the end of each topic. They also contained Likert-type scale (ranged from 1 - disagree very strong to 5 – agree very strong) questions. Five items assessed e-learning materials related to the topic. Other questions covered students' knowledge acquisition level after learning a certain topic. A number of the questions related specifically to learning topics;
- The last questionnaire was at the end of the course. We used 17 Likert-type questions on a scale that ranged from 1 - disagree very strong to 5 – agree very strong. Thirteen questions related to prediction about digital skills uses for private or business needs. Three questions assessed the e-learning environment, and the last question related to evaluation of instructor willingness to share knowledge.

Additionally, we designed a telephone interview to obtain data about the practical uses of digital skills after completing the e-learning course. It contained 10 items; there was one question for each course topic. For each topic the students were classed in the following categories:

- Did not practically use the digital skills after completing the e-course. For example, if the student did not use social networks after the e-learning course then the student indicated in the interview that he did not use the topic Social networks;
- After completing the e-course practically used the digital skills but did not practically use the skills learned in the e-course. For example, student had skills before learning Social network topics such as how to create a Twitter account and how to use Twitter. During the e-course the student learned how to create a Facebook account and how to use Facebook. If we observed that the student used Twitter but not Facebook (newly acquired skills) after the e-course, then the student indicated on the interview that he did not use newly acquired skills for this topic;
- After completing the e-course practically used the digital skills that were learned in the e-course. For example, if a student used Facebook after completing the e-course then he indicated on the interview that he used newly acquired skills.

Predictors. One predictor was instructor willingness and ability to share knowledge during the e-learning course for improvement of digital skills. This was measured by three independent variables: (I) students' evaluation of instructor support in classroom seminars and in the e-learning environment; (II) students' evaluation of e-learning materials of course; (III) students' evaluation of e-learning environment.

The second predictor was student willingness and ability to learn digital skills during the e-learning course for improvement of digital skills. This predictor was measured by two independent variables: (I) student self-evaluation of their interests (social, intellectual, professional, and private) to learn digital skills; (II) student ability to learn digital skills that is calculated by student self-evaluation of their knowledge level before and after the topic and percentage of increase of knowledge after the topic.
**Criterion Variables.** Practical uses probability is criterion. Practical uses probability we determined by three variables: (I) students’ prediction of digital skills practical uses (by means of the questionnaire), (II) observed uses of digital skills (by means of the telephone interviews) and (III) combination of predicted and observed uses.

5.3. Procedure

**Data collection.** We collected the data from the students by means of questionnaires administered from January 2012 until April 2012. The questionnaires were a section part of the blended e-learning course for digital skills improvement and could be accessed through Moodle. Moreover, we conducted interviews by phone from March 2012 until May 2012 to determine to what extent practical uses of learned digital skills were applied four to twelve weeks after the course. The number of respondents for each topic differs from 62 to 86 because the completion of questionnaires was voluntary.

**Data analysis.** The authors employed correlation and regression calculations with SPSS for Windows (version 19.0) for analysis.

6. Results

The first step in this study was to analyse correlations and exclude variables that had an insignificant relationship to practical use probabilities. Tables 1, 2 and 3 show correlation coefficients for all the topics.

The authors learned that for all the topics of Factor 1: Instructor willingness and ability to share knowledge, the evaluation of e-learning materials and e-learning environment is useful as a predictor for calculations of linear regression in case of predicted uses. Correlations are in the range of .36 to .64. Instructor willingness to share knowledge is useful for calculations of linear regressions that also falls in the range of .28 to .41. For three topics (Social networks, Computer security, and Web page design) the correlation between predicted uses and instructor willingness to share knowledge is insignificant. That means that the instructor’s willingness to share knowledge cannot be correlated with the predictors of these topics.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Predictor</th>
<th>IWS (**)</th>
<th>eLM (**)</th>
<th>eLE (**)</th>
<th>SWL (**)</th>
<th>SAL (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral setup</td>
<td></td>
<td>.38(**)</td>
<td>.56(**)</td>
<td>.64(**)</td>
<td>.38(**)</td>
<td>.25(*)</td>
</tr>
<tr>
<td>Video processing</td>
<td></td>
<td>.33(**)</td>
<td>.38(**)</td>
<td>.40(**)</td>
<td>.34(**)</td>
<td>.27(*)</td>
</tr>
<tr>
<td>Social networks</td>
<td></td>
<td>.09</td>
<td>.54(**)</td>
<td>.34(**)</td>
<td>.38(**)</td>
<td>.39(**)</td>
</tr>
<tr>
<td>PDF files</td>
<td></td>
<td>.31(**)</td>
<td>.47(**)</td>
<td>.49(**)</td>
<td>.33(**)</td>
<td>.37(**)</td>
</tr>
<tr>
<td>MS Access</td>
<td></td>
<td>.28(*)</td>
<td>.49(**)</td>
<td>.54(**)</td>
<td>.25(*)</td>
<td>.35(**)</td>
</tr>
<tr>
<td>Computer security</td>
<td></td>
<td>.18</td>
<td>.48(**)</td>
<td>.35(**)</td>
<td>.29(*)</td>
<td>.44(**)</td>
</tr>
<tr>
<td>Image scanning</td>
<td></td>
<td>.34(**)</td>
<td>.37(**)</td>
<td>.53(**)</td>
<td>.23(*)</td>
<td>.26(*)</td>
</tr>
<tr>
<td>WEB page design</td>
<td></td>
<td>.24</td>
<td>.44(**)</td>
<td>.36(**)</td>
<td>.34(**)</td>
<td>.36(**)</td>
</tr>
<tr>
<td>E-learning materials</td>
<td></td>
<td>.32(**)</td>
<td>.59(**)</td>
<td>.38(**)</td>
<td>.34(**)</td>
<td>.47(**)</td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
<td>.41(**)</td>
<td>.60(**)</td>
<td>.63(**)</td>
<td>.30(**)</td>
<td>.11</td>
</tr>
</tbody>
</table>
Moving on to Table 2, it can be seen that observed uses reflects two topics where the correlation coefficients are of middling size. Student willingness to learn, however, provides useful predictions for observed uses in the computer security topic (.32) and in the e-learning materials topic (.36).

The authors also identified correlations for Factor 2, student willingness and ability to learn that is presented in Table 1. In this table, the correlations indicated that student willingness to learn and their ability to learn are useful predictors for almost all of the topics. Their correlations fall into the ranges of .30 to .47.

In the third table, the correlations combine predicated and observed uses as well as potential predictors. Similar to predicted uses, the combined predicated and observed uses evaluate the e-learning environment, the e-learning materials and offer reliable predictors for most topics. Correlations are in the range of .32 to .60. Student ability to learn has the correlations of middling size for most of the topics and offer useful predictors for these topics. The range is .30 to .49. The instructor’s willingness to share knowledge and student willingness to learn do not offer reliable predictions for most topics because the correlations are weak. Instructor willingness to share knowledge has three topics with medium size correlations; these are Peripheral set-up that shows .36 correlation, E-mail that has .38, and E-learning materials with .31. The predictor student willingness to learn includes five topics where the

Table 2. Correlations of observed uses and predictors.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Predictor</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IWS</td>
<td>eLM</td>
<td>eLE</td>
</tr>
<tr>
<td>Peripheral setup</td>
<td>.14</td>
<td>.23</td>
<td>.15</td>
</tr>
<tr>
<td>Video processing</td>
<td>-.15</td>
<td>.02</td>
<td>.17</td>
</tr>
<tr>
<td>Social networks</td>
<td>.15</td>
<td>.30</td>
<td>.15</td>
</tr>
<tr>
<td>PDF files</td>
<td>.09</td>
<td>.17</td>
<td>.20</td>
</tr>
<tr>
<td>MS Access</td>
<td>.01</td>
<td>.15</td>
<td>.14</td>
</tr>
<tr>
<td>Computer security</td>
<td>.26(*)</td>
<td>.09(*)</td>
<td>.02</td>
</tr>
<tr>
<td>Image scanning</td>
<td>-.09</td>
<td>.19</td>
<td>.11</td>
</tr>
<tr>
<td>WEB page design</td>
<td>.03</td>
<td>-.16</td>
<td>-.10</td>
</tr>
<tr>
<td>E-learning materials</td>
<td>.14</td>
<td>.30(*)</td>
<td>.18</td>
</tr>
<tr>
<td>E-mail</td>
<td>.04</td>
<td>.13</td>
<td>.07</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

IWS- Instructor's willingness to share. eLM- e-learning materials. eLE- e-learning environment
SWL- Student's willingness to learn. SAL – Student ability to learn.
correlations are of medium size. These include: Peripheral setup .36, Computer security .41, E-learning materials .44, Video processing .31, Social networks .34.

Table 3. Correlations of the combination of Predicted uses & Observed uses and predictors.

<table>
<thead>
<tr>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic</td>
<td></td>
</tr>
<tr>
<td>Peripheral setup</td>
<td>.36(**)</td>
</tr>
<tr>
<td>Video processing</td>
<td>.18</td>
</tr>
<tr>
<td>Social networks</td>
<td>.13</td>
</tr>
<tr>
<td>PDF files</td>
<td>.26(*)</td>
</tr>
<tr>
<td>MS Access</td>
<td>.22</td>
</tr>
<tr>
<td>Computer security</td>
<td>.29(*)</td>
</tr>
<tr>
<td>Image scanning</td>
<td>.22</td>
</tr>
<tr>
<td>WEB page design</td>
<td>.21</td>
</tr>
<tr>
<td>E-learning materials</td>
<td>.31(**)</td>
</tr>
<tr>
<td>E-mail</td>
<td>.38(**)</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

IWS- Instructor's willingness to share. eLM- e-learning materials. eLE- e-learning environment

SWL- Student's willingness to learn. SAL – Student ability to learn.

In order to learn the extent to which the predictors for practical uses probability may be assessed a stepwise multiple regression analysis was computed and thus the problem of multi-collinearity was avoided.

The results shown on Table 4 and 5 demonstrate that the models are significant (p < 0.005) for all the topics.

Table 4. R Square and the significance of linear regression model of predicted uses.

<table>
<thead>
<tr>
<th>Topic</th>
<th>R Square</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral setup</td>
<td>.462</td>
<td>.000</td>
</tr>
<tr>
<td>Video processing</td>
<td>.211</td>
<td>.000</td>
</tr>
<tr>
<td>Social networks</td>
<td>.347</td>
<td>.000</td>
</tr>
<tr>
<td>PDF files</td>
<td>.299</td>
<td>.000</td>
</tr>
<tr>
<td>Access</td>
<td>.343</td>
<td>.000</td>
</tr>
<tr>
<td>Computer security</td>
<td>.228</td>
<td>.000</td>
</tr>
<tr>
<td>Image scanning</td>
<td>.284</td>
<td>.000</td>
</tr>
<tr>
<td>Web page design</td>
<td>.190</td>
<td>.000</td>
</tr>
<tr>
<td>E-learning materials</td>
<td>.353</td>
<td>.000</td>
</tr>
</tbody>
</table>
The R Square presented in table 4 and table 5 indicate how much variation can be identified in predicting practical uses probability. The table shows that the models that allow for the deduction of predicted uses can be explained 19% to 46.2% of the total number of variations. The highest percentages of variations were for the topics Peripheral setup, E-mail, E-learning materials. The lowest percentages were for such topics as Web page design and Video processing.

The R square table shows that models for deducing the combined predicted and observed uses variables can be identified 13.1% to 43.2% of the total number variations. Again, such topics as Peripheral setup, E-mail, and E-learning materials have the highest percentage. The topic Web pages design, however, has the lowest percentage of identified variations.

Table 5. R Square and the significance of linear regression model of predicted uses.

<table>
<thead>
<tr>
<th>Topic</th>
<th>R Square</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peripheral setup</td>
<td>0.382</td>
<td>.000</td>
</tr>
<tr>
<td>Video processing</td>
<td>0.167</td>
<td>.000</td>
</tr>
<tr>
<td>Social networks</td>
<td>0.397</td>
<td>.000</td>
</tr>
<tr>
<td>PDF files</td>
<td>0.28</td>
<td>.000</td>
</tr>
<tr>
<td>Access</td>
<td>0.236</td>
<td>.000</td>
</tr>
<tr>
<td>Computer security</td>
<td>0.309</td>
<td>.000</td>
</tr>
<tr>
<td>Image scanning</td>
<td>0.226</td>
<td>.000</td>
</tr>
<tr>
<td>Web page design</td>
<td>0.131</td>
<td>.0004</td>
</tr>
<tr>
<td>E-learning materials</td>
<td>0.432</td>
<td>.000</td>
</tr>
<tr>
<td>E-mail</td>
<td>0.427</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 6. Included predictors for regression models of predicted uses.

<table>
<thead>
<tr>
<th>Number of predictors</th>
<th>Factors included</th>
<th>Predictors</th>
<th>Topic</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Factor 1</td>
<td>eLM</td>
<td>Web page design</td>
<td>PU= 0.837+0.629eLM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e-learning materials</td>
<td>PU= 1.676+0.656eLM</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer security</td>
<td>PU= 1.496+0.729eLM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Factor 1</td>
<td>eLE</td>
<td>Image scanning</td>
<td>PU= 1.106+0.696eLE</td>
</tr>
<tr>
<td>2</td>
<td>Factor 1</td>
<td>eLM, eLE</td>
<td>Peripheral setup</td>
<td>PU=0.189+0.358eLM+0.617eLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Access</td>
<td>PU=0.255+0.342eLM+0.527eLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Email</td>
<td>PU=1.184+0.356eLM+0.466eLE</td>
</tr>
<tr>
<td></td>
<td>Factor 2</td>
<td>eLE, SWL</td>
<td>Video processing</td>
<td>PU=0.506+0.453eLE+0.401SWL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PDF files</td>
<td>PU=1.603+0.512eLE+0.009SAL</td>
</tr>
</tbody>
</table>
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IWS - Instructor's willingness to share. eLM - e-learning materials. eLE - e-learning environment. SWL - Student's willingness to learn. SAL – Student ability to learn. PU – Predicted uses.

Of the five selected potential predictors that varied according to topic, only one or two fit into the equation of the linear regression model. The predictor instructor willingness to share knowledge was excluded from all of the topics. Other predictors were included in the model, but the number of predictors differed for topics one and two. Tables 6 and 7 present predictors for regression models of predicted uses as well as the combination of predicted and observed uses.

Most topics have two predictors for the multiple regression model of predicted uses. Evaluation of e-learning materials is the predictor for three topics: Web page design, E-learning materials, and Computer security. Evaluation of the e-learning environment is a predictor for the Image scanning topic.

Table 7. Included predictors for regression models for the combination of predicted and observed uses.

<table>
<thead>
<tr>
<th>Number of predictors</th>
<th>Factors included</th>
<th>Predictors</th>
<th>Topic</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>eLE</td>
<td>Video</td>
<td>processing</td>
<td>PU&amp;OU=1,703+0,720eLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Image</td>
<td>scanning</td>
<td>PU&amp;OU=2,550+0,741eLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Access</td>
<td></td>
<td>PU&amp;OU=0,808+0,851eLE</td>
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<tr>
<td>Factor 2</td>
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<td>PU&amp;OU=2,662+0,019SAL</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<td>Computer security</td>
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</tr>
<tr>
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</tr>
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</table>

IWS- Instructor's willingness to share. eLM- e-learning materials. eLE- e-learning environment. SWL- Student's willingness to learn. SAL – Student ability to learn. PU&OU – Combination of predicted and observed uses.
The pair of variables: evaluation of e-learning materials and environment are predictors for three topics: Peripheral setup, Access, E-mail. The topic Video processing had the following predictors: evaluation of e-learning materials and student willingness to learn.

The topic PDF files for the predicted uses model had the following predictors: e-learning environment and student ability to learn. The topic Social networks had such predictors as evaluation of e-learning materials and students’ willingness to learn.

Fig. 1 demonstrates which factors are most important as predictors in the linear regression equation. The most important predictors for predicted uses are the following independent variables: evaluation of e-learning materials and evaluation of the e-learning environment. The factor instructor’s willingness to share does not infer predicted uses. Factor 2: Student’s willingness and ability to learn does not impact uses at all as the most important predictor. However, the linear equation for combined observed and predicted uses as most important factors includes both factors.

![Fig. 1. The most important predictors in the multiple regression model for predicted uses and for combination of predicted and observed uses.](image)

Similar to the predicted uses regression model, as is found of the combination of predicted and observed uses model, most of the analysed topics have two predictors. The evaluation of the learning environment is a predictor for Video processing, Image scanning, Access topics.

Student ability to learn is predictor for the Web page design topic. Other topics have two predictors. E-learning materials and environment are predictors for Peripheral setup and E-mail. E-learning materials and student ability to learn are predictors for Social network topic. Evaluation of e-learning material and student willingness to learn are predictors for topic: E-learning materials. Topic PDF files has the following predictors: evaluation of the e-learning environment and student ability to learn. The Computer security topic has the predictors Student willingness to learn and students’ ability to learn.

The last column of Table 6 presents linear regression equations for predicted uses. The authors found evidence that Factor 1 Instructor willingness to share knowledge and ability to share knowledge determines the linear regression equation for seven of the topics. However, both factors are included in the linear regression equation for the other three topics.
Table 7 indicates linear regression equations for combination of predicted and observed uses in the last column of the table. Factor 1 is predictor for three topics: factor 2: Student willingness and ability to learn is predictor for two of the topics. Both factors are included in the linear regression equation for five topics.

Figure 2 demonstrates the most often used predictors in the multiple regression model for predicted uses and for the combination of predicted and observed uses. The most often seen predictor in the linear regression equation for predicted uses is evaluation of e-learning materials (eLM) 43.75%. Then follows evaluation of e-learning environment (eLE) 37.5%. Student willingness to learn (SWL) is a predictor in 12.5%, but student ability to learn (SAL) is a predictor only in 6.25% of the cases.

Fig. 2. The most often used predictors in the multiple regression model for predicted uses and for combination of predicted and observed uses.

Fig. 2 presents that compared to predicted uses in the linear regression equation of combination of predicted and observed uses the most often predictor is evaluation of e-learning environment – 37.5%. Evaluation of e-learning materials and student ability to learn are predictors in 25% cases, but student willingness to learn in 12.5% of cases.

7. Conclusions

After submitting the various factors and topics to linear regression analysis, the authors found that the course they had taught on e-learning digital skills had various different predictors for practical use probability. It was also found that the student response and evaluation of the e-learning environment and e-learning materials more often were predictors for practical use probability in the e-course context.

Another outcome of the authors' analysis showed that student willingness and ability to learn served as predictors, but their impact on the regression model was less than the impact of the predictors mentioned above. This result is especially relevant because in the topic student willingness and ability to learn has low impact on the linear regression equation in assessing predicted uses of the learned digital skills.

Other results showed that instructor willingness to share knowledge is not a predictor in the study. These results confirm that the predictor’s student willingness and ability to learn and evaluation of the e-learning environment and materials varied among users. The predictor instructor willingness to share knowledge was constantly at a high level because of well-established procedures for instructor selection. The study indicated that practical use probability in
the e-inclusion model for an e-learning course was determined by the following factors: the degree of evaluation of the e-learning environment and materials and the degree of student willingness and ability to learn.

References