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Courses of Information Technologies and Statistics for the Students of Health Care

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ABSTRACT

The assessments in Information technologies and Statistics courses are high (Me=8 in ten-point system) in Latvian Universities. Taking into consideration the importance of these courses, the authors have introduced some changes in the content and teaching techniques in order to enhance the level of knowledge. The changes are as follows: more attention was paid to the classification of data processing situations; examples related to the speciality were introduced and data were generated; during the course of time, the proportion of the European Computer Driving License (ECDL) content in contact hours with students was changed. Authors have found out that these changes have improved the assessments of Information technologies and Statistics courses.

Keywords: Information Technologies, Statistics, Study Courses

1. INTRODUCTION

At colleges and universities, it is of great importance to prepare highly educated specialists in health care or social sciences. One of the most important criteria in this aspect is computer skills at the appropriate level. The courses of information technologies (IT) and statistics affect the student' s activities in the future – developing of the diploma thesis and job opportunities. According to the authors' studies, assessments of informatics and statistics courses in Latvian colleges and universities are high – their median is 8 in a ten-point system. However, students' knowledge and skills can be improved, and assessments could reach the median 9. As the studies show, the best way to achieve the goal is, first, a choice of adequate method of the data processing, second, interpretation of results. First of all, the assessment of students' knowledge must be scientifically substantiated to be further improved. Nowadays, assessment usually is by means of computer based tests (CBT). Starting from 2006, the authors undertook research on the usage of CBT in IT and statistics. CBT in association with the speciality and authors experience were approbated and the obtained results were studied of 49 students [4]. These were multiple choice tests with one correct answer. In the course of time, the tasks were varied. Many scientific articles were published about CBT, for example [6]. However, IT and statistics have specific peculiarities which should be taken into account when developing tests:

- Influence on the developing of the diploma thesis and job opportunities in the future.
- Tasks where opinions might differ.
- Different classification schemes are created for the choice of adequate method of the data processing [1, 3]. Therefore, further studies are necessary for developing tests in IT and statistics courses.

The present article deals with the problem about the improvement of students' choice of adequate method of the data processing and interpretation of results. The contribution of the authors in the enhancement of students' level of knowledge is described. The authors have used different methods in order to enhance the students' level of knowledge as follows:

- use of the data generated in relation to speciality in the teaching process;
- use of different proportion versions of the ECDL content in contact hours;
- use of additional data classification schemes with different number of situations;
- creating of questionnaires with generated data and their filling out.

The authors used the following methods:

- 13 academic staff members of Latvian Universities were inquired about the solving tasks in IT and statistics where opinions might differ; these evaluations were used to assess the students' computerized tests and research [5].
- Literature sources were analyzed about the usage of suitable data processing methods. The obtained results were used to evaluate the students' work [7, 8].
- Spearman correlation coefficients and their p values were calculated (Table 1) for evaluation of the research carried out depending on the year of studies at the College; between assessments of IT and statistics and factors affecting them at the College and Universities.

Aim of the research. To improve assessments of IT and statistics to the median 9.

Hypothesis of the research. Assessments of IT and statistics are affected by:

- use of the data generated in relation to speciality in the teaching process;
- proportion of ECDL content in contact hours;
- additional data classification schemes given by the authors;

- data processing situations number of classification;
- creating of questionnaires with generated data and their filling out.

2. MATERIALS AND METHODS

The authors have surveyed documents of the Red Cross Medical College of Riga Stradins University (RCMC) [1] where grades in informatics and statistics of 939 graduates of Nursing and Medicine departments were registered. The graduates had studied for three years. The average grade in IT and statistics was used. Also, the authors have surveyed 1,420 students of two Latvian Universities; a total of 2,359 students.

The data of students both in total and by groups were not normally distributed (Kolmogorov–Smirnov test, $p<0.001$). Therefore, Spearman correlation was used. The authors used the following methods:

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3. RESULTS

The authors have analyzed various schemes of the classification of data processing situations.

The simplest version with two situations:

- Qualitative data (it is recommended to calculate valid n, frequencies ni in case the number of investigated objects is at least 30, then valid percent p1), for example gender: 1 – woman, 2 – man.
- Quantitative data (it is recommended to calculate mean M, standard deviation SD, n), for example stature (height), cm.

After that, the next level with four situations:

- Dichotomous scale (any questions, answers to which are 0 – no, 1 – yes), for example 0 – do not smoke, 1 – smoke.
- Nominal scale with more than two answer varieties (answer varieties have no arrangement), for example eye colour 1 – gray, 2 – blue, 3 – green, 4 – brown, 5 – other.
- Ordinal scale (assessments in points, answer varieties have arrangement), for example a self-evaluation of lifestyle in a 5-point system, 1 – very unhealthy, 5 – very healthy.
- Quantitative data.

The authors have used variations with two and four situations for the 1st year students of RCMC. If the students knew the notion of a normal distribution, the authors used a measurement scale arrangement as follows:

- Dichotomous scale.
- Nominal scale with more than two answer varieties.
- Ordinal scale.
- Quantitatively, not normally distributed data.
- Quantitatively, normally distributed data.

In order to develop scientifically based evaluation system for IT and statistics courses, the authors applied the experts' opinion, a classification scheme of data processing situations, a measurement scale arrangement, and literature analysis [7, 8]. An assessment system was introduced according to which statistical data were divided into groups:

- Mandatory indicators, for example if the normal distribution was checked by using any of the criteria, then the mean and standard deviation must be indicated; if the data distribution is not known or does not correspond to the normal distribution, then median and quartiles must be indicated.
- Optional indicators, for example skewness.
- Undesirable parameters, for example mean of dichotomous data.

The following results of Spearman correlation analysis were obtained for IT and statistics assessments. They show what factors have a statistically significant effect on the assessments of IT and statistics courses at the College (Table 1) and Universities (Table2).

Table 1: SPEARMAN CORRELATION ANALYSIS AT THE COLLEGE

	College n=939	
	r	p
Year	0.077	0.018
Data related to speciality	0.130	<0.001
Amount of ECDL in contact hours	0.132	<0.001

Table 2: SPEARMAN CORRELATION ANALYSIS AT THE UNIVERSITY

	College n=1,420	
	r	p
Year	0.117	<0.001
Data related to speciality	0.036	<0.001
Amount of ECDL in contact hours	-0.188	<0.001
The classification of data processing situations created by authors	0.008	0.002
Creating of questionnaires and data generation	0.108	<0.001

Both at the College and Universities, assessments of IT and statistics tend to enhance (r_1=0.077, p_1=0.018; r_2=0.117, p_2<0.001, respectively). In the graph, the arithmetic mean of assessments of IT and statistics are depicted yearly at the College and Universities (Figure.1) that illustrates the increase of assessments the best.

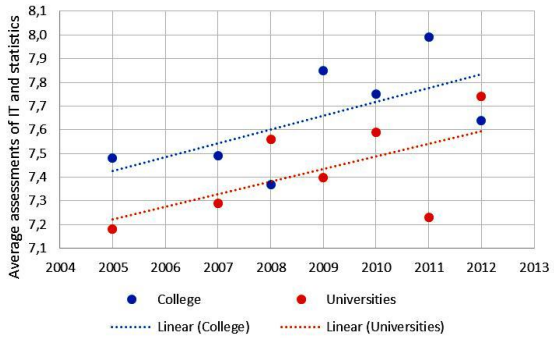

Figure 1: Average assessments of IT and statistics

At the College, the larger proportion of ECDL content during the contact hours, the higher assessments of IT and statistics are (r=0.132, p<0.001). At Universities, there is an opposite tendency, namely the larger proportion of ECDL content during the contact hours, the lower assessments of IT and statistics are (r =–0.188, p<0.001). The authors have observed that at Universities, the academic staff tends to decrease the ECDL content acquisition during the contact hours. According to the authors' experience, most part of the students are able to learn and rewise the needed information independently. At Universities, the classification schemes of data processing situations were offered to a part of students from literature, another part of students were additionally offered schemes created by the authors. The classification schemes of data processing situations created by the authors affected positively results of assessments of IT and statistics. At Universities, part of students (810 of 1,420 or 57%) were given schemes from textbooks (r=0.080, p=0.002). The others were additionally given schemes worked out by the authors. Assessments of IT and statistics were not affected by the number of situations given in the classification scheme (Spearman correlation, p>0.05).

In order to facilitate the acquisition of IT and statistics, various classification schemes of data processing situations are created in the world, for example [1, 3]. However, the authors could not find any information how these schemes affect the students' success in acquiring knowledge. Exactly this aspect was an important reason of the present research.

At Universities, classification schemes of data processing situations were given from literature sources with 14 and 103 situations. Assessment medians of IT and statistics did not differ statistically significantly (Mann–Whitney test, n_1=799, n_2=11, p=0.170; Spearman correlation r=–0.048, p=0.810).

In addition, at Universities, classification schemes of data processing situations created by the authors were given with 31, 35, 42, and 61 situations. Assessments of IT and statistics did not depend on the number of situations, however the highest average assessment 8.1 was reached at 42 situations (Spearman correlation r=0.066, p=0.105, n=610).

Developing of questionnaires by students and filling them out with generated data took place only at Universities, this resulted in a positive effect on the assessments of IT and statistics (r=0.108, p<0.001). For the acquisition of statistics course, tables with a large amount of data are needed, however, according to the respondents' opinion, data cannot be obtained in a short period of time. That is why the questionnaires developed by students were filled out with created data.

4. CONCLUSION

Due to the authors' activities, assessments of IT and statistics during the course of time have a statistically significant high increase.

The authors' advanced hypothesis has proved true partly:

- use of generated data related to specialty in the teaching process at the College affects IT and statistics assessments positively, while at the Universities it does not have a positive effect;
- at the College, the larger is the proportion of ECDL content in contact hours, the higher are the IT and statistics assessments;
- at Universities, the larger is the proportion of ECDL content in contact hours, the lower are the IT and statistics assessments;
- data classification schemes given additionally by the authors affect positively assessments of IT and

statistics;

- number of data processing situations in the classification scheme does not affect assessments of IT and statistics;
- developing of questionnaires and filling them out with generated data affect positively assessments of IT and statistics.

The following tasks should be done in the future:

- at the college, the proportion of ECDL content should be increased in contact hours as much as possible; also due to the fact that many of the students enter the college after some time has passed when they finished the secondary school;
- at the University, ECDL should be covered with the accent on some important aspects of the design of the research paper allowing students to study the ECDL issues independently;
- during the teaching process, additional data of classification schemes should be given; the number of situations is not important, but they must be comprehensible to the students;
- developing of specialty related questionnaires and filling them out with generated data.

Specialty related questionnaires and generated data are recommended to be introduced into the teaching process.

Nowadays, the ECDL content in contact hours of IT and statistics courses gradually loses its topicality, for that reason you can assign students to revise ECDL independently emphasizing the most important topics regarding research.

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