ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 437

International Scientific Conference "Digitalization of Education: History, Trends and Prospects" (DETP 2020)

Digital Education Competencies: Power Query

Nazarov D.M. Nazarov A.D.* Kondratenko I.S.

Ural State University of Economics, Ekaterinburg 620144, Russia
**Corresponding author. Email:* nazarov_usue@mail.ru

ABSTRACT
The article provides a method of teaching Power Query technology, implemented as part of the Federal State Educational Standard for Higher Education 3 ++ by professional standards in the direction of the bachelor's program "Business Informatics". The authors provide a set of laboratory works in the form of situational tasks and cases for the formation of professional competencies in the aspect of processing data of various types using Power Query technology. The use of situational tasks and cases helps to develop a range of professional competencies that are elements of generalized labor functions: bachelors learn to use the basic elements of Power Query technology, gain skills related to the application of the studied technology in performing professional tasks stipulated by a professional standard. The material considered in the tasks is not specifically linked to any discipline. The methodology is presented in the form of traditional Key-by-Key technology, widely used in teaching information technology.
Keywords: *professional standards, competencies, case study, situational task, Power Query, ETL process, labor functions, business informatics, business analytics, Excel, request*

1. INTRODUCTION

The development of society at the present is impossible without the use of modern information technologies. Over the past half-century, technology has changed our lives and opened up a new market and educational opportunities. The role of information technology has become important: at first, they turned the traditional economy into information, then into collaborative and, finally, into digital. We can note the process of digitalization of the educational system that has begun. This process has two important trends: the development of digital technologies, organizational and substantive changes in the education system.

The education system of Russia is indeed in a state of renovations associated with the transition to new federal state educational and professional standards. The modern labor market makes serious demands on the professional competencies of a specialist, who are becoming more formalized and practice-oriented [1,2].

The following trend can be noted in the system of Russian education: the transition to new federal educational standards is carried out taking into account professional educational standards. In this dual system, under the influence of digital technologies, it is necessary to develop the modern content of education, taking into account the competency-based approach.

2. EXPERIENCE IN USING PROFESSIONAL AND FEDERAL STATE EDUCATIONAL STANDARDS IN THE FIELD OF "BUSINESS INFORMATICS"

Carrying out the preparation of bachelors and masters in the field of "business informatics", it is necessary to focus on the system of professional competencies within the framework of the Federal State Educational Standard of Higher Education - undergraduate in the direction of training 03.03.05 Business Informatics, the master's degree in preparation of 04.04.05 Business informatics and the system of labor functions provided for by the professional standard 08.037 "Business Analyst". When developing the content of education, teachers should focus on the dual-link: "labor market requirements (professional standards) - educational system requirements (Federal state educational standards 3 ++)" [3, 4, 5].

Let's consider in more detail the conceptual foundations of a professional standard. Any professional standard implies the allocation of a professional type of activity, the formulation of the main goal of the type of activity and labor functions per the level of qualification (the fifth level of qualification corresponds to secondary vocational education, the sixth level to higher education (bachelor's degree), and the seventh level to higher education (master's degree)). The professional standard also prescribes the possible names of specialist positions in the economic sector [6].

In the professional standard 08.037 “Business Analyst”, a specialist with higher education can occupy the positions of “leading business analyst” and “chief business analyst” [7]. By analyzing the labor functions corresponding to these positions and the level of qualification, it becomes clear that the main difference between such specialists is the ability to formalize the decision-making process, the skills to choose the optimal solution to the problem, and the process of managing changes in the organization.
Within the framework of the work programs of the Federal State Educational Standards 3 ++, the following forms of intermediate and final control are provided: test, situational task, case. With a competency-based approach, training, in our opinion, should be based on situational tasks and cases - they allow a more comprehensive assessment of the level of students' competence (technological, substantive, organizational component).
The practice of using situational tasks and cases has confirmed the effectiveness in the training of business analysts. The methodology proposed below, aimed at the formation of professional competencies, is universal, not tied to either the subject, the course, or even the level of training. The methodology implements a cross-cutting approach to the formation of professional competencies and labor functions at the level of the ETL process [9] for the preparation, processing, and data cleaning using the Power Query software product and the corresponding situational tasks and cases.

3. METHODOLOGY OF FORMING BUSINESS ANALYTICS COMPETENCIES AS PART OF THE STUDY OF POWER QUERY TECHNOLOGIES

Lecture 1. Microsoft Power Query for Excel (2 hours). The study of the software product begins with a lecture on the current state of the analytics process in the corporate environment, the stages of this process are identified and each of them is assigned a Microsoft product.
The purpose of this lecture is to identify the limits of applicability of Power Query technology, to show the development of modern digital technologies using Microsoft products as an example.
Students should know:

1. Power Query is a data connection technology that allows you to effectively analyze them in real-time taking into account their variability.
2. Power Query is an effective business intelligence (BI) tool that allows an ordinary Excel user to implement fairly complex management tasks at the level of storage and data storage use.
3. Power Query can connect to multiple data sources, combine and put into one table or Excel data model. This is a complete tool for processing big data [10].

This lecture implements the formation of the “knowledge” part of the competencies of OPK-4, PK-3, PK-18, and generalized labor functions provided for by the professional standard [11,12,13].

To build competencies in the practical use of Power Query, a laboratory work system is provided on the following topics:
Lab. 1. Introduction to Power Query. The simplest queries (2 hours).
Lab. 2. Implementation of the ETL-process of processing data from the Internet using Power Query (2 hours).
Lab. 3. Merging Queries (4 hours)
Lab. 4. Inquiries from various sources (4 hours)
Lab 5. Bulk data loading (4 hours)
We give an example of the contents of typical laboratory work.
Laboratory work 2 (Situational task). Implementation of the ETL process for processing data from the Internet using Power Query (2 hours).
As a source of source data, the web page https://www.imdb.com/chart/boxoffice is used (Fig. 2).

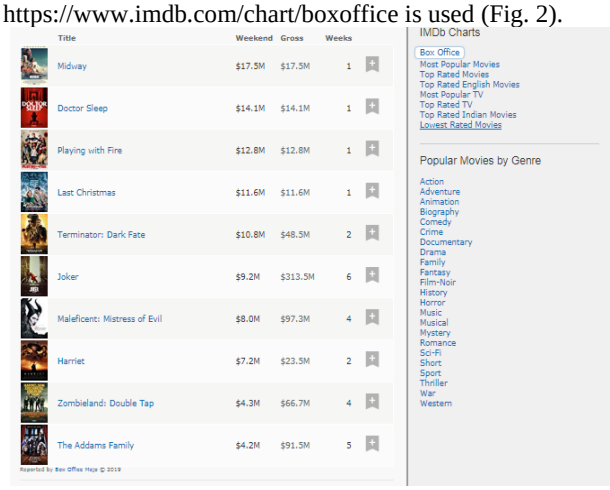


Figure 2 Fragment of a website page [**Ошибка! Источник ссылки не найден.**]

The purpose is to get a constantly updated list of the 10 most profitable films of the week using Power Query technology. The source information is constantly changing due to the updated movie rating on the Internet Movie Database - IMDb.

1.Create a new workbook, and select the command Data-Download & Convert- Create a request- From other sources- From the Internet.

2.The system will prompt you for the address. Enter https://www.imdb.com/chart/boxoffice and click on the OK button.

As shown in fig. 3 in the Navigator dialog box for this URL, three available items are displayed: Weekend of September 6-8, 2019, Table 1, Document. Click on the top element of Weekend of September 6-8, 2019, and information from the site will appear to preview the contents of this element. If its appearance suits you, click on the Change button and the Query Editor window opens. (Think about why in your case the list of films of the top ten will probably not be the same as shown in Fig. 2)

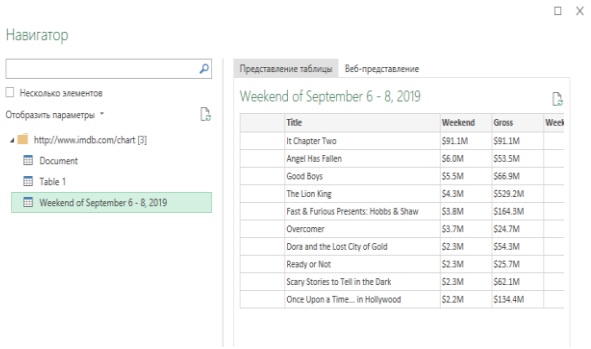


Figure 3 Screenshot of the implemented action in the "Navigator" Power Query window

For this query, six columns will be displayed in the editor window (maybe less, the site design is constantly changing). The first and last of them are empty, so it's better to delete them by choosing Home-Manage columns-Delete columns in the editor window.
The four remaining columns are shown in fig. 4.

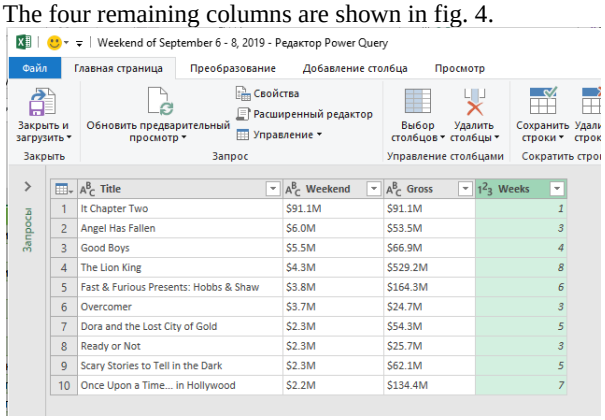


Figure 4 Result of loading web content in Power Query

3. The ETL process starts from this moment and is associated with the conversion of data types and cleaning data from unnecessary characters.
The values in the Weekend and Gross columns are the Text data type. To turn them into numbers, you should remove the "$" signs and the "M" characters from these values. The Power Query tool allows you to solve this problem in different ways (using the context menu or the corresponding commands on the control panel).

a. Click the Weekend column heading, press <Ctrl>, and then click the Gross column heading. This will allow you to select two columns for processing at once.

b. Select the Transform-Any column-Replace values command and remove the "$" character from the values - replace it with a blank character.

c. Repeat the same operation to remove the "M" character from the values.

d. Sales data are presented in the English language format - the symbol "." is used as a separator. So, you need to select the Transform-Any column-Replace values command again and replace the "." symbol in two columns with sums to the symbol ",".

As a result, the values in the columns will be cleared of non-digital characters but will still be of type "Text".

e. We use the Convert-Any column-Data type-Decimal command to convert text values in decimal columns to decimal numbers.

Sales were given in millions of dollars in the source table, so an additional operation is required so as not to distort the "cleared" data.

f. Select the Weekend [15] column heading and select the Transform - Column "Quantity" - Standard-Multiply command. The Multiplication dialog box opens.

g. Enter a factor of 1,000,000 in this window and click on the OK button.

h. Repeat for the Gross column.

The result of all the actions taken is presented in Figure 5.

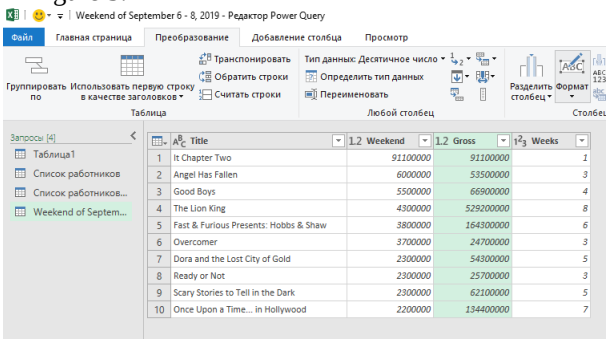
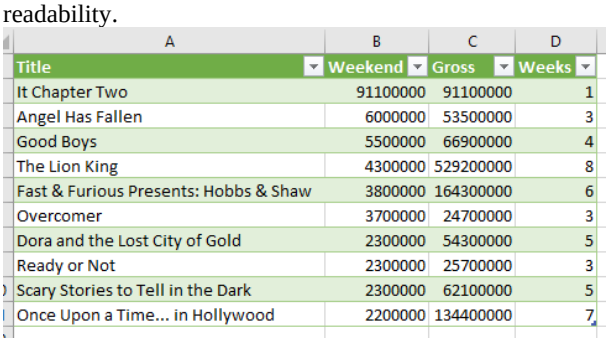


Figure 5 The result of the end of the ETL process in Power Query

Now everything is ready for uploading (importing data) to an Excel worksheet. To implement this process, select the File - Close and Download command in the Query Editor window. Excel inserts the data prepared by the query into your table on a new worksheet. Figure 6 shows such a worksheet. You can optionally apply the desired number format to Weekend and Gross columns to improve readability.



	A	B	C	D
	Title	Weekend	Gross	Weeks
	It Chapter Two	91100000	91100000	1
	Angel Has Fallen	6000000	53500000	3
	Good Boys	5500000	66900000	4
	The Lion King	4300000	529200000	8
	Fast & Furious Presents: Hobbs & Shaw	3800000	164300000	6
	Overcomer	3700000	24700000	3
	Dora and the Lost City of Gold	2300000	54300000	5
	Ready or Not	2300000	25700000	3
	Scary Stories to Tell in the Dark	2300000	62100000	5
	Once Upon a Time... in Hollywood	2200000	134400000	7

Figure 6 The result of importing data into an Excel worksheet

It is useful to draw students' attention to the fact that the rating is updated once a week and next week they should open a file with the result and update the created request. To do this, in the menu Data-Download & Convert- Show request. Select it and update using the context menu (right mouse button).
After completing this work, students receive assignments according to the options (Power Query parses data from the site but not all sites allow it to be done freely. For this, Power Query provides different ways to access the content of the site, taking into account data privacy).

4. CONCLUSIONS

The set of laboratory works presented in this article as part of the implementation of the Federal State Educational Standards 3 ++ in the direction of “Business Informatics”, taking into account the requirements of the professional standard “Business Analytics”, allows creating general professional and professional competencies in the aspect of processing various types of data using Power technology Query to extract data from various sources. This approach allows forming part of the labor functions provided for by the relevant professional standard. The training technique consists of updating the traditional and well-studied process of business analytics using Microsoft technologies that automate data processing. Students master the basic and unique tools of Power Query technology as part of the proposed tasks and cases.
We have proposed a methodology for teaching students in the field of “business informatics”, which allows us to form competencies and labor functions provided for by the standards of the Russian Federation. The experience of implementing such an approach to the formation of competencies during the semester, within the framework of modular technology, confirmed its effectiveness, showed that the proposed set of laboratory work can be used in different disciplines, at different courses, and different educational levels. This can be achieved by changing cases, tasks for independent work, and increasing the number of Power Query technology elements to study.

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