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POZNAŃSKIE STUDIA SLAWISTYCZNE
NR 27 (2024)
DOI: 10.14746/pss.2024.27.12

Data przesłania tekstu do redakcji: 21.02.2024
Data przyjęcia tekstu do druku: 17.09.2024

Mathematical knowledge in the Grand Duchy of Lithuania

Abstract: Rudenka Alena, *Mathematical knowledge in the Grand Duchy of Lithuania*, "Poznańskie Studia Slawistyczne" 27. Poznań 2024. Wydawnictwo "Poznańskie Studia Polonistyczne," Adam Mickiewicz University, Poznań, pp. 239–257. ISSN 2084-3011.

The article is devoted to mathematical knowledge in the Grand Duchy of Lithuania. This fragment of the linguistic worldview of the inhabitants of the GDL is modelled on the basis of the other authors' works and the study of the relevant Ruthenian vocabulary. It is argued that education was widespread due to the multi-confessionalism of the GDL. Ruthenian names for counting and measurement, selected from the dictionaries of the Old Belarusian and Old Ukrainian languages, are considered in the article as a lexical-semantic field with several groups: numbers, arithmetic concepts and operations; units of measurements, weight, currency; types of profits, benefits, taxes. It is concluded that, according to the Ruthenian language, mathematical knowledge in the GDL is represented by: 1) arithmetic concepts and operations; 2) applied knowledge related to agriculture, handicrafts, trade, and social organisation of society; 3) abstract mathematical concepts, denoted by Latin borrowings.

Keywords: linguistic worldview; education; mathematical vocabulary; the Grand Duchy of Lithuania; the Ruthenian language

1. Introduction

The Grand Duchy of Lithuania (GDL), Rus′ and Samogitia (Žemaitija) appeared on the political map of Eastern Europe in the 30s–40s of the 13th c. It arose on the territory of the Naváhradak principality (Naváhradak is the modern Belarusian town of Navahrúdak, where Adam Mickiewicz was born) and began to overgrow, annexing the lands of the surrounding Baltic and Slavic principalities.

The purpose of the article is to describe briefly the education system in the Grand Duchy of Lithuania and to study Ruthenian[1] counting and measuring names. These words were selected from three dictionaries: *Gìstaryčny sloŭnìk belaruskaj movy*. (Minsk, 1982–2017, t. 1–37); *Slovnik staroukraïns′koï movi XIV–XV st.* (Kyïv, 1977–1978, t. 1–2); *Slovnik ukraïns′koï movi XVI – peršoï polovini XVII st.*: u 28-mi vyp. (L′vìv, 1994–2017, vyp. 1–17 A – Mo). The lexico-semantic analysis of these names, together with historical and cultural data, allows us to characterise a fragment "mathematical knowledge" of the linguistic worldview of Ruthenian speakers.

The description of the educational situation in the Grand Duchy of Lithuania is based on previous research – only the necessary minimum of works on the subject is mentioned here. However, in order to model a fragment of the Ruthenian linguistic worldview on counting and measurement, a general characteristic of education and mathematical knowledge is necessary.

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1 We consider the Old Belarusian and the Old Ukrainian languages as one language, at least in the written version, with dialectal differences that are not significant for our study. In the English-speaking tradition it is usually called the Ruthenian language.

Daniel Bunčić wrote: "during the 'middle period' (14th – 18th c.) there was still a common literary language for the ancestors of the modern Ukrainians and Belarusians (and the Rusyns), so that, again, *Middle Ukrainian* and *Middle Belarusian* (Ukr. *староукраїнська мова,* lit. 'Old Ukrainian'; Blr. *старабеларуская мова*, lit. 'Old Belarusian') refer to the same language (though Muscovy already had a distinct literary language)" (Bunčić 2015, 278). And further: "Of course in everyday life each village continued to use its own dialect, but written texts obeyed certain norms that were more or less unified all over the Ruthenian lands" (Bunčić, 2015, 279). It was this written language that was often called *prosta mova* (cf. Latin *lingua rustica*).

2. The educational system of the Grand Duchy of Lithuania

First, we shall briefly characterise education in the Grand Duchy of Lithuania.

By the 14th c., the GDL inherited the education system of Ancient Rus′. In wealthy families, education was provided at home; children from poor families could learn the basics in church parishes. Under the protectorate of the Orthodox Church (the most widespread church in Ancient Rus′), there were elementary schools where children were taught God's law, reading, writing and basic arithmetic. In the Orthodox schools of the Grand Duchy of Lithuania, as well as when taught by itinerant sextons, primary education was conducted in Church Slavonic language with varying degrees of *prosta mova* – pupils were taught to read and write the Cyrillic alphabet. There were also a few schools that provided a more in-depth education. This "orthodox" school tradition continued in the territory of the GDL.

In the 15th c. Latin-language schools began to appear: they operated at Catholic churches and some parishes. "There were more primary schools in cities and towns than in villages. However, since the times of Sigismund the Old, it was rare to find a church in a village without a primary school" (Łukaszewicz, 1749, I, 67. Translation – A.R.). The programme of the parish schools was quite limited: reading, writing, elementary Latin grammar, some Latin psalms, arithmetic and hymns. The cathedral schools were organised on the European model, and their programmes included seven liberal arts – the trivium (Latin grammar, rhetoric, dialectics) and the quadrivium (arithmetic, geometry, music, astronomy). In addition, Catholic rites and the basics of theology were studied. The main language of instruction was Latin; German or Polish could be used as auxiliary languages. Graduates of such schools could continue (and often did) their studies at European universities.

In the 2nd half of the 15th c. – the 1st half of the 16th c. Orthodox education and Western-style Catholic schools coexisted in the Grand Duchy of Lithuania.

From the middle of the 16th c., significant changes took place in the educational system of the Grand Duchy of Lithuania (see Ragauskiene, 2014). These changes were influenced by the Reformation and Counter-

Reformation and were connected with the emergence of new educational institutions of different levels and different religions (only in Christianity there were the Orthodox, Catholic, Protestant, and Uniate ones).

It is known that the Grand Duchy of Lithuania was a multi-ethnic, multi-lingual, and multi-confessional state. This had a positive effect on the educational system and the level of education of the population. Representatives of different Christian denominations were forced to fight for parishioners and they understood very well that commitment to a particular church is formed in childhood. In order to attract children, young people and their families, Orthodox, Catholic, and Protestant schools were opened. The principles of education in all schools were similar. The main aim of education in the initial stage was to teach the relevant religious dogmas and norms, to teach reading (mainly religious texts), and then the basics of writing and arithmetic. Further education was modelled on European schools.

For example, from the end of the 16th c., brotherhood schools began to spread throughout the territory of the Grand Duchy of Lithuania. These were educational institutions founded by Orthodox brotherhoods. The purpose of such schools was to confront the Catholic, Protestant and later the Uniate Church. Education in brotherhood schools lasted 3–5 years. Representatives of all social classes could study there. After receiving a basic education, students began to study "the seven liberal arts". They studied *prosta mova* (the official written language of the GDL), Church Slavonic, Greek, Latin, Polish, works of ancient thinkers, dialectics, rhetoric, and music. Students also received some knowledge of arithmetic, geometry, astronomy, and geography. Particular attention was paid to the study of the Church Slavonic language, which was seen as a means of opposing Catholicism. Despite their orthodoxy, the brotherhood schools were influenced by Jesuit colleges, as well as by Renaissance and Reformation ideas.

"Brotherhood schools used a class-based teaching system, organised theatre performances, and provided the organisation of a choir and musical education. The first such schools appeared in Vilna (c. 1585), Brest (1591), Mogilev (1590–1592), Minsk (1612), Polotsk (1633), and other cities" (Batvìnnìk, 2001, 52. Translation – A. R.).

In 1615 the Kyiv-Mohyla school was founded, based on the Kyiv brotherhood, and in December 1631, the Kyiv-Mohyla Collegium was created. The reforms by the first rector Petro Mohyla turned the Kyiv-Mohyla College into an educational institution focused on the "Latin", Western European educational system modelled on Jesuit educational institutions. Much attention at the college was paid to the study of languages, especially Polish and Latin (the language of instruction). Domestic and world history, literature, poetry, and philosophy were studied. Elementary music theory (on the Western model) and singing, catechism, arithmetic, rhetoric, and theology were also taught here. Children from all social classes were admitted to the college; and the length of the course was twelve years. In 1701 the college received the title of an academy. The Kyiv-Mohyla Academy became the first Orthodox institution of higher education in Eastern Europe to be officially awarded this title.

> The influence of the Reformation on the sphere of education in the Grand Duchy of Lithuania in **the second half of the 16th c. and the first half of the 17th c.** was reflected in the emergence of a large network of Protestant elementary schools. By the end of the 16th c., there were about 300 primary Protestant schools. In the first half of the 17th c., their number gradually declined. During the period under study, 16 Protestant secondary schools operated in the Grand Duchy of Lithuania: one Socinian and 15 Calvinist ones (Tolokonnikov, 2015, 29. Translation – A. R.).

According to Joseph Łukaszewicz, "although the teaching of science in Polish Protestant schools was better than in Catholic schools at that time, although they used better textbooks, including those of Donatus, Priscian, etc., they were not at all suitable for the great purpose of educating good citizens for the country, because in them science was secondary and the main thing was religion" (1849, I, 72. Translation – A. R.).

With the spread of Protestantism on the territory of the Polish-Lithuanian Commonwealth in general and of the Grand Duchy of Lithuania in particular, the influence of the Catholic Church diminished, and the number of Catholic schools decreased accordingly. The

influence of Catholicism began to be restored only with the advent of the Counter-Reformation – at **the end of the 16th – beginning of the 17th c.**, which was facilitated by the activities of the Jesuits in the field of education (Blinova, 2002). The colleges opened by the Jesuits were aimed at educating young people in the Catholic spirit, especially in places where Protestantism and Orthodoxy were widespread. Jakub Niedźwiedź wrote:

> First, they [the Jesuits] provided students with highly qualified teachers and a coherent and effective programme of studies. Secondly, their extensive network enabled young boys to receive humanistic education even in the remotest provinces of the country. Thirdly, the Jesuits offered their education free of charge. Finally, they allowed non-Catholics to study at their colleges. These four advantages of Jesuit schools presented a real challenge to the Protestants and the Orthodox (Niedźwiedź, 2018, 452).

The Jesuits covered the Grand Duchy of Lithuania with a network of educational institutions. The fact that Jesuit colleges taught argumentation and debate gave their graduates an additional advantage in an era of active socio-religious disputes and controversies. In 1579, the University of Vilnius, the first university in the territory of the Grand Duchy of Lithuania, was founded on the basis of the Jesuit College.

The types of schools in Vilnius – according to ethnicity and religion – are presented in the book of Jakub Niedźwiedź *Literacy in Medieval and Early Modern Vilnius: Forms of Writing and Rhetorical Spaces in the City* (Niedźwiedź, 2023, 131–182): in addition to schools of various Christian denominations, Jewish and Tatar ones are also described. Education in Vilnius generally corresponds to education throughout the Grand Duchy of Lithuania.

3. Mathematical knowledge in the Grand Duchy of Lithuania

Secondary and higher education in the Grand Duchy of Lithuania was conducted in Latin, therefore the *prosta mova* usually specified only

basic arithmetic knowledge, and more complex concepts were designated in Latin.

In Rus′ in the 15th – 16th c. there were handwritten arithmetic textbooks translated from Western European books or their analogues. As trade was developing rapidly at that time, the textbooks were mainly intended to help trade calculations. They also contained some rules for solving the simplest first-degree equations with one unknown using the false position method. Such textbooks were also distributed in the Grand Duchy of Lithuania.

Mathematical knowledge in the territory of the Grand Duchy of Lithuania in the 14th – 17th c. was a synthesis of Old East Slavic (Old Russian) and European traditions. On the one hand, the knowledge that existed in Kyivan Rus′ and was transmitted through the Byzantine tradition was preserved (see Bubnov, 1908; Magnickij, 1914; Rybakov, 1957, and others), and on the other hand, the experience of European Latin-language science was transmitted. Special literature is devoted to the dissemination of mathematical information of various kinds in the GDL (purely mathematical, as well as land surveying, astronomical, architectural, artillery etc.) (see Łukaszewicz, 1851; Harlampovič, 1898; Sìropolko, 1935; Narysy, 1968; Bespamâtnyh, 1975; Asveta, 1985; Gusak, 2000, etc.).

A few words should be added about the heritage of Old East Slavic mathematical knowledge in the Grand Duchy of Lithuania.

In Kyivan Rus′ (10th – 13th c.), according to *Русская правда / Russkaya Pravda*[2] and *Учение о числах / Uchenie o Chislah* (*Teaching on Numbers*, 1136) of Novgorod monk Kirik, people knew large numbers (10,000 – *тьма / t′ma*, 100,000 – *легион / legion*, 1,000,000 – *леодр / leodr*, etc.), worked with integers and fractions; mathematical notations were made in Cyrillic letters. This knowledge was undoubtedly preserved in the Grand Duchy of Lithuania.

Numerous Old Russian currency names are known (*гривна / hryvnia, ногат / nogat, куна / kuna, резан / riezan, рубль / ruble, полтина / poltina, деньга / denga, копейка / kopiejka*, etc.), many of which were used in the Grand

2 *Russkaya Pravda* (*Rus′ Justice*, *Rus′ Truth*, or *Russian Justice*) is the legal code of Kievan Rus′ and the subsequent Rus′ principalities that was written at the beginning of the 12th c.

Duchy of Lithuania. There were also various names for measures of bulk goods: *кадь / kad'* 'a kind of barrel', ≈ 64 kg), *четверть / chetviert'* ('a quarter of a bucket', ≈ 3,0748 l, etc.), weight (*пуд / pood* ≈ 16 kg, etc.), length (*большая пядь / bol'shaya piad'* (distance between thumb and little finger) ≈ 22–23 cm), *малая пядь / malaja piad'* (distance between spread thumb and forefinger) ≈ 19 cm), *локоть / lokot'* ('elbow', distance from the elbow to the end of the middle finger, from 38 to 54 cm), *сажень / sazhen'* (2,1336 m), *верста / viersta* (1066,8 m), etc.), square measures (*четверть / chetviert'* ('quarter', ≈ 18 mm), *десятина / diesiatina* ('tithe, tenth'; several different tithe sizes were used, ≈ 1.09 hectares), *соха / sokha* ('plow', from 600 to 1800 tenths'), etc. (Rybakov, 1949), later used in the Grand Duchy of Lithuania.

Applied mathematical knowledge (architecture, construction, military science, craftsmanship) in both Kievan Rus' and later in the Grand Duchy of Lithuania was empirical. The masters used approximate, practical calculations that were passed down from generation to generation in an unchanged, sometimes secret, form. The craftsman passed on to the apprentice all the secrets of his craft, including the basic mathematical data. During the training process, apprentices were given some knowledge of mathematics and practical geometry. Deeper mathematical knowledge was acquired through systematic school or university education, usually in Latin.

4. Counting and measuring names of the Ruthenian language

An idea of mathematics in the Grand Duchy of Lithuania can be obtained not only from special studies, such as those mentioned above but also from studying the vocabulary related to a given lexical-semantic sphere. The language material for the article was the names of counting and measuring selected from the dictionaries of Middle Belarusian and Middle Ukrainian languages (using the terminology of Daniel Bunčić). The basis for the ethnolinguistic interpretation was provided by a complete selection of lexemes with counting and measuring semantics. In order to model a fragment of the linguistic worldview, the following characteristics are important: the way of structuring this

lexical-semantic field into lexical-semantic groups and the relations between groups; the number of lexical-semantic groups within the field and their internal structure; the way of motivating the original words (see similar research on the material of the modern Belarusian language – Rudenko, 2001).

Let us look at the lexical-semantic groups within the field of study.

Numbers and counting nouns are as common in the Ruthenian language as in modern Belarusian or Ukrainian. Among them are names that have survived to the present day (*одинъ / odin* 'one', *чвертъ / chvert'* 'quarter', etc.), as well as names different from modern Belarusian or Ukrainian words (*махеръ / taher* 'twelve', *захцыкъ / zahtsyk* 'sixty pieces') and different derivatives (*деленица / delenitsa*, *делица / delitsa* 'share, part').

The Ruthenian counting verbs are *вычести / vychesti* 'to subtract', *делити / deliti* 'to divide', *додати / dodati* 'to add', *личити / lichiti* 'to calculate', *множити / mnozhiti* 'to multiply', *отняти / otniati* 'to subtract', *прибавити / pribaviti* 'to add', *раховати / rahovati* 'to calculate', *сумовати / sumovati* 'to add up', *считати / schitati* 'to calculate' and their affixal derivatives from the same roots with the semantics of counting, for example *почитати / pochitati* 'to count'. In addition to the general names for counting (Ruthenian *liciti, rahovati, schitati* 'to count') there were names for specific arithmetic operations: *vychesti* 'to subtract', *deliti* 'to divide', *dodati* 'to add', *mnozhiti* 'to multiply', *otniati* 'to subtract', *pribaviti* 'to add', *сумовати / sumovati* 'to sum up'.

Dictionaries list specialized names for counting (Ruthenian *ценити / tseniti*, *шацовати / shatsovati* 'to evaluate') and measuring verbs (Ruthenian *важити / vazhiti, vesiti* / *весити* 'to weigh', *мерити / meriti* 'to measure'). The names of more abstract mathematical concepts and actions, such as modern Ukr. *корінь квадратний / korin' kvadratnyj* 'square root' are absent, although there is no doubt that this knowledge was widespread in the territory of the Grand Duchy of Lithuania: this is proved by special sources (Rybakov, 1957, etc., see above). Only the basics of mathematics were taught in the mother language (Ruthenian); more complex things were taught, understood and, accordingly, nominated in Latin – that is why the names of abstract mathematical concepts in Ruthenian, as a rule, were of Latin origin (Ruthenian *квадратъ / kvadrat* 'square', *мелионъ / melion* 'million', *центрумъ / centrum* 'center', etc.).

In the Ruthenian language there was a large group of names for indefinite quantities (*безчисление / bezchislenie* 'many', *безмерный / bezmiernyj* 'immeasurable', *венцъ / vients* 'more', *вмале / vmale* 'less' and many others), which require special study.

Among the Ruthenian counting names, the names of currencies and various measures were extremely common: area, weight, bulk substances, liquids, etc. Such names, both original and borrowed, were much more numerous than today. In the Grand Duchy of Lithuania, coins of various countries and peoples, with different denominations were in use; see the names of some of them: *аспра / aspra, галеръ / galer, гривна / hryvnia, дидрахма / didrachma, мна / mna, монета / moneta, португалъ / portugal, скоецъ / skoets, талантъ / talant, талеръ / thaler, тынфъ / tynf, унция / ounce, четвертакъ / chetviertak*. There are special studies devoted to the names of coins in the Grand Duchy of Lithuania, see, for example (Ânovič, Ûrevič, 1964; Civanova, 2000).

As far as the names of the measures are concerned, this is an additional proof that in the 15th – 16th c. mathematical knowledge was much more applied than it is today; more precisely, applied mathematical knowledge had a different focus and other areas of application.

In the basic monograph by Kim Skurat "Old Belarusian Measures" (Skurat, 1974), and other works (Ânovič, Ûrevič, 1972) the following areas are considered:

1) names of units of measurement of length and area;
2) names of units of measurement for bulk and liquid substances;
3) names of units for weight;
4) units of quantity and counting (bundles (of wood / straw), rolls, shocks, etc.: *ставъ / stav* 'measure of cloth'; *труба / truba* (lit. 'tube') 'unit of cloth'; *резъ / rez* ' unit of paper'; *соха / soha* (lit. 'plough') 'pair of draught animals', 'unit of area', 'unit of taxation in the Grand Duchy of Lithuania, which was measured by the number of working cattle', *копа / kopa* 'shock, heap', etc.).

Among the numerous names of measures, the most interesting are those that do not exist in modern Belarusian and Ukrainian (in some cases the dictionary does not give the meaning of a certain old measure) or that have developed a different meaning. For example:

1) names of weights:
   1.1. absent in the modern Belarusian and / or Ukrainian language (*велтакъ / veltak, либра / libra, лотъ / lot, цеберъ / tseber*);
   1.2. with other meanings in the Ruthenian and in modern Belarusian and / or Ukrainian language (*безменъ / bezmen* (also 'scales'), *гривна / hryvnia* (also 'currency, coin') 'unit of weight of valuable metals', *литра / liter* (also a 'unit of liquid measurement') 'unit of weight', *ремень / remien'* (also 'belt') 'unit of weight').
2) names for measures of volume of liquid, solids and other substances which do not exist in the modern Belarusian and / or Ukrainian language: *антелогкъ* / antelogk, *севня / sievnia, секъ / sek* 'unit of the quantity of meat', *третинникъ / tretinnik* '160–204 litres', *фаса / fasa, фаска / faska* I 'unit of measurement of bulk materials'; II 'unit for measuring the quantity of metal products (knives, axes, nails, etc.)', 'weight unit of measurement of metal products'.
3) names of measures of length and area:
   3.1. missing in the modern Belarusian and / or Ukrainian language: *волока / voloka* 'a unit of land area equal to 21,36 hectares', *реза / reza* 'a measure of area equal to one third of a *voloka*', *цаля / tsala* 'a unit of length approximately equal to the width of a finger', *моркгъ / morg* (cf. *выморкговати / vymorkgovati* 'to measure out the land');
   3.2. has different meanings in Ruthenian and modern Belarusian and / or Ukrainian languages: *бочка / bochka* (also 'barrel') 'a measure of liquid and loose substances', 'a measure of area equal to one barrel of sown grain'; *лыко / lyko* (also 'bast') 'unit of length', 'unit of the quantity of fish', *следъ / sled* (also 'track', 'footprint') 'unit of area', *соха / soha* (see above) 'plow', *стая / staja* (also 'flock') 'about 80 m', *топорище / toporishche* (also 'ax handle') 'unit of length in carpentry';
   3.3. preserved in the modern Belarusian and / or Ukrainian language as historicisms and known to closely related languages (*верста, локоть, сажень* – see above).

4) names of time measures:
   4.1. absent in the modern Belarusian language: *днина / dnina* 'all day';
   4.2. has different meanings in the Ruthenian and modern Belarusian and / or Ukrainian language: *луна / luna* (also 'moon') 'the first month according to the lunar calendar', 'the period of the month according to the ancient Eastern annual division of the celestial sphere into 7 planets', 'a period of time of 19 years, after which the full moon returns to the previous days of the year';
   4.3. preserved in the modern Belarusian and / or Ukrainian language, for example, borrowings *минута* 'minute', *секунда* 'second'.

5. Financial vocabulary

In the Ruthenian language, the vocabulary related to counting and property accounting was very widespread, numerous and common. This also applied to such lexical-semantic areas as financial calculations and payments. For example, there were numerous verbs that had developed a figurative "property" or "financial" meaning, e. g. *отдавати / otdavati* 'to give back' > 'to pay tax', etc.

Here are some Ruthenian names for various profits, incomes and benefits: *акцесия / aktsesija* 'profit, income'; *асекурация / asiekuracyja* 'certificate of benefits, receipt'; *вено / veno* 'dowry', 'funds to provide for single women (according to their dowry)', 'groom's ransom for the bride', 'reward'; *внесенье / vniesienje* 'dowry'; *жолдъ / zhold* 'payment to soldiers'; *дефелка (дефелга) / defelka (defelga)* 'benefit'; *либертация / libertacyja* 'tax exemption document', *праздничное / prazdnichnoje* (lit. 'holiday') 'additional fee on the occasion of a holiday'. Such vocabulary is, of course, most common in metrics and act books. But it is also common in manuscripts of other content.

The names of taxes and duties used in the Ruthenian language are extremely numerous – about 100 one-word nominations. Among the taxes of the Grand Duchy of Lithuania some are interesting for the modern

reader: *вижованое / vizhovanoe* 'payment for proof of damage caused', *вызываное / vyzyvanoje* 'monetary duty for calling abroad', *гиберна / hiberna* 'tax on the maintainance of troops in winter', *езовщина / jezovshchina* 'payment for the use of jez – a wicker partition of the river for fishing', *почопное / pochopnoe* 'tax on the production of alcoholic beverages', *потуремное / poturemnoje* 'payment from a prisoner for being in prison', *темьяншчына / temjanshchina* 'cash tax on the purchase of incense'.

If we follow the postulate of cognitive linguistics that one-word names are used for the most important concepts for native speakers, then the system of payments, taxes and duties was worked out in detail and was very important for the citizens of the Grand Duchy of Lithuania. There is no doubt about the high level of socialisation of GDL residents: for example, the adjective borrowed from Polish *гайный / gajny* 'happens within the prescribed period and with the implementation of the rules prescribed by law' was used very actively.

6. Original lexemes and borrowings in counting names

When analysing Ruthenian lexemes with the semantics of counting and measurement, the ratio of original lexemes and borrowings, as well as the semantics of borrowings, is significant.

Aliaxander Bulyka, the author of two books on borrowings in the Ruthenian language, identifies the vocabulary of counting and measurement as a separate group and divides it into two parts. "The first group consists of words related to everyday counting, construction and measurement of spatial and volumetric figures, as well as general and specific names of units of measurement, weight and quantity" (Bulyka, 1980, 153). Moreover, A. Bulyka notes that the names of the sciences are of Latin-Greek origin: *арифметика / arithmetic*, *математика / mathematics*, as well as some mathematical concepts (*сумовати / sumovati, плюс / plus, минус / minus*) and many philosophical terms (*аргумент / argument*, etc.). "A slightly smaller group of borrowings consists of words associated with everyday and calendar measurement of time" (Bulyka, 1980, 156. The translation is ours – A. R.). In this article we will focus on counting in general and spatial counting.

Almost all the verbs of counting and measurement which form the core of the field, are original names (*вычести / vychesti* 'to count', 'to subtract', *делити / deliti* 'to divide', *додати / dodati* 'to add', *множити / mnozhyti* 'to multiply', *отняти / otniati* 'to subtract', *прибавити / pribaviti* 'to add', *считати / schitati* 'to count', *весити / vesiti* 'to weigh', *мерити / meriti* 'to measure', *ценити / tseniti* 'to evaluate'), and borrowings from the Polish language or with Polish mediation (*важити / vazhiti* 'to weigh', *раховати / rahovati* 'to count', *сумовати / sumovati* 'sum up, add up', *шацовати / shatsovati* 'to evaluate') show the competition between the Eastern and Western components in the given lexical sphere of the Ruthenian language.

There were also many borrowings on the periphery of the lexical-semantic field of counting and measurement. The loanwords can be divide into two groups: lexemes related to everyday counting, building design, volumetric measurement, and names for weight, measure and quantity (e.g., Old Bel. *дрелинкъ / drelink* < German. *Dreilink* 'measure of wine'; Old Bel., Old Ukr. *ланъ / lan* < German. *Lehen* 'unit of measure for arable land' (*А ненадобѣ оу тую зємьлю никому оустоупатиса, а ни съ лану чиньшу никому давати* – Городокъ, 1443 *P* 144–145 [SSM, I, 538]); (Rozov 1928)[3]. Such borrowings from the German, Polish, Lithuanian, Romance and Turkic languages confirm the openness and activity of the inhabitants of the Grand Duchy of Lithuania. However, there were also loanwords of a different kind, mainly from the Latin language, such as, for example, *анигилевати / anigilevati* 'to cancel', *амплификовати / amplifikovati* 'to exaggerate', *алекговати / alekgovati* 'to prove, to argue, to make arguments'. Such borrowings testified to the spread of abstract knowledge and sustained interest in it.

In addition to the borrowings among Ruthenian counting names and the entire scientific vocabulary, numerous cases of semantic derivation are interesting. For example, the borrowing *градусъ / gradus* was used in the sense of 'degree of smth.', not in the meaning of the 'exact unit of temperature', and Old Bel. *степень / stiepień* 'degree of smth.' was used with the semantics 'step, staircase'. The semantics 'to prove' could be

3 Quoted by SSM.

nominated by the verbs *нагонити / nagoniti, догнати / dognati* 'to catch up, to overtake'. The adjective *аномалный / anomalnyj* 'abnormal', for example, was used by Meletius Smotrytsky as follows: *вамъ оучителем власное, аномалных, мовлю, имен и гл҃ъ зобране* – Сматр. Гр., 4 (GSBM 1982, 1, 121; SUM 1994, 1, 110)[4].

7. Conclusion

Consideration of the educational system in the Grand Duchy of Lithuania, as well as the lexical-semantic field 'counting, measuring' showed the following.

Education in the Grand Duchy of Lithuania was accessible regardless of social class and religion. In a situation of multi-confessionalism and competition between different religions and different types of Christianity, the clergy were well aware that people's choice of denomination in childhood was largely determined by the influence of the family and the social advantages offered by one or another religion. One of these advantages was education – Jews, Muslims and Christians of all kinds offered educational programmes alongside the promotion of their religion. As a result, the parishioners won: literacy and academic knowledge were widespread in the Grand Duchy of Lithuania.

Mathematical knowledge in the Ruthenian language as a fragment of the linguistic worldview can be modelled on the basis of a study of the corresponding vocabulary. The analysis shows that, in addition to the names of the simplest mathematical concepts and operations, the names of various measures and monetary units were extremely common in the Ruthenian language. This indicates the openness of the GDL to external contacts. Various financial concepts were also widely used, including the names of profits, rewards, taxes, which testified to the high social and state organisation of the Grand Duchy of Lithuania.

Higher mathematical knowledgel was usually taught and used in Latin. Therefore, the semantics of borrowings among the names of the

4 Quoted by GSBM, SUM.

Ruthenian mathematical concepts is significant: along with very specific names of measures, currencies, types of profits and taxes, many names of abstract mathematical and general scientific concepts were borrowed from Latin, which proved a stable interest in abstract knowledge.

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