STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

VILNIAUS UNIVERSITETO PROGRAMOS *MATEMATIKOS IR INFORMATIKOS MOKYMAS* (612X13006) VERTINIMO IŠVADOS

EVALUATION REPORT OF *TEACHING MATHEMATICS AND INFORMATICS* (612X13006) STUDY PROGRAMME AT VILNIUS UNIVERSITY

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Išvados parengtos anglų kalba
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Vilnius
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DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	Matematikos ir informatikos mokymas
Valstybinis kodas	612X13006
Studijų sritis	Socialiniai mokslai
Studijų kryptis	Pedagogika
Studijų programos rūšis	Universitetinės
Studijų pakopa	Pirmoji
Studijų forma (trukmė metais)	Nuolatinė (4)
Studijų programos apimtis kreditais	240 ECTS
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Dalyko pedagogikos bakalauras, matematikos bakalauras; Pedagogas
Studijų programos įregistravimo data	2001-05-24

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	Teaching mathematics and informatics
State code	612X13006
Study area	Social sciences
Study field	Teachers training
Kind of the study programme	University studies
Study Cycle	First
Study mode (length in years)	Full-time (4)
Volume of the study programme in credits	240 ECTS
Degree and (or) professional qualifications awarded	Bachelor of Specialist Teacher Training, Bachelor of Mathematics; Teacher
Date of registration of the study programme	2001-05-24

CONTENTS

I. INTRODUCTION

This report summarizes the observations of the expert team (Team) based on the analysis of documents prepared by the self-assessment group consisting of seven members of VILNIUS UNIVERSITY (VU) and the information obtained from the interviews during the visit at the institution on October 12, 2012.

Schedule for the visit:

The members of the Team acquainted themselves with and assessed the documentation and annexes provided by the Lithuanian Centre for Quality Assessment in Higher Education (CQAHE) in Vilnius.
On October 08, 2012, an introductory meeting at CQAHE was arranged and the following topics were presented:

1. Brief overview of CQAHE
2. Higher Education Evaluation System in Lithuania
3. Study Programmes Evaluation and Accreditation
4. Methodological Guidelines. Visits. Final Reports

The following schedule for the visit at VU has been prepared and executed:

Friday, October 12, 2012	
09.00 – 09.30	Meeting with administration staff
09.30 – 10.30	Meeting with staff responsible for the preparation of the Self-Assessment Report (SAR)
10.30 – 10.45	*Coffee break*
10.45 – 11.30	Meeting teaching staff
11.30 – 12.15	Meeting with students
12.15 - 13.15	*Lunch*
13.15 – 14.00	Visiting auditoriums, libraries, other facilities (studios, teaching spaces, computer services etc.)
14.00 – 15.00	Review of students‘ course and final papers (thesis), examination material
15.00 – 15.30	Meeting with alumni
15.30 – 16.00	Meeting with employers and social partners
16.00 – 16.30	Experts private discussion and finalization of the visit
16.30 – 16.50	Introduction of general remarks of the visit to Vilnius University community

The Team would like to thank the authorities of VU for their friendly welcome and hospitality. We also want to express our appreciation to the various representatives of VU, who actively participated in the meetings and considerably contributed by their open discussions to a good overview of the institution.

Last but not least we want to thank Mrs. Agnė Tamošiūnaite from CQAHE for her friendly way of maintaining contact with us, for preparing the visit so well and assisting us during our stay in Lithuania.

II. PROGRAMME ANALYSIS

Vilnius University (VU) is the oldest, largest and the most prestigious higher education institution in Lithuania. It dates back to 1570 when it was founded as a Jesuit college. In spite of the many problems VU has faced since independence in 1990 it has made impressive progress with respect to the quality of its teachers, its students and its leadership. VU attracts many of the best students in the country. The University of Vilnius has 12 faculties, 7 institutes, 4 study and research centres, the oldest Library in Lithuania, 3 university hospitals, an Astronomical Observatory, a Botanical Garden, a Centre of Information Technology Development and St. John's Church.

The Faculty of Mathematics and Informatics responsible for the Bachelor programme “Mathematics and Informatics Teaching” is one of the biggest faculties and consists of 10 departments. The compulsory subjects of this programme are taught by the Department of Didactics of Mathematics and Informatics, the Department of Differential Equations und Numerical Mathematics, the Department of Probability Theory and Number Theory and the Department of Mathematical Statistics. In addition certain subjects and electives are taught by teachers from other faculties, e.g. Psychology, Physics etc.

Lithuania and especially the Faculty of Mathematics and Informatics with its study programme Mathematics and Informatics Teaching are strongly hit by a serious decline in the birth rate over recent years. Additionally emigration of young people has risen considerably since Lithuania became a member of the European Union. However, according to predictions the demand for teachers in secondary schools and gymnasiums should increase by the year 2014. The Mathematics and Informatics Teaching study programme has the advantage of awarding not only the professional teacher qualification but also a Bachelor degree in Mathematics.

1. Programme aims and learning outcomes

The programme Mathematics and Informatics Teaching has a defined mission in the Lithuanian educational system and society. It is designed for the preparation of teachers, but opens also the possibility of working successfully in technology, business and social areas. However the mission should be made clearer, specifying whether the first goal of the degree is the education of teachers in mathematics and informatics, or the formation of mathematicians and computer scientists with the right to teach in secondary schools and gymnasiums.

According to the formulated learning outcomes of the programme Mathematics and Informatics Teaching the graduates are supposed to have specific competences in education and

psychology, mathematics and mathematics teaching, as well as informatics and informatics teaching. In addition they should have general competences in communication and in performance improvement, and a high level of ethical and social responsibility.

The name of the Programme, its learning outcomes, content and qualifications offered, are compatible with each other. However, the degrees awarded, Bachelor of Subject Pedagogy and Bachelor of Mathematics, are somehow misleading because it does not express the qualification to teach informatics. Moreover the amount of Mathematics and Informatics in the programme outweighs that pedagogical part. Also the programme content shows that the teachers involved in the programme are teachers in mathematics and informatics, but not pedagogues in general.

The Team commends the staff for the numerous activities they organise to attract more students to the programme.

2. Curriculum design

The Programme's specific competences in education and psychology, mathematics and mathematics teaching, and informatics and informatics teaching are on the bachelor's level. The standard period of instruction for this Programme is four years. The workload amounts to 240 ECTS credits. This is compliant with the Bologna declaration and Lithuanian legal requirements. The Programme is subdivided into the following educational components:

- Pedagogical studies (65 ECTS)
- Mathematics (92 ECTS)
- Informatics (90 ECTS)

The total sum of 247 ECTS was explained during the visit by the fact that two courses (Didactics of Informatics and Educational Practice) figure under Pedagogy and Informatics. The Faculty should correct this anomaly and publish a curriculum with exactly 240 credits. The size of each educational component is 3 to 6 ECTS. The Educational Practice is 6 plus 9 plus 15 ECTS. The content of each educational component corresponds to the intended learning outcomes of that component. Size and content of all educational components are appropriate. The curriculum design meets the legal requirements.

The set of informatics subjects forms an excellent and consistent part of the curriculum. It could be further improved by adding a subject (as a last-year course) summarizing some essential new issues and tendencies in the rapidly developing field of information technology. Nevertheless, the Team has some comments with respect to the mathematics part of the curriculum:

- Some course descriptions are misleading, e.g. the Mathematical analysis 4 course taught in the fourth semester. Headings and content descriptions promise more than what is actually taught and examined.
- Algebraic structures are an important topic in teacher education. On one hand abstract algebra is an important cultural good. On the other hand the lack of algebra means many interesting and motivating applications (European article number, international standard book number, coding theory, etc.) cannot be discussed.
- The sequence of courses should be reconsidered. The course in Physics (semester IV) should not be taught before the course on Differential Equations (semester V)
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Students and graduates complained that there were no clear rules or guidelines for the practice in schools. It was also stated that languages, especially English, should receive more attention in the curriculum. The education in psychology was said to be too theoretical; applicable psychology of teaching and learning mathematics are not covered. History of mathematics should have more attention too. Each course could start with a short historical introduction.

The methods of instruction in the undergraduate programme are rather traditional. The Team does not find much evidence that activating forms of learning and teaching are practiced. One way of engaging students to participate actively in the process of learning is to introduce project-based learning.

Everywhere in the world each mathematics course has two components. The first concerns the theoretical aspects of the course content – the key concepts and theorems. In the second component the students learn to apply the theory by tackling exercises and problems assigned by the teacher. This is a crucial part of the training of young mathematicians because they learn the subject by doing mathematics themselves and not by watching others doing it. We therefore recommend the following refinement of the procedures at present in use in the practical component of courses. Each week the teacher should distribute a set of exercises to the students a week in advance of the practice lecture (tutorial); each student will work on finding solutions to the exercises, alone and possibly in collaboration with other students. A week later the students will discuss their solutions with the teacher during the practice lecture.

Nevertheless, the level of instruction meets in most parts the requirements of a modern, internationally competitive education in Mathematics and Informatics Teaching.

3. Staff

The qualifications of the current academic staff are sufficient for achieving the aims and learning outcomes set for the Programme and meets the legal requirements. However the Team was given no evidence that teachers delivering lectures on didactics of mathematics have formal qualifications in pedagogy. In total, 30 teachers are affiliated with the Programme. 9 teachers are based in the Department of Didactics of Mathematics and Informatics. Only two teachers of this Department work at more than full-time.

The decreasing number of students enrolled in the programme and applying to enter it in recent years poses a serious problem. In 2011 only 9 students entered the programme.

4. Facilities and learning resources

The premises of the Department of Mathematics and Informatics are adequate in size and quality. The Team visited lecture rooms, the faculty library, computer laboratories and offices for staff. There is evidently a lack of literature on pedagogy, philosophy, psychology, and English language learning in the faculty library.

5. Study process and student assessment

Students are admitted according to national regulations based on high school graduation results. Access to state financed places is competitive and has to meet minimum standards. Those not admitted to state funded places get access to the Programme if they pay tuition on their own. As has been mentioned before, the students admitted seem to be very motivated and enter with high marks. However, this year only 9 students out of 25 planned were enrolled.

The academic year is organized in two semesters. Timetables are scheduled rationally. The study classes are well distributed during the week and semester. The sequence of the different courses follows in general a consistent and well-elaborated scheme, except for Physics which succeeds Differential equations. The examination sessions are carefully planned and fit well into the study programme.

The Team observed that final bachelor papers were sometimes co-authored, but it was not made clear which author was responsible for what part. The Team recommends that individual contributions to joint work should be clearly stated.

Because the number of students is small, students in the programme attend some lectures with students in the Statistics programme; this may cause some difficulties for them in capturing the material. The first part of Pedagogical practice is arranged after the lectures, which is inconvenient for both students and teachers in the schools. The goals of observation are not clearly stated, either for students or for mentors. This can be clearly seen in the Practice reports, which contain only descriptions of the lesson; no analysis is included. Moreover didactical lectures are delivered later in the Programme so that the effectiveness of this stage of the practice is doubtful. According to responses from students and alumni there is a lack of practical skills in psychology, therefore it is difficult to lead a lesson both during the practice and after graduation from the university.

Alumni of the programme stressed that skills in English language are inadequate and there is not enough practice in ways to control pupils in the classroom. They also noted that there is a big gap between the level of abstraction in school mathematics and the level of abstraction in the first year of mathematical studies in the programme. This makes it difficult for them to keep up with the lectures. Alumni also noted that History of Mathematics should be taught earlier, not in the last year.

The drop-out rate varies considerably from year to year but has improved in the last two years. The majority of students graduate at the end of the fourth year.

Mobility of staff and students is documented. However the numbers in and out are very small compared with other European universities. There is almost no student mobility.

Most of the graduates proceed to further studies. Some get employment as teachers. It was said that graduates with good computer knowledge are very much in demand in schools.

6. Programme management

Only a small percentage of the students fill out the questionnaires that assess the quality of the educational components and course management at the end of each semester. The dean’s office collects and evaluates the results. There is no clear information on consequences and supportive instruments designed to improve the quality of teaching. Alumni complained that there was no reaction when they passed information on the inconsistent sequence of two subjects, namely, Physics and Differential equations.

Stakeholders stated that they have good contacts with the Faculty administration and have some influence on the content of courses and the design of the curriculum. The activities of the Faculty with respect to the ongoing training of teachers and life long learning were praised.

III. RECOMMENDATIONS

(The first number refers always to the corresponding section

2.1 The Team stresses that a knowledge of discrete mathematics and algebraic structures is essential to several applications of mathematics. The Faculty should consider providing for those elements in appropriate educational components and incorporating such material into the undergraduate degree programme. A teacher cannot ignore the cultural achievements of algebra in school. The introduction of those elements may be accomplished by reducing the volume of other subjects.

2.3 The sequence of some courses has to be corrected (e.g. Physics and Differential Equations).

2.4 Education Psychology should focus more on the psychology of teaching and learning.

2.5 History of Mathematics should be strengthened.

4.1 A faculty responsible for teacher education should provide literature on pedagogy, philosophy, psychology as well as English language learning in its library.

5.1 Realistic and reasonable course descriptions should be agreed and examinations set at a level to guarantee the desired study outcomes. Students who do not know or understand the basic facts of a course must not be marked positively.

5.2 Observe carefully joint student work for final degree papers and clarify authorship.

5.3 Increase autonomous student work and self-learning components. Strengthen creativity and practical elements in your curriculum.

5.4 Improve the Educational Practice in schools by giving clear rules and guidelines to your students.

6.1 The Faculty should further enforce Quality Assessment and go ahead with the quality assurance procedures already started. Quality assessment should not be considered as a burden but as an instrument for improvement. Hence the Team suggests that clear procedures to improve teaching, course management and research should be defined based on feedback from students, the extensive collection of information, and the results of different evaluations. The collected data should be used in order to provide advice. Students and teachers should be kept fully informed of the impact their responses and suggestions have on the quality improvement of teaching and course management. Mechanisms to support academic staff in their teaching (teacher training, teacher promotion) and research missions (study leaves, reduction of work load) should be developed.

6.2 Internationalisation is an essential element of higher education development. It is a multi-dimensional task taking into account mobility programmes, language policy, curricula, joint study and double degree programmes, collaborative research, conference attendance etc.

Strengthen further your foreign languages policy by using more English textbooks and offering lectures in English. The Faculty of Mathematics and Informatics should look for equal partners for student and teacher exchange and increase the incoming and outgoing mobility of both students and academic staff (Erasmus, special agreements).

IV. SUMMARY

The bachelor degree programme “Mathematics and Informatics Teaching” at VU meets the needs of society and the Lithuanian labour market. It prepares teachers in Mathematics and Informatics as well as specialists in the field of mathematics to work in different fields of economy and industry. The high competence of VU’s academic staff, especially in the area analysis and statistics, provides for the strength of the programme. However, the lack of experts in the field of algebraic structures, in psychology for teachers and in school pedagogy is an obstacle to improving the programme.

The aims of the Programme should be clarified and the focus put on teacher education. Looking at the present curriculum and the course contents the Team feels there is an imbalance between the mathematical and pedagogical components of the degree. The programme educates mathematicians who have additional knowledge of pedagogy and psychology. But there are no special courses on education in mathematics, psychology of learning and teaching mathematics, pedagogy for schools etc. However the low number of students in the programme should be observed and measures taken to guarantee the sustainability of the programme. The incoming and outgoing mobility of both students and academic staff needs to be increased. Course descriptions should be revisited and examinations adjusted to ensure their mutual compatibility. The level of difficulty of examinations should be increased. Research and its international visibility should be strengthened. Students should be more integrated into project work, and self -learning components should be strengthened. The results of the evaluation of the courses should be more thoroughly analysed and discussed with the students. Students are key stakeholders, thus open communication with them is a very important element.

V. GENERAL ASSESSMENT

The study programme *Teaching mathematics and informatics* (state code – 612X13006) at Vilnius University is given positive evaluation.

Study programme assessment in points by fields of assessment.

No.	Evaluation Area	Evaluation Area in Points*
1.	Programme aims and learning outcomes	**3**
2.	Curriculum design	**3**
3.	Staff	**3**
4.	Material resources	**3**
5.	Study process and assessment (student admission, study process student support, achievement assessment)	**3**
6.	Programme management (programme administration, internal quality assurance)	**3**
	Total:	**18**

*1 (unsatisfactory) – there are essential shortcomings that must be eliminated;

2 (satisfactory) – meets the established minimum requirements, needs improvement;

3 (good) – the field develops systematically, has distinctive features;

4 (very good) – the field is exceptionally good.

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V. APIBENDRINAMASIS ĮVERTINIMAS

Vilniaus universiteto studijų programa *Matematikos ir informatikos mokymas* (valstybinis kodas – 612X13006) vertinama teigiamai.

Eil. Nr.	Vertinimo sritis	Srities įvertinimas, balais*
1.	Programos tikslai ir numatomi studijų rezultatai	**3**
2.	Programos sandara	**3**
3.	Personalas	**3**
4.	Materialieji ištekliai	**3**
5.	Studijų eiga ir jos vertinimas	**3**
6.	Programos vadyba	**3**
	Iš viso:	**18**

* 1 - Nepatenkinamai (yra esminių trūkumų, kuriuos būtina pašalinti)

2 - Patenkinamai (tenkina minimalius reikalavimus, reikia tobulinti)

3 - Gerai (sistemiškai plėtojama sritis, turi savitų bruožų)

4 - Labai gerai (sritis yra išskirtinė)

IV. SANTRAUKA

VU įgyvendinama programa „Matematikos ir informatikos mokymas“, kuria suteikiamas bakalauro laipsnis, atitinka visuomenės ir Lietuvos darbo rinkos poreikius. Pagal ją rengiami matematikos ir informatikos mokytojai ir specialistai, dirbsiantys įvairiose ūkio ir pramonės šakose. Stiprumo programai suteikia didelis VU akademinio personalo kompetentingumas, ypač analizės ir statistikos srityje. Tačiau algebrinių struktūrų, pedagoginės psichologijos ir mokyklinės pedagogikos specialistų stoka trukdo gerinti programą.

Reikėtų išaiškinti šios programos tikslus ir daugiausia dėmesio skirti pedagogų rengimui. Išanalizavusi dabartinę programos sandarą ir studijų dalykų turinį vertinimo grupė mato, kad nėra kvalifikacinio laipsnio komponentų – matematikos ir pedagogikos – pusiausvyros. Pagal šią programą ugdomi matematikai, kurie dar turi pedagogikos ir

psichologijos žinių. Bet specialių matematikos mokymo, matematikos mokymosi ir mokymo psichologijos, mokyklinės pedagogikos ir kt. studijų dalykų nėra. Tačiau reikėtų atkreipti dėmesį į mažą studentų skaičių ir imtis programos tvarumą užtikrinančių priemonių. Būtina padidinti atvykstančių ir išvykstančių studentų bei akademinio personalo judumą. Turėtų būti peržiūrimi studijų dalykų aprašai, o egzaminai pakoreguoti taip, kad būtų užtikrintas jų tarpusavio suderinamumas. Egzaminai turėtų būtų sudėtingesni. Turėtų būti stiprinama mokslinių tyrimų veikla ir didinamas tarptautinis matomumas. Į projektinę veiklą reikėtų labiau įtraukti studentus; reikėtų sustiprinti savarankiško mokymosi komponentus. Reikėtų kruopščiau išnagrinėti studentų pateikiamą grįžtamąjį ryšį ir aptarti jį su studentais. Studentai yra pagrindiniai socialiniai dalininkai, taigi atviras bendravimas su jais yra labai svarbus.

III. REKOMENDACIJOS

(Pirmasis skaičius visada rodo atitinkamą skyrių).

2.1. Vertinimo grupė pabrėžia, kad abstrakčių matematikos ir algebros struktūrų žinojimas yra būtinas keliose taikomosios matematikos srityse. Fakultetas turėtų apsvarstyti šių elementų įtraukimą į atitinkamus studijų komponentus ir šios medžiagos įtraukimą į pirmosios pakopos studijų programą. Dėstytojas negali neatsižvelgti į kultūrinius algebros pasiekimus mokykloje. Šiuos elementus galima įtraukti sumažinus kitų dalykų apimtį.

2.3. Reikia pataisyti kai kurių kursų seką (pvz., fizikos ir diferencinių lygčių).

2.4. Ugdymo psichologija turėtų būti labiau orientuota į mokymo ir mokymosi psichologiją.

2.5. Turėtų būti sustiprinta matematikos istorija.

4.1. Už mokytojų rengimą atsakingo fakulteto biblioteka turėtų aprūpinti pedagogine, filosofine, psichologine ir anglų kalbos mokomąja literatūra.

5.1. Turėtų būti susitarta dėl realių ir pagrįstų studijų dalykų aprašų ir nustatyti tokio lygio egzaminai, kurie užtikrintų pageidaujamus studijų rezultatus. Pagrindinių kurso faktų nežinantys ar nesuprantantys studentai neturėtų būti vertinami teigiamu pažymiu.

5.2. Atidžiai stebėti kelių studentų kartu rengiamus baigiamuosius darbus ir išsiaiškinti autorystę.

5.3. Didinti studentų savarankiškai atliekamo darbo apimtį ir savarankiško mokymosi komponentų skaičių. Stiprinti kūrybiškumą ir praktinius studijų turinio elementus.

5.4. Gerinti pedagoginę praktiką mokyklose, nurodant aiškias taisykles ir gaires.

6.1. Fakultetas turėtų ir toliau užtikrinti kokybės vertinimą ir tęsti jau pradėtas kokybės užtikrinimo procedūras. Kokybės vertinimą reikėtų laikyti ne našta, o pažangos priemone. Taigi vertinimo grupė pataria apibrėžti aiškias dėstymo, studijų programos valdymo ir mokslinių tyrimų gerinimo procedūras, atsižvelgiant į studentų grįžtamąjį ryšį, surinktą gausią informaciją ir įvairių vertinimų rezultatus. Surinktus duomenis reikėtų panaudoti teikiant konsultacijas. Studentai ir dėstytojai turėtų būti nuolat išsamiai informuojami apie tai, kokį poveikį mokymo kokybės gerinimui turi jų atsakymai ir pasiūlymai. Turi būti kuriami mechanizmai, padedantys akademiniam personalui (dėstytojų mokymas, dėstytojų kvalifikacijos kėlimas) ir atlikti mokslinių tyrimų funkciją (atostogos studijoms, darbo krūvio mažinimas).

6.2. Tarptautiškumas yra pagrindinis aukštojo mokslo plėtros elementas. Tai daugialypis uždavinys, apimantis judumo programas, kalbų politiką, jungtines ir dvigubo laipsnio programas, bendrus mokslinius tyrimus, dalyvavimą konferencijose ir t. t. Ir toliau stiprinkite užsienio kalbų politiką ir naudokite daugiau anglų kalbos vadovėlių bei skaitykite paskaitas anglų kalba. Matematikos ir informatikos fakultetas turėtų ieškoti lygiaverčių partnerių studentų bei dėstytojų mainams ir didinti atvykstančių ir išvykstančių studentų bei akademinio personalo judumą (programa *Erasmus*, specialios sutartys).

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