



STUDIJŲ KOKYBĖS VERTINIMO CENTRAS

Vytauto Didžiojo universiteto
STUDIJŲ PROGRAMOS
BIOCHEMIJA (612C73002)
VERTINIMO IŠVADOS

EVALUATION REPORT
OF *BIOCHEMISTRY (612C73002)*
STUDY PROGRAMME
at Vytautas Magnus University

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Išvados parengtos anglų kalba
Report language - English

DUOMENYS APIE ĮVERTINTĄ PROGRAMĄ

Studijų programos pavadinimas	<i>Biochemija</i>
Valstybinis kodas	612C73002
Studijų sritis	Biomedicinos mokslai
Studijų kryptis	Molekulinė biologija, biofizika ir biochemija
Studijų programos rūšis	Universitetinės studijos
Studijų pakopa	Pirma
Studijų forma (trukmė metais)	Nuolatinė (4)
Studijų programos apimtis kreditais	240
Suteikiamas laipsnis ir (ar) profesinė kvalifikacija	Biochemijos bakalauro laipsnis
Studijų programos įregistravimo data	2010-05-11

INFORMATION ON EVALUATED STUDY PROGRAMME

Title of the study programme	Biochemistry
State code	612C73002
Study area	Biomedical sciences
Study field	Molecular biology, biophysics and biochemistry
Type 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
Degree and (or) professional qualifications awarded	Bachelor of Biochemistry
Date of registration of the study programme	2010-05-11

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I. INTRODUCTION

1.1. Background of the evaluation process

The evaluation of on-going study programmes is based on the **Methodology for evaluation of Higher Education study programmes**, approved by Order No 1-01-162 of 20 December 2010 of the Director of the Centre for Quality Assessment in Higher Education (hereafter – SKVC).

The evaluation is intended to help higher education institutions to constantly improve their study programmes and to inform the public about the quality of studies.

The evaluation process consists of the main following stages: *1) self-evaluation and self-evaluation report prepared by Higher Education Institution (hereafter – HEI); 2) visit of the review team at the higher education institution; 3) production of the evaluation report by the review team and its publication; 4) follow-up activities.*

On the basis of external evaluation report of the study programme SKVC takes a decision to accredit study programme either for 6 years or for 3 years. If the programme evaluation is negative such a programme is not accredited.

The programme is **accredited for 6 years** if all evaluation areas are evaluated as “very good” (4 points) or “good” (3 points).

The programme is **accredited for 3 years** if none of the areas was evaluated as “unsatisfactory” (1 point) and at least one evaluation area was evaluated as “satisfactory” (2 points).

The programme **is not accredited** if at least one of evaluation areas was evaluated as "unsatisfactory" (1 point).

1.2. General

The Application documentation submitted by the HEI follows the outline recommended by the SKVC. Along with the self-evaluation report and annexes, the following additional documents have been provided by the HEI before, during and/or after the site-visit.

1.3. Background of the HEI/Faculty/Study field/ Additional information

Vytautas Magnus University (VMU) is a rather young institution celebrating created initially in 1922 and reopened in 1989. It covers a rather broad spectrum of study programmes ranging from humanities, social sciences and arts to the fundamental sciences, environmental sciences and biotechnologies.

VMU contains 10 faculties: Humanities, Economics and Management, Informatics,

Natural Sciences, Social Sciences, Theology, Arts, Social Sciences, Political Science and Diplomacy, Law, VMU Music Academy.

VMU is a full member of the European University Association (EUA), the European Association of International Education (EAIE), the Association for the Advancement of the Baltic Studies (AABS), and the European Distance and Elearning Network (EDEN). VMU has bilateral agreements with 120 Universities and a collection of 250 LLP/Erasmus partners in 30 European countries. The present programme is hosted by the Faculty of Natural Sciences (approximately 680 students and about 75 lecturers and researchers). Among it the Biochemistry departments comprises two research groups. Vertically, this programme is connected to the master programme "Biochemical Analysis" and to a PhD programme in Biochemistry.

Following the previous evaluation, the programme, had been found to be too orientated towards basic sciences, evolved by introducing several biochemistry core courses. Noticeably, substantial acquisition of materials for laboratory practices and bachelor theses has been made.

1.4. The Review Team

The review team was completed according *Description of experts' recruitment*, approved by order No. 1-01-151 of Acting Director of the Centre for Quality Assessment in Higher Education. The Review Visit to HEI was conducted by the team on 8/11/2016.

- 1. Prof. Laurent Counillon (team leader)** Professor in University Nice Sophia Antipolis (France);
- 2. Dr. Domingo Cantero Moreno**, University of Cadiz, Science Faculty (Spain);
- 3. Dr. Elizabeth Margaret Briggs**, Retired Head of the School of Chemical and Life Sciences, University of Greenwich (United Kingdom);
- 4. Prof. Jan Lundell**, Professor, Head of the Department of Chemistry, Director of the Central Finland LUMA (STEM) Center, Jyväskylä University (Finland);
- 5. Mr. Šarūnas Zigmantas**, Head of QC sector at *TEVA Pharmaceutical Industries Ltd.* (Lithuania);
- 6. Mr. Benas Balandis**, Student of Master programme in Chemistry at Lithuanian university of health and sciences (Lithuania).

II. PROGRAMME ANALYSIS

2.1. Programme aims and learning outcomes

The aim of the programme is to provide the students with a Bachelor in biochemistry, while preparing them intellectually and practically to withstand future challenges in their lives and careers. The learning outcomes are presented following a rather large (and too general) introduction on the philosophy of the programme and general societal demands. For example sentences such as " The analysis of successful career examples shows that the best specialists in

higher education, science, biotechnological industry, or other spheres have bachelor or master degrees in biochemistry" is emblematic of a sentence that could be written for any successful career in any field. Taken together, this leaves the reader with the overall impression that objectives and outcomes should be defined in a more concise and specific manner. The Self Evaluation Report (SER) then focuses on the academic aspects, which include a general scientific core followed by studies in biochemistry and biotechnology. The emphasis also stands on modern information technology and computing, and other transferable skills such as communication and collaboration skills.

The programme aims are also based on a general analysis of the job market as well as on international and national directives (Level 6 of the National and European Qualification Framework, EQF). The self-reflection indicates that the job market for Biochemists is expected to be expanding both at the Lithuanian and European Scales. However, the reflection does not state factors relating to competing programmes nor complementarity/benchmarking introduced by other biochemistry related programmes in the country.

The programme is consistent with a BSc level in biochemistry. Its essentials cover a broad range of fundamentals (mathematics, general chemistry, basic biology) before focusing on studies in biochemistry core accompanied by biological knowledge (anatomy, cell biology). This enables the students to get a solid scientific background in general before specialisation into the direction of the full study programme in biochemistry. Taken together, the programme title of Biochemistry is compatible with learning outcomes, contents and qualifications, although it would be fully appropriate for a programme in which biochemistry and biochemistry subjects would be taught earlier and more intensively (see details below).

2.2. Curriculum design

The Biochemistry programme acknowledges and supports educational and business roadmaps presented in the National and European Action Plans, such as the recent EU "2025 World Challenges" report⁴, EC FP7 Strategic Research Roadmap⁵, etc. Specifically, the Programme is problem- and challenge-oriented, geared to preparing the workforce capable to cope with today and tomorrow's technical, economic, and societal challenges. Along with the global orientation, the Programme is developed in compliance with the Law on Science and Studies⁶, the General Requirements for Degree Providing First Cycle and Integrated Study Programmes⁷, VMU Charter, VMU Study Regulation, VMU and FNS Strategic Plans for 2012–2020. The Review Team makes a note on that, even though the programme constitution follows European Higher Education Area Actions it is not aligned with the unified European 3 three

cycles of education (B.Sc., M.Sc. and Ph.D.) where Bachelor degree is identified as a three-year education. This should be not considered as a negative point for the present programme, which follows Lithuanian regulations on this aspect. However such a discrepancy could have an impact on the students' mobility during studies as well as their competitiveness on international labour market..

The modules are evenly spread between the different years. The Undergraduate Programme of Biochemistry at VMU is in total 240 credits which is divided along 8 semesters with 5-7 study subjects per semester. There is no notable overlap between study content during the semesters and this is mainly because a significant amount of basic scientific topics are taught in the first two years of the programme. These studies include for example languages, philosophy, mathematics and physics, as well as general, organic/inorganic chemistry topics. These support the specialisation studies following highlighting more specific biochemical subjects and contents. The general studies comprise 48 ECTS units (20 %) of the total programme, whereas the Essentials is 138 ECTS (56 %) and specialisation 62 ECTS (26 %) of the programme. In addition, the students follow a Special part of the programme, which allows to deepen the knowledge on some specific area and also to acquire practical and transferable skills.

As previously mentioned, the first and second years contents are largely aimed at building a broad scientific background in general sciences (see above) and transverse disciplines (e.g. English 12 credits, Philosophy 4 credits, becoming of modern Lithuania 4 credits, elective courses on economy, humanities, Social Sciences or Arts, 4 credits each). In the case of this particular programme, this is both strength, and weakness. A solid background is clearly needed in mathematics, physics and basic chemistry since biochemistry is at the crossroad of many sciences. Too much of such a background is detrimental, as it does not leave enough space for biochemistry and biology themselves. The balance between basic hard natural sciences with respect of bio-related topics is a matter of constant revision and reflection of the learning outcomes of the studies with respect to the surrounding scientific and industrial needs, and needs long-standing strategic vision of the HEI.

Such problems have been pointed out in the previous evaluation and although some modifications have been introduced, the overall impression is that the corresponding changes have not been thoroughly implemented yet. For example, Basic Enzymology, Physical Biochemistry, Molecular Genetics, Cell Biology all appear as themselves in the 4th year. Also, some names may be misleading within the context of the programme. For example, the basis of enzymology is taught in Biochemistry I but there is a "Basic Enzymology" course that appears

later in the programme. After discussion with the teachers it appears that the contents pertain to more advanced enzymology even though they appear similar in the curriculum.

The SER states that various teaching methods are used. They range from classical courses to practical, and also involve self-study, group consultation and supervision, learning by debate. However, during the visit, both students and staff did not appear to be very well aware of those advanced methods and discussed them in a quite evasive manner.

Taken together, the contents and infrastructure enable this programme to provide the students with an adequate general scientific background in biochemistry. However, the modifications that have been introduced since the last evaluation do still not allow the programme to reach the international standards required in the field.

2.3. Teaching staff

Staff recruitment is well advertised and is based on fair procedures. The staff members meet legal requirements and annexes of the SER indicate that the teachers are qualified to ensure the success of the programme. The average teaching experience is 13 years which demonstrates a long-standing and developed competence in teaching. Nevertheless, the age pyramid is relatively young as many lecturers and teachers are in their 40's. Most of them have a PhD and perform their research in their field of their teaching. 38 % of the courses are taught by professors, 45% - by associate professors and 17 % - by lecturers. 10% of the staff has been changed since the last evaluation, which indicates a rather small turnover within the staff. New teachers have been recruited in Genetics, Biochemistry, Molecular Genetics and General Biochemistry, which support the developments in the study programme. In addition, the teachers are supported by three technicians and engineers.

The discussions with the staff were very open and showed a strong dedication towards the students. This was also reflected by the students, they expressed a very positive opinion on the dedication of the staff (see later in this report) and admiration for the scientific and teaching quality of particular staff members.

The teacher list given as an annex of the SER, which states the presence of 29 staff members and explains that this is an adequate number to ensure the learning outcomes defined for this particular programme. Indeed, as the general scientific subjects are mutualized between the different programmes (80-150 students for the general study subjects, 15-30 for programme essential and special study subjects), this organization is operative. However, a more detailed examination shows that only 6 out of the 29 teachers are indeed teaching general biochemistry, and work in biochemistry related fields (with three others teaching physical and plant

biochemistry). Furthermore, the department of Biochemistry corresponds to two research groups: Bioenergetic of eukaryotic cells and Membrane biochemistry, which are rather close topics. This raises the question whether the programme has a sufficient critical mass to ensure a high level teaching in biochemistry. This is extremely important, as biochemistry is a very open and expanding field, where teaching has to be intensely connected to the research, even at Bachelor level. This provides also clues to understand (at least partly) why this programme is still unbalanced between general science and biochemistry *per se*.

From the SER and discussion with the management, it appears that the higher education institution provides training and tools for professional development. The SER states that members of the Programme teaching staff raise their qualification through different courses and/or trainings, held during academic holidays. This includes problem based teaching, introduction to learning outcomes, use and implementation of virtual learning environment, as well as English training. However, during the visit it was difficult to ascertain how pedagogical support and training was provided and used by the teachers of this particular programme, despite the numerous questions asked by the committee members. Taken together, it was difficult to have a clear feedback on the strategic plan for teachers training.

Based on the SER analysis and the discussions with the staff members, it is evident that contact hours with students for teachers can comprise easily 450 to 550 hours per year. This a large workload and definitely not an optimal one for research intensive institute and research-based education. To some extent this translates into the publication record of the staff, which contains a large amount of Lithuanian scientific literature but for the majority is limited in international journals.

All in all, based on the SER and the very constructive site visit, the staff is very motivated and keen on learning new things – and to translate this new knowledge to the students of the programme. The university provides opportunities for self-development, but this meets restrictions in the form of allocated working hours for research and educational tasks. The teaching record is very good thorough the study programme, and new teachers are easily taken into the community of scholars. There is a notable enthusiasm and future-driven attitude both in the staff and the students – which can be traced back to the role model approach of the teachers and the friendly teacher-student atmosphere at the Faculty.

2.4. Facilities and learning resources

The Faculty of Natural Sciences shares the building (further FNS building) with the Faculty of Informatics at Vileikos st. 8. From the visit, the review Team could observe that the

lectures halls and computing facilities were of good quality and enabled the students to work in good conditions.

The visit also revealed that the quality of laboratories and arrangements for practical exercises and Bachelor's thesis is improving but remains unequal. The evaluation panel recognized that significant improvements have been made for Biology/Biochemistry equipment (modern materials and rooms for cell culture, microbiology, molecular biology...), which is now sufficient to support the programme. By contrast, several practical rooms are still below adequate standards, in particular for chemistry. Moreover, during the visit, the committee noted, that health and safety issues were implemented in an unequal manner. The area where the newest equipment was installed were usually satisfactory while some issues (such as an acid glass bottle up on a shelf above a bench) could be noticed elsewhere. Taken together, a culture for safety is an important issue that needs to be addressed with more attention

The teaching materials are provided by a general library at VMU and by a small library in the FNS building (68 workspaces, 16 of which are computer equipped). The SER mentions 260 titles of books and 10 biochemistry, molecular biology and biophysics journals. This is sufficient for the first years of the BSc at an average level but is clearly limited if the aim is to conduct deeper information retrieval, which can be necessary for example, for Bachelors Thesis projects. Moreover, the general biochemistry international textbooks, which are extremely useful for everyday consultation at the Bachelor's level are clearly in too limited quantity. A rapid search on the library website with Biochemistry as a keyword yields 48 entries. Within them less than a quarter are general textbooks in biochemistry and about half of them appear old or outdated (e.g. two books from Lehninger dating from 1985 (apparently in Russian), and 1972 respectively, John Sutties book from 1973 etc...).

Taken together, like for other aspects of the programme, the Review Team was left with the impression that even though significant efforts have been made but that facilities are still unequally adapted to completely fulfil the aims and operations of the study programme.

2.5. Study process and students' performance assessment

The admission rules are clear and organized according to the recommendations of the Education and Science Ministry in the Science and Studies. They are approved by the Rector, made public on the VMU site and well organized. The marks used to rank the students are mostly chemistry (0.4) coefficient while other have less weight (0.2 for Language, 0.2 for maths/bio for example). It has to be noted that the number of government paid students is highly reduced. This could become an important future source of concern if it contributes to limited

student recruitment in the programme.

The organization of the studies is satisfactory, as shown both from the students' interviews and from the SER. The study timetable is presented on the Internet and on the FNS bulletin board and the students are well aware of it. In a similar manner, the exams schedule is well organized and available for the students who can demand for modifications.

The major encouragement to participate in research is the Bachelor thesis that the students can conduct as a full research project. Several subjects in molecular biology, bioenergetics, analysis of biological objects, gene transport into cells and tissues can be chosen. This leads to an overall good quality for bachelor's theses, as it was found by the committee during the visit.

Students can also be given the opportunity to present their research at the biennial conference of the Lithuanian biochemical society as well as to other scientific events.

VMU announces that it is ranked 3rd among the Lithuanian universities for students (and teachers) mobility, mainly due to a large number of Erasmus agreements with many Universities (see Introduction). However, both the SER and the visit showed that those possibilities are very poorly used by the students. Although the reasons might be multiple, the overall impression of the Review Team is that a clear strategic view on the goals to achieve and on the organization to setup for outward mobility is lacking.

The SER further mentions the opportunity for the students to obtain a Thermo Fisher Scholarship that enables the students to move in the company to do a full internship. By contrast, the inward mobility is satisfactory as there is a significant flow of foreign students in the programme. Staff mobility is also significant (about 20% of mobility each year). Visiting professors/researchers (10 in 2013, 5 in 2014 and 8 in 2015) are also listed in the SER.

It is obvious that VMU has a strong tradition of very open communication and support towards the students. During the interviews, the students and alumni insisted on the very active support given by their professors and their availability, which is facilitated by the limited size of the programme and department. Support is given under different forms e.g. direct council, information on career planning, future jobs etc. Finally, the VMU student's association organizes different events as well as discussions and seminars with the teachers. Scholarships are given to students with excellent marks (20% of students). Information on external possible financial support is also given.

Assessment is based on the expected learning outcomes with the objective to deliver trustworthy, objective and adequate assessment of the student's knowledge and skills, as presented in the SER. Assessment criteria are available for each study subject and course content (University website, intranet and Moodle). They are also presented in detail by the teachers at the

beginning of each study subject.

The SER mentions a strong policy to survey the professional insertion of student. VMU has an agreement with Kaunas Labour Exchange for the observation of graduate placement. In addition, VMU graduate career development is observed through yearly "Alumni Days", individual communication, on-line surveys. Taken together, the SER States that "the graduates of Biochemistry find it not difficult to get a job ". Indeed, the alumni and students who were met during the visit were satisfied by their employability prospect after this programme. It has to be noticed that most of the alumni and students listed in appendix P4 continue in Master programme.

2.6. Programme management

The governance is distributed among several administrating units: Biochemistry Study Programme Committee, Department of Biochemistry, Faculty of Natural Sciences and Faculty Board.

The programme is managed by a Study Programme Committee, which organizes the quality assessment and eventual changes, which have to be approved by the Faculty Board and implemented by the Department. The composition appears adequate with experienced staff members and a student representative. Students and stakeholders can also give feedback and suggestions to the study programme. The chain of decision appears effective and flexible as the structure is rather small. Minor decisions can be taken directly resulting in efficient reactions when needed. This kind of direct and "familial" management is not however the most efficient in delivering a strategic vision of the programme evolution and positioning in the national and international landscape.

The programme has an internal quality insurance policy based on (i) the collect of information by the institutional study quality assessment system, and (ii) quality supervision performed by the institution. The different study subjects are assessed at the end of every semester, both by teachers and students using dedicated questionnaires.

The student's feedback is however still difficult to collect, resulting in limited quality of information. The programme and institution should implement this point for example by making the feedback mandatory to pass the exams.

The information obtained by the surveys are analysed by the study committee. However, during the visit, it was not fully clear how this could be used in a concrete manner to improve different points that were detected to be problematic. Taken together, the Review Team was not able to see a quality assurance cycle associated with efficient and effective feedback

procedures. The HEI does collect feedback from the students but there lacks a general procedure how this information is used to improve and modify learning outcomes, course contents, teaching and assessment methods, and strategic planning within the study programme and Faculty activities, including development of research environment.

The SER lists a series of collaboration contracts between VMU and stakeholders: Thermo Fisher Scientific Baltics, “Kaunas Šilainiai Clinics”, and the network of certified medical research laboratories PI “Medicina Practica” company “Volfas Engelman“. Lectures are also given (training seminar) by JSC "Biocentras" and their partners ("Cell analysis", lecturer Dr. Karina Blachnio from Merck).

The SER states that the opinions of the stakeholders are important for the development of the programme and that these contracts "strengthen the relations and develop strategic partnership with industry." It also states in a very honest manner that the programme management would like to "involve them more". This statement was corroborated by the visit in which the manner the stakeholders were involved in the evolution of the programme was not fully clear.

In summary, the measures taken to improve the programme seem rather effective in terms of day-to-day modest modification of the programme. However, there were no evidences of a formalized process in which the information collected from different sources (students, staff, stakeholders, environment...) is processed to result in a strategic vision of the programme planning and evolution.

III. RECOMMENDATIONS

1. The programme needs to define clearer and more realistic objectives, in order to cope with rapidly changing and competitive scientific and socioeconomical environments.
2. In particular, the programme should further restructure its organization and contents to introduce a strong biology and biochemistry core at its very beginning and gradually expand it throughout all the years. This should be backed by actions of the faculty and department to increase the critical mass of both research and teaching staff.
3. The overall management of the programme operates in a familial manner and should evolve towards a more formalized, documented, and efficient strategic planning led by Study programme committee. This also involve the use of student and staff feedback for strategic planning of actions, as well as a tool to improve the research and educational actions to reflect the changes and needs within the field in the society.
4. The programme needs to take rapid and accurate actions to increase its number of students. As previously recommended, increasing the biology-biochemistry core (see point 2) could make the programme more attractive. Furthermore, the introduction of a larger part of teaching in English, to further attract foreign students, should also be considered.
5. Students international mobility should be further implemented and promoted. The department should take more advantage of the numerous agreements signed by the University. At the student's level, the department should be more proactive in planning ahead and organizing the exchanges in particular in terms of courses contents and credits harmonization.
6. A culture for health and safety is missing both in teaching and during practical exercises. This should be corrected by installing a sensitization during courses and by implemented safety measures and procedures in the laboratories where the practical exercises take place.
7. Teachers training and the use of more innovative pedagogical approaches for teaching, learning and assessment should be developed in a more proactive and rational manner.

IV. SUMMARY

The learning outcomes for a Biochemistry BA programme are well defined. The curriculum includes with very strong bases, in particular for fundamental scientific topics like maths, physics, chemistry. This can be regarded as positive, because a solid background is needed to further study biochemistry. On the other hand, this organization is not strictly based on pedagogical grounds and relates on critical mass issues. Hence the biochemistry department appears rather limited in size, making it difficult for the programme to operate at satisfactory national and international levels. This is problematic for the identity and strength of the programme. Definite actions should be taken to implement a stronger biology-biochemistry core from the beginning of the programme.

The teaching staff appears to be qualified, experienced and is very appreciated (and available) for the students. The age pyramid is well balanced. Three engineers and technicians support the programme. A very clear and open communication towards the students on the programme outcomes, timetables and assessment procedures is noticed.

The infrastructure for computing, lectures and library are of correct quality. They are however unequal for practicals. If recent material has been acquired for biology, the chemistry part remains to be further improved.

The programme does not take enough advantage of the numerous agreements signed by the University to promote the students' outward mobility, which currently is limited.

The precise involvement of stakeholders is not clear.

The management of the programme is very familial and the implementation of the internal quality assurance policy is not optimal. Taken together, this does not allow a strategic vision that is absolutely necessary to increase the attractiveness of this programme in such a rapidly evolving field.

V. GENERAL ASSESSMENT

The study programme *Biochemistry* (state code – 612C73002) at Vytautas Magnus University is given **positive** evaluation.

Study programme assessment in points by evaluation areas.

No.	Evaluation Area	Evaluation of an area in points*
1.	Programme aims and learning outcomes	3
2.	Curriculum design	2
3.	Teaching staff	3
4.	Facilities and learning resources	2
5.	Study process and students' performance assessment	3
6.	Programme management	2
	Total:	15

*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.

Grupės vadovas:
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Grupės nariai:
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