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Learning outcomes for postgraduate education in anatomy based on national qualifications framework

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Abstract

Postgraduate education provides students with a higher level of education in their chosen subject of study. This study described and discussed learning outcomes for postgraduate education in anatomy, drawing on the author's own experiences. Because learning at higher levels is contingent on acquiring prerequisite knowledge, skills, and competences at lower levels, learning outcomes based on lower-level qualifications were established for each degree. The arrangement of postgraduate programs varies greatly not only between nations but also among the universities within the same country. Having a uniform framework appears to be a useful and novel guideline for institutions. The National Qualifications Framework for Higher Education in Türkiye (NQF-HETR) provides specific explanations for degrees based on learning outcomes and content to build new qualifications. Learning outcomes reflect what a learner is expected to know, understand, and/or be able to do by the end of a learning period. There are three categories of learning outcomes: knowledge, skills, and competences. Learning outcomes for postgraduate education in anatomy provide a means of translating the goals of an anatomy course or program into a set of competences, as well as providing students with clear indications of their paths through postgraduate education and what levels of knowledge and skills will qualify them for degree awards. Learning outcomes also provide a useful language for communicating about a curriculum.

Keywords: anatomy education; learning outcomes; national qualifications framework; postgraduate education

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Introduction

Postgraduate programs represent a crucial part of university education and research. Traditionally, they were primarily viewed as a path to pursuing academic careers in the future. In recent years, there has been a rapid increase in the number of postgraduate candidates and major changes in the global job market. Therefore, universities have to change postgraduate programs to adapt to new conditions. Postgraduate education has also increased in importance in the context of the Bologna Process since the Berlin Communiqué (2003), which, following a recommendation from the European University Association (EUA), included doctoral programs as the "third cycle" after bachelor's and master's degrees.[1,2]

Master's programs (second cycles) focus on developing specific professional or occupational abilities. A master's degree is typically obtained through research, coursework, or both. A study is gaining an in depth understanding of a given field of study, typically by independent investigation. In Türkiye, there are two types of master's programs: those with and without a thesis.[3]

Doctoral programs (third cycles) are regarded as a critical source for the next generation of researchers, acting as the primary link between European Higher Education (EHE) and European Research Areas (ERA).[2,4] As a result, they have become an official and significant component of the political agenda for the Bologna Process. However, doctoral programs differ significantly from the first and second cycles of higher education. The primary characteristics of doctoral programs are: (a) a thorough review of the literature, experimentation, or other systemic approach to a body of knowledge; (b) an original research project resulting in a significant contribution to knowledge and understanding and/or the application of knowledge within a field of education; and (c) a substantial and well-ordered thesis demonstrat-

ing the relationship of the research to the broader framework of the field.[3–6]

In this study, learning outcomes for master's and doctoral degrees in anatomy based on "National Frameworks of Qualifications for Higher Education in Türkiye (NQF-HETR)" were described and discussed with the contribution of the author's own experiences and studies.

Qualifications

National frameworks of qualifications are typically constructed using similar elements to those indicated in the Berlin Communiqué (2003).[1] Qualifications are defined in this report as any degree, diploma, or certificate issued by a competent authority, attesting that specific learning outcomes have been achieved. This usually follows the successful completion of a recognized higher education program.[2]

Learning Outcomes

Learning outcomes are one of the most important building blocks for openness in higher education systems and certifications. They were the focus of a Bologna Conference held in Edinburgh on July 1–2, 2004, when all issues of their application were discussed in light of Bologna developments.[7]

Learning outcomes are the expression of what a learner is supposed to know, comprehend and do after completing a learning process. The use of active verbs to represent knowledge, comprehension, application, analysis, synthesis, and evaluation, among other things, distinguishes learning outcome statements. The "outcomes-based approaches" have consequences for qualifications, curriculum design, teaching, learning, and assessment, as well as quality assurance.

Learning outcomes a) help teachers to translate the aims of a course or program of study into a set of competencies that the learner is expected to be able to demonstrate by satisfactorily performing a set of assessment tasks, b) make it easier to recognize and give credit for learning acquired in another institution, and c) help employers to understand what they can expect a graduate to know, understand and be able to do.[3,8]

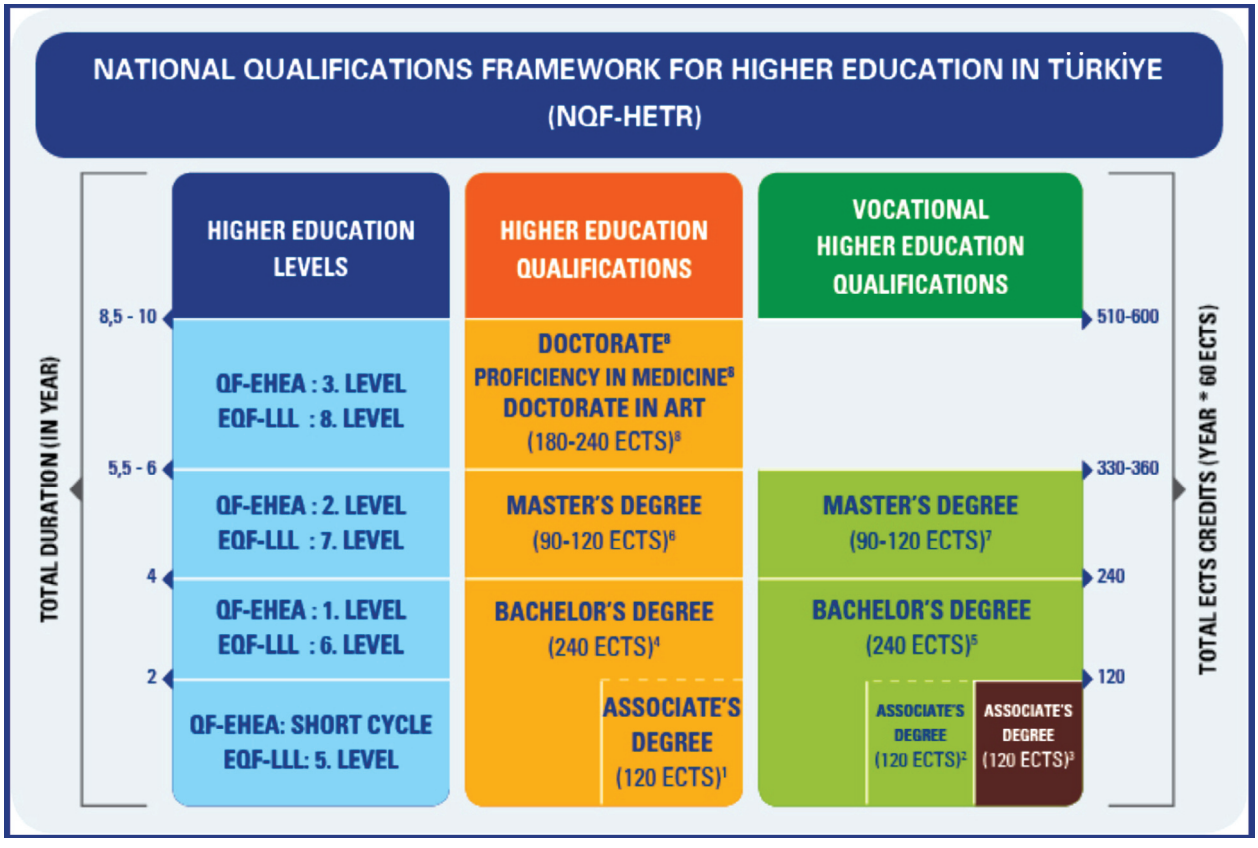

Figure 1. Qualifications' profiles for NQF-HETR levels. Retrived from http://tyyc.yok.gov.tr/

Descriptors of Learning Outcomes

Descriptors of learning outcomes include three components: (a) theoretical and conceptual knowledge; (b) cognitive and practical skills; and (c) competences. The shared qualification descriptors (Dublin descriptors) produced as part of the Joint Quality Initiative (JQI) comprise generic competences (skills and knowledge) as well as qualities like the ability to learn, analyze and synthesize, and so on.[5,8]

National Qualifications Framework for Higher Education in Türkiye (NQF-HETR)

Türkiye participated in the Bologna Process in 2001, and since then it has been actively involved in the process under the responsibility and coordination of the Council of Higher Education (CoHE, YÖK). The development of the National Qualifications Framework for Higher Education in Turkey (NQF-HETR) has been a major success in the framework of the Bologna Implementations in Türkiye.[8,9] The importance of NQF-HETR is that it presents not only certain explanations among the degrees based on the learning outcomes but also content to design new qualifications. The process involves the careful mapping of national qualifications (their levels, learning outcomes, and descriptors) with the cycle descriptors identified for the European overarching framework. NQF-HETR can be defined with four cycles, including associate's, bachelor's, master's, and doctoral degrees, with its current design. Defining these qualification groups in NQF-HETR with different profiles and their degrees is important for the transparency and comprehensibility of NQF-HETR.[8]

Table 1

Master's level (Level7) qualifications in Türkiye. These qualifications may be applied to the field of health.

National Qualifications Framework for Higher Education in Turkiye (NQF-HETR)* 7. Level (Associate's) Qualifications						
			COMPETENCES			
NQF-HETR LEVEL	**KNOWLEDGE - Theoretical - Conceptual**	**SKILLS - Cognitive - Practical**	**Competence to work independently and take responsibility**	**Learning competence**	**Communication and social competence**	**Field specific competence**
7 MASTER'S ——— EQF-LLL: 7. level ——— QF-EHEA: 2. cycle	- Develop and deepen knowledge in the same or in a different field to the proficiency level based on Bachelor level qualifications. - Conceive the interdisciplinary interaction which the field is related with.	- Use of theoretical and practical knowledge within the field at a proficiency level. - Interpret the knowledge about the field by integrating the information gathered from different disciplines and formulate new knowledge. - Solve the problem faced related to the field by using research methods.	- Independently conduct studies that require proficiency in the field. - Take responsibility and develop new strategic solutions as a team member in order to solve unexpected complex problems faced within the applications in the field. - Demonstrate leadership in contexts that require solving problems related to the field.	- Evaluate knowledge and skills acquired at proficiency level in the field with a critical approach and direct the learning.	- Communicate current developments and studies within the field to both professional and non-professional groups systematically using written, oral and visual techniques by supporting with quantitative and qualitative data. - Investigate, improve social connections and their conducting norms with a critical view and act to change them when necessary. -Communicate with peers by using a foreign language at least at a level of European Language Portfolio B2 General Level. - Use advanced informatics and communication technology skills with software knowledge required by the field.	- Audit the data gathering, interpretation, implementation and announcement stages by taking into consideration the cultural, scientific, and ethic values and teach these values. - Develop strategy, policy and implementation plans on the issues related to the field and assess the findings within the frame of quality processes. - Use the knowledge, problem solving and/or implementation skills in interdisciplinary studies.

*Retrived from http://tyyc.yok.gov.tr/

Qualification Profiles for NQF-HETR Levels

Qualification profiles under the NQF-HETR were judged to be adequately divided as (1) Qualifications for Higher Education and (2) Qualifications for Vocational Higher Education (**Figure 1**). The level descriptors (generic learning outcomes) for associate's, bachelor's, master's, and doctoral degrees, as well as all levels of higher education under the NQF-HETR system, were developed, as were their qualification profiles (differences). **Tables 1** and **2** reflect the qualifications for both master's and doctoral levels as defined in the NQF-HETR.

Bloom categorized educational objectives (learning outcomes) into three "domains": cognitive, emotional, and psychomotor. Bloom also categorizes cognitive outcomes into subcategories ranging from the most basic to the most sophisticated. According to Bloom's Taxonomy, learning at higher levels depends on having obtained prerequisite knowledge and skills at lower levels. The main difference between Bloom's Taxonomy and NQF-HETR classification is that the emphasis has shifted from instructional objectives which describe what instructors do, to the student learning outcomes which describe what students can do as a result of their educational experiences.[10,11]

Learning Outcomes for Master's and Doctorate Education in Anatomy

NQF-HETR is a guide to plan both the education of master's, doctoral or speciality education as well as the core curriculum in anatomy. For example; The Turkish Society of Anatomy and Clinical Anatomy (TSACA) has prepared an "Anatomy Core Education Program" taken into consideration NQF-HETR for Anatomical Applications and Scientific Activities for Medical Specialization and Doctoral Students on 04.12.2019.[12] NQF-HETR is also used to prepare questions for the assesments.[11]

In **Table 3**, two separate columns were created based on the author's experiences to compare the learning outcomes for anatomy master's and doctoral education based on NQF-HETR.

Table 2

Doctorate level (Level 8) qualifications. These qualifications may be applied to the field of health.

National Qualifications Framework for Higher Education in Turkiye (NQF-HETR)* 8. Level (Associate's) Qualifications						
			COMPETENCES			
NQF-HETR LEVEL	KNOWLEDGE - Theoretical - Conceptual	SKILLS - Cognitive - Practical	Competence to work independently and take responsibility	Learning competence	Communication and social competence	Field specific competence
8 DOCTORATE —— EQF-LLL: 8. level —— QF-EHEA: 3. cycle	- Develop and deepen the current and advanced knowledge in the field with original thought and/or research and come up with innovative definitions based on Master's degree qualifications. - Conceive the interdisciplinary interaction which the field is related with; come up with original solutions by using knowledge requiring proficiency on analysis, synthesis and assessment of new and complex ideas.	- Evaluate and use new information within the field in a systematic approach. - Develop an innovative knowledge, method, design and/or practice or adapt an already known knowledge, method, design and/or practice to another field; research, conceive, design, adapt and implement an original subject. - Critical analysis, synthesis and evaluation of new and complex ideas. - Gain advanced level skills in the use of research methods in the field of study.	- Contribute the progression in the field by producing an innovative idea, skill, design and/or practice or by adapting an already known idea, skill, design, and/or practice to a different field independently. - Broaden the borders of the knowledge in the field by producing or interpreting an original work or publishing at least one scientific paper in the field in national and/or international refereed journals. - Demonstrate leadership in contexts requiring innovative and interdisciplinary problem solving.	- Develop new ideas and methods in the field by using high level mental processes such as creative and critical thinking, problem solving and decision making.	- Investigate and improve social connections and their conducting norms and manage the actions to change them when necessary. - Defend original views when exchanging ideas in the field with professionals and communicate effectively by showing competence in the field. - Ability to communicate and discuss orally, in written and visually with peers by using a foreign language at least at a level of European Language Portfolio C1 General Level.	- Contribute to the transition of the community to an information society and its sustainability process by introducing scientific, technological, social or cultural improvements. - Demonstrate functional interaction by using strategic decision making processes in solving problems encountered in the field. - Contribute to the solution finding process regarding social, scientific, cultural and ethical problems in the field and support the development of these values.

*Retrived from http://tyyc.yok.gov.tr/

Table 3
Learning outcomes for anatomy master's and doctoral education based on NQF-HETR *[to be continued]*.

MASTER LEVEL 7 (CYCLE 2)	DOCTORATE LEVEL 8 (CYCLE 3)
KNOWLEDGE - Theoretical - Conceptual	
- Explain and deepen the anatomical concepts and fields of study based on Bachelor level qualifications. - Desribe the normal gross anatomy, vascularization, innervation, lymphatic drainage, and functional relationships of the structures. - Differentiate variations and abnormalities in the human body. - Define the surface anatomy of the structures. - Combine knowledge of anatomy with knowledge of other fields. - Use anatomical knowledge to explain the clinical cases. - Understand the technologies, technical equipment, cadavers, models, and microscopic techniques essential in the anatomy discipline. - Interpret, evaluate, synthesize, and combine anatomy with other disciplines to provide new information. - Design scientific researches in the field of anatomy and creates a report. - Identify commonly used statistical approaches in anatomy and related fields.	- Develop and deepen current and advanced knowledge on the functional relationships of organs, structures, and systems based on Master's degree qualifications with original thought and/or research and reach the original definitions that will bring innovation to the field of anatomy. - Explain variations and anomalies in the human body based on phylogenetic and ontogenetic development. - Conceive the interdisciplinary interactions related to anatomy; analyze, synthesize, and evaluate original and new ideas. - Distinguish 2D and 3D radiological images of structures and integrate this information with knowledge of anatomy. - Make interpretations about clinical cases by using anatomy knowledge. - Develop new methods for anatomy education. - Develop an original idea, method, and design/application that brings innovation to anatomy or implements a known thought, method, and design/application in different fields. - Choose accurately statistical methods, implements for the research of anatomy and related disciplines and analyze and synthesize within the scope of ethical rules. - Write the report of a research in which he or she participated and publishes or presents it in peer-reviewed national or international journals or scientific meetings.
SKILLS - Cognitive - Practical	
- Perform the macroscopic and microscopic dissection of the cadaver with appropriate techniques. - Draw the reference points, superficial contours, and projections of structures, vessels, and nerves on the living human body. - Follow the ethical rules in proceedings after dissection, obtaining, conservation, and using process of cadaver. - Perform experiments and measurements in the field of anatomy. - Interpret the knowledge about anatomy by integrating the information gathered from different disciplines and formulating new knowledge. - Solve the problem faced related to anatomy by using research methods.	- Perform investigations by using tools, devices, instruments, and technologies required by the anatomy field and related disciplines at an advanced level and develop new and creative solutions for problems. - Evaluate and use new information within the anatomy field with a systematic approach. - In advanced-level skills in the use of research methods in the field of anatomy.
COMPETENCES Competence to work independently and take responsibility	
- Conduct research on anatomy and related fields independently or as a team member. - Take responsibility and develop new strategic solutions in order to solve unexpectedly complex problems faced within the applications of anatomy. - Demonstrate leadership in contexts that require solving problems related to anatomy.	- Broaden the borders of knowledge in the anatomy field by producing or interpreting an original work or publishing at least one scientific paper in the field in national and/or international refereed journals. - Demonstrate leadership in contexts requiring innovative and interdisciplinary problem solving.
Learning competence	
- Evaluate knowledge and skills acquired at the proficiency level in the field with a critical approach and direct the learning.	- Develop evidence-based new ideas and methods in the anatomy field by using mechanisms of creative and critical thinking, problem solving, and decision-making.

Table 3
Learning outcomes for anatomy master's and doctoral education based on NQF-HETR *[continued]*.

MASTER LEVEL 7 (CYCLE 2)	DOCTORATE LEVEL 8 (CYCLE 3)
Communication and social competence	
- Communicate current developments and studies within the anatomy field to both professional and non-professional groups systematically by using written, oral, and visual techniques, supported by quantitative and qualitative data. - Investigate, improve social connections and their norms with a critical view, and act to change them when necessary. - Communicate with peers by using a foreign language, at least at the European Language Portfolio B2 General Level. - Use advanced informatics and communication technology skills with the software knowledge required by the anatomy field.	- Use the current developments and knowledge regarding the anatomy field for the benefit of children, families, national values, and societies in accordance with the facts of the country. - Defend original views when exchanging ideas in the anatomy field with professionals and communicate effectively by showing competence in the field. - Discuss and make visual, written, and oral communication with peers by using the C1 level for the Common European Framework of Reference for Languages at an advanced level.
Field specific competence	
- Audit the anatomical data gathering, interpretation, implementation, and announcement stages by taking into consideration cultural, scientific, and ethical values. - Develop strategies, policies, and implementation plans on the issues related to the anatomy field and assess the findings within the framework of quality processes. - Use knowledge, problem-solving skills, and/or implementation skills in interdisciplinary studies.	- Communicate functionally by using mechanisms of ethical and strategic decision-making for solving encountered problems; contribute to and maintain the process of information society by presenting scientific, technological, social, and cultural advancements related to the anatomy field. - Demonstrate functional interaction by using strategic decision-making processes to solve problems encountered in the field of anatomy. - Contribute to the solution-finding process regarding social, scientific, cultural, and ethical problems in the anatomy and related fields and support the development of these values.

Training in Core and Transferable Skills

Acknowledging the diverse career paths available to postgraduates and the complex demands of the global job market, universities have made it a priority to offer a broad selection of courses and modules within their postgraduate programs. In the field of anatomy, different types of training such as lectures, seminars, colloquia, and summer schools provide scientific training in core research skills such as research methodology, techniques, management, analysis, diffusion, problem-solving, scientific writing, publishing, awareness of scientific ethics and intellectual property rights, etc. Additionally, these training programs also provide instruction in transferable (generic) personal and professional skills and competences such as writing and communication skills, networking and teamwork, materials and human resources (i.e. cadaver) management, time management, career management including job-searching tactics, leadership abilities, and so on. Scientific training in essential research abilities is typically necessary, however it is usually provided voluntarily to meet the individual needs of postgraduate anatomy applicants through a range of modules or courses.

Conclusion

Finally, it is preferable to raise awareness about the importance of improving postgraduate programs and career opportunities in anatomy. Higher education institutions, government ministries of education and research, innovation and technology, and national scientific councils should all work collaboratively to address this issue.

The wide variety of scientific disciplines has had an important effect on the structure of postgraduate education. These differences must be considered when designing postgraduate programs in anatomy, but they should not be interpreted as a barrier to developing novel methods of providing candidates with the opportunity to improve their abilities and gain additional experience in an international and interdisciplinary research environment, as well as to be better prepared for future possibilities.

Conflict of Interest

None.

Ethics Approval

Since this study is a review and reflects the author's perspectives on the topic, ethical approval was not required.

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