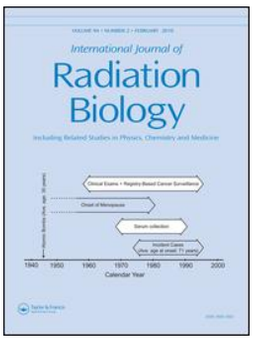

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ORIGINAL ARTICLE

Students' expectations in an international Master of Science course in radiation biology

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ABSTRACT

Purpose: We assessed students' expectations to a full two-year Master of Science course regarding workload, extracurricular activities, learning methods, and career plans.

Materials and methods: A questionnaire was handed out to all students in the MSc radiation biology course. Questions evaluated the time for study and lectures expected a desire for specific teaching and testing formats, expectations from extracurricular activities as well as the motivation to study the subject and the future career plans. All students (100%) enrolled in the first semester were handed out and completed the questionnaire.

Results: Most students had learned about the course from the internet (68.75%) or received information from teachers or professors (25%). Two students stated that all disciplines were equally relevant (25%). Others students made clear preferences: fourteen voted molecular biology (87.5%) as relevant, radiation protection in 93.75%, 81.25% consider physics the most important topic, followed by immunology (62.5%). Tutorials and lectures were preferred teaching formats. Generally, a workload of 20 hours per week is preferred.

Conclusions: An ongoing feedback loop is important in designing a modern Master of Science course in the context of the Bologna process. Valuable information is given by students and should be integrated continuously in the design and continuation process.

Abbreviations: ECTS: European Credit Transfer and Accumulation System; MD: Medical Doctor; MSc: Master of Science; PhD: Doctor of Philosophy; TUM: Technical University of Munich

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Students' expectations; generation y; work-life-balance; test formats

Background

Students' expectations and curricular commitments are often contradictory. While teachers generally want to convey a maximum of content, students are keen to learn but retain a substantial interest in day-to-day life, personal hobbies, additional qualifications or, in some cases, are forced to earn money to finance their education. Thus, designing a University curriculum has to take into account many factors, always finding the balance between effective education and retention of student free time and their other preferences. Within curricular requirements, it has been shown that integrating student engagement by providing interactive training and teaching methods, self-assessment, for example, using formative assessments or other tools as well as setting up a feedback loop regarding student contentment have significantly increased learning effectivity and students' satisfaction (Evans et al. 2014; Hopper 2016).

Over the last decades, the willingness to devote most of the personal time to work and studies has diminished. The so-called 'Generation Y' has a strong focus on quality of life (QOL), the balance between study and free time, as well as on workload per scheduled teaching topic. Moreover, the anticipation of 'time-of-teacher-per-student' has increased. Many expect that course materials and additional reading are readily prepared, while a more conventional self-search for literature and other options of self-study have been reduced. Students' expect well-prepared lectures, online documentation of topics, a complete compilation of reading material and literature, including a detailed guideline for reports, assays or other necessary work, which has to be prepared during the semesters.

At the Technical University of Munich (TUM), we developed a full Master of Science (MSc) course in radiation biology following all requirements of the Bologna Process. In 2014, the first course was launched, with the first official semester starting in 2015. Few data are available on the expectations of students coming from various countries for participation such an MSc. We developed an interdepartmental curriculum, which includes 4 semesters, 20 modules and a variety of teaching formats including lectures, tutorials, practical courses, and journal clubs.

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In the framework of the Bologna Process and the requirements at TUM, we sought to determine whether our students expect similar workload, lecture, and teaching characteristics as well as offers for extracurricular activities. The present work evaluates intercultural preferences, as well as students' request for teaching and testing format within the MSc radiation biology course.

Materials and methods

We interviewed all students within the MSc radiation biology at the beginning of the winter semester 2016. Due to the strict selection process and the admission requirements, the MSc semesters consist of a small group of students with a high level of excellence. The study group consisted of 16 students, 7 male (43.75%), 9 female (56.25%). The country of origin was Germany ($n = 6$; 37.5%), Egypt ($n = 2$; 12.5%), India ($n = 2$; 12.5%), Nigeria ($n = 2$, 12.5%), and China, Mexico, Ghana and Iran with one student each (each 6.25%). The median age was 26 years (range 20–30 years). Of all 16 students 15 had performed a Bachelor's program successfully (93.75); two out of 16 students (12.5%) had already completed another MSc degree, and one student was previously trained a radiotherapist. One medical doctor (MD) enrolled as a student in the MSc radiation biology course.

The study is performed within the quality assurance and development program within the MSc course according to internal standards of the TUM and the respective Ethic's Committees at TUM. We handed out a questionnaire to all sixteen (100%) of the students, all students fully completed the questionnaire. To gain information on the students' background and their personal mid- and long-term goal with the MSc course we asked the following questions: What is your country of origin? Where did you learn about the course? Internet/online, reference by teacher or mentor, personal recommendation from current or previous students. We then focused on questions regarding expectations in total teaching hours per week as well as the preference of teaching formats. To define student-friendly exams, we wanted to find out which test formats, i.e. oral exam, multiple choice, essay or other, is the preferred teaching format. Additionally, we wanted to find out which extracurricular activities the students would like to take part in.

Questions were asked as multiple-choice questions. The analysis included statistical and descriptive evaluation of the data.

Results

Motivation to choose the MSc radiation biology course

Most students (11 out of 16; 68.75%) picked the course because they claim special interest in the field of radiation, radiation biology or other related disciplines. Of these, six students (55%) have worked previously in work areas related to radiation or radiation biology. Five students (31.25%) stated the course seemed important to them due to future job opportunities, and six students (37.5%) claimed that in their home country, education is urgently required in this field and they can contribute by being educated in the field. The students' home countries were China, Ghana, Nigeria, and Egypt, as well as one student from Germany. Two students (12.5%) stated, they chose the course as they wanted to study in Munich; both are working in the field, one has been trained previously as a radiotherapist and has the possibility to work during her studies in the Munich metropolitan area, and one is an MD working as a resident. Most students had learned about the course from information on the internet ($n = 11$; 68.75%), and four students had received information and recommendations about the course from their teachers or other professors at universities (25%). One student had learned about the MSc radiation biology at the TUM Master's Fair, which is held every year with substantial information on all MSc programs offered at TUM. Another student already enrolled in the course (6.25%) recruited one student.

To tailor a curriculum to the individual needs of students and their future careers, we asked about the future career plans and goals. Ten out of 16 students (62.5%) are in favor of a job with research activity; this includes governmental jobs as well as Ph.D. positions. Of all, 68.75% of the students want to earn a Ph.D. after completing the MSc course ($n = 11$). However, at the time of the questionnaire, no student was planning to complete an additional MSc program in a related or non-related topic to radiation biology. The students, which previously worked in a governmental job in the home country, have planned to go back to the job with the newly acquired knowledge from the MSc program.

Course composition of the MSc curriculum

The TUM MSc curriculum is designed as a multidisciplinary interdepartmental course including all relevant disciplines to radiation biology. This includes basic sciences such as biology, physiology, molecular biology, physics, and immunology as well as more practice-oriented subjects including informatics, radiology, radiation oncology and nuclear medicine. In view of the students' future perspectives, we inquired which discipline or specialization the students thought to be most important in the course (Figure 1(A)). Two students stated that all disciplines were equally relevant within the curriculum (25%). All other students made clear preferences: Fourteen students voted molecular biology (87.5%) as relevant and 15 students (93.75%) identified radiation protection as the most important topic. Thirteen out of 16 students (81.25%) consider physics as being one of the most important topics, followed by immunology in 10 students (62.5%). Only six students consider biology (37.5%) as important, likewise informatics ($n = 4$; 25%). Other recommendations made by the students included a specialized module on radiation therapy, as well as an emphasis on research methodology; both topics are already covered within dedicated modules in the MSc course.

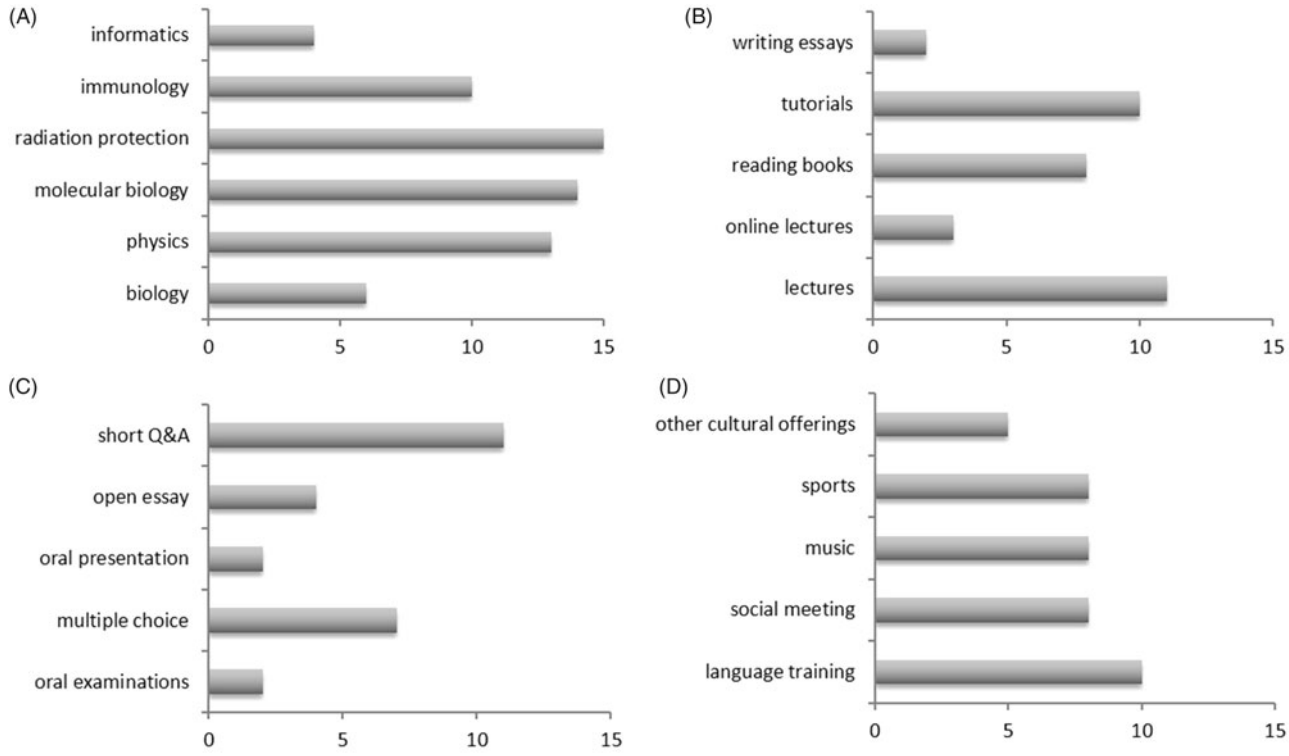

Figure 1. (A) Most relevant topics. (B) Preferred teaching formats. (C) Favorite examination format. (D) Preferred extracurricular activities.

Preferred methods of learning and examination

Most students reported that tutorials ($n = 10$; 62.5%) and lectures ($n = 11$; 68.75%) were the preferred teaching formats (Figure 1(B)). Only three students prefer online lectures to 'live' lectures (18.75%). Writing essays, i.e. selecting and reading certain materials on a topic and compiling the information in a concise format was only chosen by two students (12.5%). However, self-study in terms of reading textbooks is preferred by eight (50%) students.

Two students only selected oral exams as a favorite examination method (12.5%) (Figure 1(C)). All students rejected online examinations. However, multiple choice questions formats are preferred by seven students (43.75%), and written answers to carefully worded questions by 11 students (68.75%). Only four students would prefer an essay-style exam with open questions (25%).

Study working hours and extracurricular activities

Most students would prefer a workload of 20 class hours per week ($n = 6$, 37.5%), and four students claimed that he would think 30 hours were appropriate (25%; Figure 2). Only one student voted for 40 teaching hours per week. No schedule exceeding 40 hours per week was preferred. Five students preferred less than 20 hours with one student (6.25%) choosing 15 hours, one student requesting 12 hours (6.25%) and three students (18.75%) selecting 10 hours per week. For extracurricular activities (Figure 1(D)), most students ($n = 10$; 62.5%) would favor language courses, including German courses for European and International students, and English training for German as well as for all other nationalities. Social meetings ($n = 8$; 50%), sports ($n = 8$; 50%), music events ($n = 8$; 50%) and other cultural offerings ($n = 5$; 31.25%) would be wanted by half of the students. No other extracurricular activities were suggested.

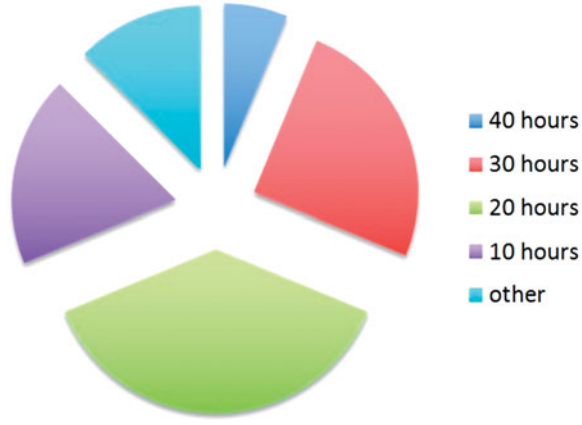

Figure 2. Students' preferences on the weekly hours within the MSc course.

All students but one student indicated they had to work in parallel to their studies, independently of age or nationality.

Discussion

Students' preference has to be taken into account when designing a study curriculum while the country and university-specific regulations and requirements must be met. In a detailed questionnaire, we evaluated the perceptions of international students in the MSc radiation biology at TUM Medical Faculty. The data show that students have a clear willingness to learn and study, and the majority has an explicit vision on the goals they want to achieve by choosing this

particular curriculum, including a structured career perspective. However, willingness regarding time investment into lectures and other teaching formats is limited; most students prefer that physical presence does not exceed 20 hours per week. An even-tempered work-life-balance is a high priority; however, especially in students from foreign countries, certain hours are required to earn money to finance their studies.

When designing a new MSc course, we thought it was important to learn about the preferences of students, especially since the course was designed as an international format with students originating from several European and non-European countries. The uniqueness of the MSc course radiation biology is that this is the first 2-year graduate study course on radiation biology following the requirements of the Bologna process. Additionally, the course is held within the framework of the medical faculty; in Germany, medical education follows a unique structure quite different from conventional bachelor and master (previously intermediate and final diploma) studies. Therefore, the composition of the course had to be in line with several guidelines: Firstly, the MSc radiation biology course at TUM was designed according to the Bologna process; it was the first Bologna-conform course at a medical faculty in Germany (Kessel et al. 2016). Other specifications thus included all requirements of the European framework for higher education, as well as TUM-internal regulations regarding the modules. Thus, exemplarily, 40 weekly hours were not to be exceeded, in only 45 weeks per year. All modules were set up based on the European Credit Transfer and Accumulation System (ECTS).

Design of a degree program is an ongoing loop of input, supervision, adaption to changes, evaluation by students and teachers, as well as personal judgment by all involved. In this context, it is essential to include students' perceptions and students' demands while adhering to predetermined guidelines. In the literature, few studies exist on the specific preferences of students in such a course. However, it has been shown that students' satisfaction with courses is mostly related to content with teaching and exam difficulty rather than objective determinants of high-quality teaching (Schiekirka and Raupach 2015). Other groups have shown that seeking students' satisfaction and integrating their comments lead to improvements in instruction and evaluation which increased student satisfaction with courses and improved scores on internal, statewide and national examinations (Feinstein and Levine 1980). Therefore, an assessment of which teaching formats and exam formats, students would prefer to seem essential for the effective future conduction of any MSc course. For example, several studies have shown that making use of portfolios which foster personal responsibility for learning and supporting professional development in biology, medicine or other related topics of study seem highly beneficial (Buckley et al. 2009; Tochel et al. 2009). Our students do not prefer test formats including open questions, neither as essays nor as an oral examination. Students favor multiple choice questions or formats with clearly expressed questions requiring precise answers. Our students declined online examinations.

Work-life-balance is becoming more and more important (Mitchell 2008; Hewlett et al. 2009). A high priority is set on personal hobbies, family time as well as other recreational activities; work is seen primarily to earn money to finance free time and to support the family, and often not as a primary goal in life. In the past, with students, a high workload was accepted and lecture hours, self-study time as well as other curricular activities often exceeded 50 hours per week. Today, especially following the Bologna regulations, recommendations are given regarding weekly teaching hours. These include lectures, tutorials, lab work as well as time for self-study, which in detail not further regulated but left open to the individual student. Not all voices support the notion that Bologna improved overall study outcomes: comparison of Bologna-conform studies with curriculums in the 'older' systems have shown that numbers of alumni increase, graduates are coping more easily with exams and exam formats, but overall grades and the level of (general) education is lower (Harzer et al. 2015; Masic and Begic 2015).

The present study clearly demonstrates that students enrolling in the MSc radiation biology course have a clear vision on their future career. All had a plan on what they strived for after completion of their MSc, ranging from research careers to administrative and governmental jobs. Additionally, students' perceptions of the most relevant topics in the MSc course were well in line with the established curriculum again supporting the notion of well-informed students in the field of the chosen topic, but also confirming that the design of the course reflects (a) the specificities of the field and (b) meets the criteria wanted by students. Smaller discrepancies were evident in the number of hours committed to the curriculum: while the Bologna process recommends 40 hours, students would prefer even lower hours per week. However, this might be due to misconception between hours requiring physical presence at the University and self-study hours, which are included in the 40-hour calculation of the Bologna criteria.

Interestingly, students would prefer an additional offer of activities, mainly including language training, which is most likely to be explained by the international composition of the class. Other activities include predominantly social and cultural events, such as music performances. The preference of students for such extracurricular events is an outstanding item since the value of such commitments is often underestimated: engagement, e.g. in student organizations or other networks, fosters relevant social skills, which contribute positively to success in studies and subsequent work life (Macintyre et al. 2013; de Ridder et al. 2014). Based on this information we are in the process of complementing the MSc radiation biology course in this regard, and have already sought to integrate the MSc students in the 'Fachschaft Medizin', an already existing association of the medical students at the faculty.

Conclusion

The present work provides substantial information for the further improvement and continuation of the MSc radiation biology course. The results stress that the topics of the course reflect the needs and preferences of students interested in radiation biology. Moreover, the results provide valuable information for future exam formats and give essential information on additional extracurricular offerings. Thus, the importance of student input on course definition and refinement is reflected by the present analysis. The data provide an essential basis for the continuation and optimization of such a course in the special context of a German Medical Faculty and the Bologna process criteria.

Disclosure statement

No potential conflict of interest was reported by the authors.

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