
MEDICAL STUDENTS' ATTITUDE TO CREATING SCIENTIFIC WORK

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Abstract: Introduction: Scientific studies and their publication have always been messengers for future advances in medicine, as the primary tool for technological and scholarly advances in the field. They are an integral part of the professional life of specialists working in a university. Creating your own scientific publication of any kind is often an undervalued activity whose procedural stages and significance remain insufficiently known. The path to the final publication can be a monotonous and extensive process. While the road to a final draft could be tortuous and monotonous, the pace and mood of walking it are heavily determined by the researcher's motivation. Postgraduate scientific work in academia is an area less preferred to a clinical career, and not favorite for medical graduation students. The main goal of higher education is to prepare students for work, so the introduction to scientific thinking is an important factor for better results in the professional field. During their studies, students must learn how to properly work with scientific literature and create their own scientific work. Training students in the principles of creation and assessment of academic projects is an important factor for better science. Our aim is to explore the preparedness of medical students for scientific work. We can use this information to identifying strategies for the promotion of research skills among them. Materials and Methods: We gathered the opinions of 278 Bulgarian and English medical students in the second and fourth year of study, using a multiple-choice questionnaire, specifically designed and approbated to correspond to our research mission. Data was processed with the predictive analytics software IBM SPSS Statistics, v. 25. Results: Almost all students have had a certain level of previous experience with scientific work. They have mostly done presentations and essays; 94% of them have used scientific literature. The students generally exhibit consciousness of its importance and follow the requirement to properly cite used sources. The year of education is a factor in predicting a student's assessment of the level of importance. Even though 90% admit that it is important to learn how to create scientific work, only 76% are of the opinion that their own knowledge is lacking, and thus would potentially opt for a module on scientific writing. Discussion: Students' experience factored by their year of medical education and completed degree of previous studies is a factor that changes their opinions towards a greater understanding of the meaning of scientific work and the need for further training. Students agree that they need further training in research methodology to be able to develop valid and efficient skills to undertake scientific work.

Keywords: medical students, scientific work, research methodology, higher education

"A university is not about results in the next quarter; it is not even about who a student has become by graduation. It is about learning that molds a lifetime, learning that transmits the heritage of millennia; learning that shapes the future."

Drew Gilpin Faust

American historian and the first female President of Harvard University

INTRODUCTION

Scientific research and scientific publications are inarguably important for the development of medicine both as a science and as a practice. In the current era of evidence-based medicine, the use of research backed-up data is an integral part of doctors' professional life, helping them take educated decisions regarding patients' care. This renders the accurate interpretation of scientific results a truly important skill, and justifies the increased interest in the integration of research-oriented education into the undergraduate medical training programme (Fisher, 2012; Pfeiffer et al., 2016; Foster and Lemus, 2015). Unfortunately, recent studies have demonstrated lack of interest in scientific research among physicians and medical students alike (Siemens et al 2010; Pfeiffer et al., 2016; Fosbøl et al., 2016). The sheer amount of work and skills it takes to create a scientific publication is often undervalued, and the stages and significance of scientific research remain insufficiently known (Guilford, 2001). As academic writing could turn out to be a difficult, monotonous and extensive process, it is not a preferred activity among health care professionals and students (Derntl, 2014).

The main goal of higher education is to prepare students for work in their chosen field. As a profession founded on science, medicine requires continuous monitoring of scientific literature, and medical students should be aware of how to critically assess the findings of new studies on diagnosis and treatment (Fisher, 2012). Some authors argue that, unlike other academic disciplines, for a doctoral candidate in medicine it is important to begin work on their scientific thesis during the medical education. (Fisher, 2012; Pfeiffer et al., 2016). Studies show that students who have been introduced to scientific research early in their academic training are better critical thinkers and possess more efficient abilities to solve practical problems in their professional area (Hughes, 2000; Anderson 2016). Scientific skills emerge from the ability to ask questions, design experiments, analyze and interpret data, and make cognitive associations.

According to many authors, the basis of science education is to create cognitive skills and promote creative thinking in scientific problem-solving. However, the approaches to accomplish this target have not yet become commonly known or utilized (DeHaan, 2009). That is why, in recent years, the discussion concerning the inclusion of a higher degree of research-oriented teaching in medical education has expanded (Fisher, 2012; Pfeiffer et al., 2016). Teaching such important skills in academia should begin with helping students learn how to formulate scientifically valid analytical questions (Foster and Lemus, 2015). The process remains incomplete, however, unless new results are communicated to others, because science fundamentally requires peer review and criticism to validate or discard proposed new knowledge. Therefore, a concise and clearly written research paper is a critical step in the scientific process and is important for young researchers as they are mastering how to express scientific concepts (Hesselbach, 2012).

Training students in the principles of creation of scientific work is an important factor for a better understanding and correct interpretation of scientific data. Students need to be repeatedly reminded that critical thinking and question asking skills are necessary to facilitate their future professional development. As the importance of teaching scientific research and publishing in the medical profession is imperative, we decided to find out some medical students' opinions and attitudes on the matter.

This article presents some results of our project titled "Methodology of scientific research in medicine and health care - development of critical appraisal and creative approaches to science for undergraduate and graduate students". The goal is to study medical students' opinions on scientific research. We aim to analyze the students' opinion about the place of scientific work in the area of biomedical sciences, their experience with it and their evaluation of the importance of scientific research in medicine. We have approached our target using a number of research methodologies. Additionally, we have researched the current literature on the topic and systematized and summarized methods of good scientific practice that can be utilized when teaching academic writing skills to students of biomedical sciences. In view of the new challenges to both teachers and students, the main objective is to achieve a higher quality of student research work. We are planning to do this by increasing students' competency, focusing on knowledge of scientific work's main elements.

MATERIALS AND METHODS

The design we used was a cross-sectional study. Participants were 278 undergraduate medical students in their second and fourth year of education. We designed a specific multiple-choice questionnaire to be filled out by members of the target population. The survey was analyzed by performing descriptive statistics, Kolmogorov-Smirnov test of normality, Mann-Whitney test, chi-square test for hypothesis testing and Spearman's rank correlation. The two-tailed P value of less than 0.05 was considered significant. All statistical analyses were performed with the predictive analytics software IBM SPSS Statistics 25.

RESULTS AND DISCUSSION

Table 1. Demographic data of respondents.

| | | Frequency / Mean (95% CI) (N = 278) | Percentage / SD |
|--------|----------------|--|--------------------|
| Age | 18 to 45 years | 22.1 (21.7; 22.5) | 3.37 |
| Gender | Male | 106 | 38.1 |
| | Female | 172 | 61.9 |

| | | | |
|--------------------------|-------------|-----|------|
| Nationality | Bulgarian | 200 | 71.9 |
| | English | 78 | 28.1 |
| Year of education | Second | 167 | 60.1 |
| | Fourth | 111 | 39.9 |
| Last completed education | High school | 221 | 79.5 |
| | Bachelor | 45 | 16.2 |
| | Master | 12 | 4.3 |

We have studied the students' opinion about the place of scientific work in the area of biomedical sciences, their experience and their evaluation of the importance of scientific research, and have evaluated the differences produced by their experience, gender and nationality in the assessment of this importance.

Almost all students agree that it is important for them to learn how to create scientific work (90.6%), and that an equally important part of this is to do referencing (87.4%). They are not so certain they can deal with such a task, so 69.1% of them think that they might, if available, elect a module on scientific writing. It is interesting that while 25% of the respondents agree to the importance of scientific work, they would still not elect a module on scientific writing, and just 3 of them would elect such a module while of the opinion that it is not important to learn how to create scientific work. It cannot be interpreted whether these discrepancies stem from individual manner of thinking and convictions, or whether they represent lack of cooperation or attentiveness in filling out the questionnaire. All these differences are statistically significant ($P < 0.0001$).

According to the students' opinions, there is a statistically significant relationship between the importance of learning how to create scientific work and the desire to elect a module on scientific writing ($P < 0.0001$). Contingency coefficient is 0.4771, indicating a moderate degree of association between these two variables.

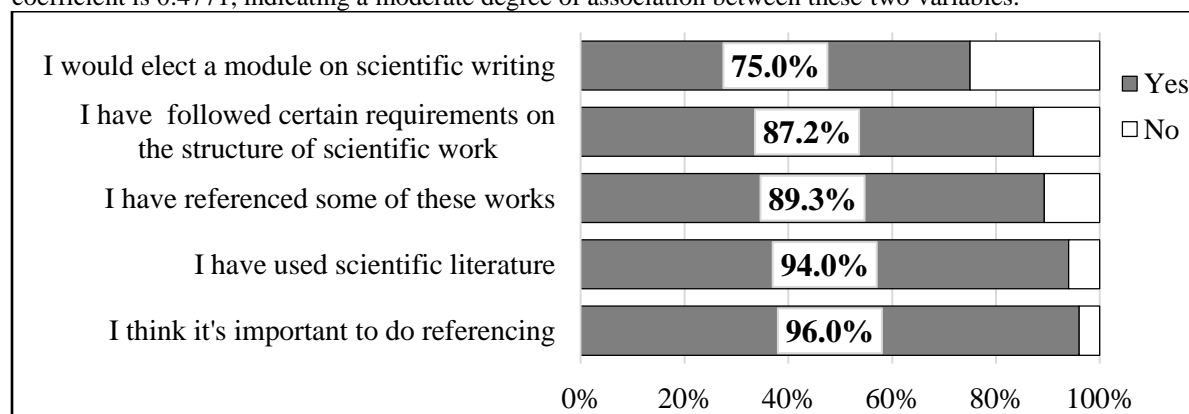


Figure 1. Distribution of student experience with academic writing and literature review by their agreement/disagreement with the statement: "I think it is important for students to learn how to create scientific work"

All students have previous experience in browsing scientific literature and creating some sort of scientific work. Almost all have done a presentation (94.2%), and nearly 80% have at least written an essay on an academic subject. Surprisingly, as much as 20.5% have worked on an article, and 11.2% have published on the Internet.

Yet, even in view of the experience the respondents have with academic work, a notorious 6.3% of them do not consider referencing their sources important. Most medical students (72%) have done three different types of academic writing or research at maximum, but there are participants in our survey who have produced four to six different sorts of scientific work, and their percentage totals 28.

What is hard to believe is that only 89% have ever occupied themselves with referencing any of the materials they have used for the accomplishment of scientific work. We suppose the reason is that either their instructors did not specifically insist on this or the students never entirely understood the importance of referencing.

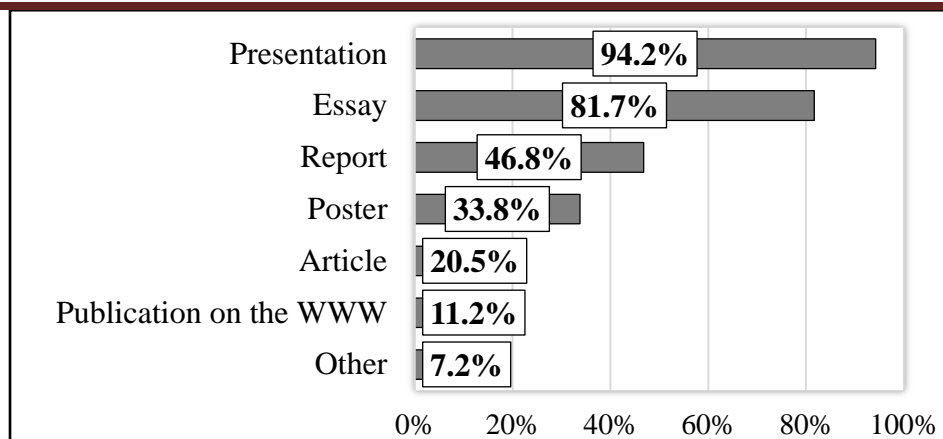


Figure 2. Distribution of the types of scientific work students have previously done.

Students appear insufficiently acquainted with the level of scientific importance of various sources of information. Every fourth of the respondents is convinced that Wikipedia is a good source for obtaining academic level information (Figure 3).

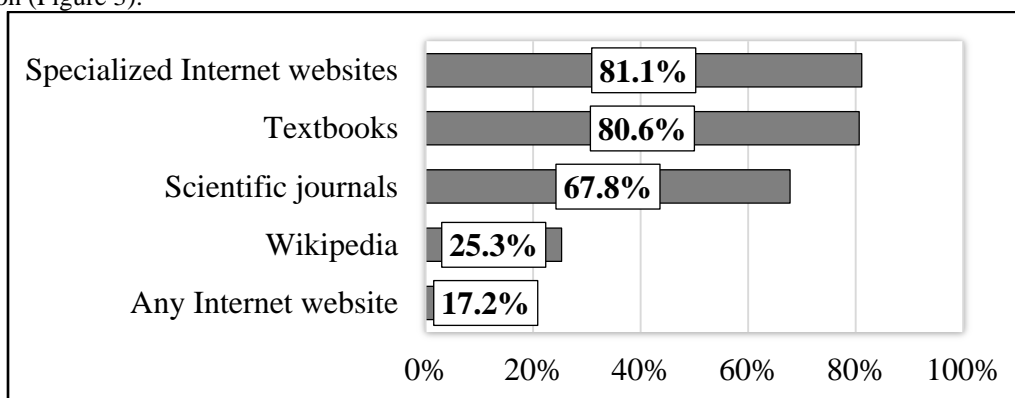


Figure 3. Distribution of possible sources of information in the process of writing an academic piece of work.

The ratings of the importance of scientific work range between 3 and 10, with just 4.3% less than 5, having a mean value of 9.11 and 95% CI (8.79; 9.26). There are statistically significant differences by the year of education ($P=0.032$) and the number of different types of scientific works ($P=0.042$), but not by gender or nationality ($P>0.05$) (Table 2.).

Better experienced students and those who have worked on a higher number of different types of academic work (four or more), accordingly rate higher – their average ratings are 9.83, while those of the rest of the respondents average 8.86.

Table 2. Differences of rating of the importance of scientific research in biomedical sciences.

| | | N | Mean | Std. Deviation | Sig. P |
|-----------------------------------|--------------------|-----|------|----------------|--------|
| Year of education | Second | 121 | 8.74 | 1.557 | 0.032 |
| | Fourth | 88 | 9.15 | 1.140 | |
| Gender | Male | 106 | 9.02 | 1.257 | 0.539 |
| | Female | 172 | 8.90 | 1.552 | |
| Nationality | Bulgarian | 200 | 8.97 | 1.500 | 0.522 |
| | English | 78 | 8.85 | 1.300 | |
| Number of scientific works | More or equal to 4 | 72 | 9.83 | 1.218 | 0.042 |
| | Less than 4 | 206 | 8.86 | 1.512 | |

Age of the respondents is also related to their rating. We found a moderate positive correlation between the rating and student experience (derived by the age of the respondent) with Spearman's rank correlation 0.324, ($P=0.026$). Thus, the year of education and the number of different types of scientific works (more than 4) turn out to be independent factors for the rating of the importance of scientific work among undergraduate medical students.

CONCLUSION

Students generally admit the importance of scientific research in medicine and health care as well as the need to develop critical appraisal and creative approaches to science during their undergraduate education. However, it appears that they still do not fully comprehend the steps that need to be made on the path of scientific research, or the nature of the skills one should possess to do scientific work. Worse is, perhaps, that a number of them do not even aim at developing such skills, or do not perceive a necessity to do so.

More work needs to be done to raise awareness of the significance and nature of the methodology of scientific work and academic writing among undergraduate medical students, so that better professionals, equipped with dealing with scientific data in their daily practice emerge among the rows of medical universities graduates and young doctors.

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