Research Article

Awareness on the application of bioinformatics tools among college – A survey

R. Bharathi[1], R. Gayathri[2]*, V. Vishnu Priya[2]

ABSTRACT

Bioinformatics is recognized as part of the essential knowledge base of numerous career paths in biomedical research and health care. The field of data and resource integration within bioinformatics has received significant attention over the past decade. Bioinformatics is used in a large number of fields such as medicine, microbial genome applications, biotechnology, waste cleanup, gene therapy, and agriculture. As an interdisciplinary field of science, bioinformatics combines biology, computer science, information engineering, mathematics, and statistics to analyze and interpret biological data. This is a survey-based study. The survey was conducted among 100 college students. The aim of the study was to create awareness on the application of bioinformatics tools among college students and make them understand the importance of the application of bioinformatics tools.

KEY WORDS: Awareness, Bioinformatics, Biomedical, College students, Databases, Importance

INTRODUCTION

The need for bioinformatics education and training is immense, but it is also diverse. There is a wide range of audiences who are potential recipients of training, each of which has different needs in terms of what skills or knowledge they require and at what depth. The ISCB Education Committee's Curriculum Task Force described the potential for refinement and application of bioinformatics core competencies for different user groups. Moreover, further refinement of these competencies and provides a series of use cases illustrating their applications to different bioinformatics education and training programs globally.[1,2]

The number and diversity of bioinformatics tools, including data resources, grow vastly. To aid users in finding, comparing, selecting and integrating tools into workflows or workbenches, it is important having the tools consistently described with respect to a number of categories. These include their application domain (e.g., protein structure and metagenomics), function (e.g., alignment construction), type of input and output data (e.g., accession and feature record), and available formats of the data (e.g., FASTQ and PDB format). In the absence of accepted standards for such tool descriptions, the categorization of tools has been left to providers of tool catalogs or workbenches. In this undesired situation, tools have to be described again every time they are integrated into a new framework. Not only duplicating efforts but this also leads to fragmented descriptions and inconsistent categorization.[3]

The fields of bioinformatics and computational biology have grown in importance as drivers of research in the life sciences as evidenced by the increasing number of journals and international conferences dedicated to these fields. Local scientists are generating large and varied datasets including next-generation sequencing (NGS; genomic, transcriptomic, and metagenomic), proteomic data, and other data, coupled with rich phenotypic datasets, especially large patient, and surveillance cohorts. These research groups seldom have embedded data analysts, so they turn to bioinformatics groups for support.[4]

Access this article online

Website: jprsolutions.info | ISSN: 0975-7619

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Received on: 09-11-2018; Revised on: 22-12-2018; Accepted on: 27-01-2019

Definition of bioinformatics shall be "an emerging scientific field involving the development and integration of techniques, such as applied mathematics, statistics, computer science, chemistry, and biochemistry, to solve biological problems." Obviously, by providing algorithms, databases, user interfaces, and statistical tools, bioinformatics makes it possible to complete important work such as comparative genomics, proteomics, interactomics, metabolomics, and all other "omics" research. Over the years, there have been several bioinformatics training events, including workshops and modest research in this field. It is obvious that computing and sequencing are rapidly and drastically changing the face of biology.[5,6]

Bioinformatics has become essential to the life sciences, especially important for supporting "omic" technologies. Now commonplace, these comprehensive studies bring new challenges.[7,8] Many students are not being equipped to get the most from currently available technologies. The problem stems partly from how much bioinformatics has changed and partly from how it is taught. The latter can be especially difficult.[9-11]

RESULTS

Nearly 70% of them are aware that the research and structural predictions of biomolecules can be done with ease with the help of bioinformatics and also know that bioinformatics helps in learning molecular biology with ease.

Nearly 62% of them do not have bioinformatics in their curriculum.

Nearly 62% of them are aware that bioinformatics has an application in nanomedicine and they are also aware that it helps to reduce the cost of the upcoming research work, especially in dentistry.

Although most of them are aware of the importance of the bioinformatics, almost 55% of them are not aware of the various databases and tools employed in bioinformatics [Figures 1-4].

DISCUSSION

Bioinformatics is a complex field, necessitating broad procedural skills to use tools and databases and coupled with factual knowledge and strategic thinking. The topic of bioinformatics and the coordination of the related knowledge and skills are not abundant or typical in school tasks.[12] The introduction, application, and evaluation of bioinformatic modules using web-based software packages for pedagogic purposes in the biological sciences have been evolving for the past 20 years, requiring constant revision and updating to keep pace with the ever-changing scientific technologies and pedagogic techniques.[13-15]

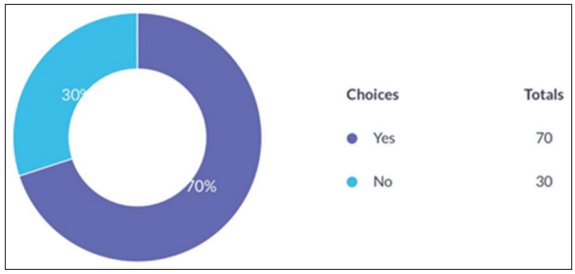

Figure 1: Are you aware that the research and structural predictions of biomolecules can be done with ease with the help of bioinformatics and it helps in learning molecular biology with ease?

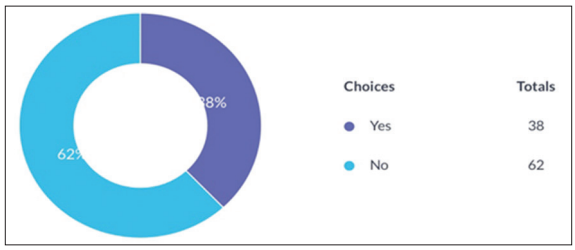

Figure 2: Do you have bioinformatics in your curriculum?

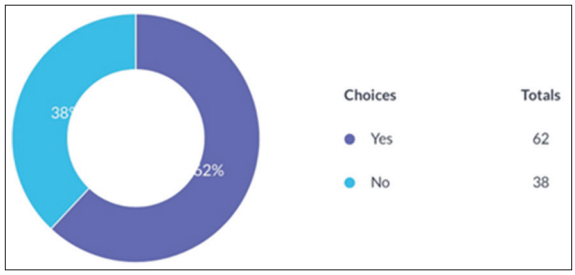

Figure 3: Are you aware that using bioinformatics tools helps reduce the cost and time of wet lab work and its importance in nanomedicine?

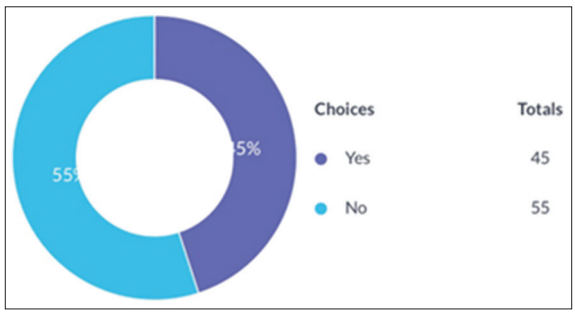

Figure 4: Are you aware of various databases use in bioinformatics?

Contemporary biology is currently undergoing a revolution, driven by the availability of high-throughput technologies and a wide variety of bioinformatics tools. However, bioinformatics education and practice are still in its infancy. Consequently, concerted efforts have been made in recent years to incorporate bioinformatics modules into biological sciences curriculum of universities. Despite this, one aspect of bioinformatics that is

yet to be incorporated is structural bioinformatics. The target protein was characterized using various free, user-friendly, and online sequence-based and structure-based bioinformatics tools. This exercise gave students the opportunity to generate new data, interpret the data, and acquire collaborative research skills. In this report, the emphasis is placed on analysis of the data generated to further encourage analytical skills. It is anticipated that institutions would adopt parallel strategies to expose undergraduate students to structural biology and increase awareness of freely available bioinformatics tools for tackling pertinent biological questions.[16]

Bioinformatics is often the starting point for laboratory-based research projects; therefore, high importance was placed on allowing students to individually develop and apply processes and methods of scientific research. Students led a bioinformatic inquiry-based project (within a framework of inquiry), discovering, justifying, and exploring individually discovered research targets. An inquiry-based peer-assisted learning module increased students' engagement, practical bioinformatic skills, and process-specific knowledge.[17]

Recent advances involving high-throughput techniques for data generation and analysis have made familiarity with basic bioinformatics concepts and program a necessity in the biological sciences. Undergraduate students increasingly need training in methods related to finding and retrieving information stored in vast databases. The rapid rise of bioinformatics as a new discipline has challenged many colleges and universities to keep current with their curricula, often in the face of static or dwindling resources. Many bioinformatics modules and related databases and software programs are free and accessible online, and interdisciplinary partnerships between existing faculty members and their support staff have proved advantageous in such efforts. Strategies and methods have been successfully used to incorporate bioinformatics content into undergraduate curricula.[18]

Students need a robust introduction to bioinformatics tools and a solid understanding of related principles and technologies. Circumstances are favorable for computer scientists to participate in and support bioinformatics programs.[19] Moreover, many interdisciplinary programs have been established at the undergraduate and graduate levels.[20]

CONCLUSION

Although most of them are aware of the importance of bioinformatics, they are unaware of the tools and databases used in bioinformatics. This is due to the reason that bioinformatics is not included in their curriculum. It is very important for life science, dental and medical graduates to have knowledge of bioinformatics tools. The growing science and research require a wide knowledge of all aspects of technology. Thus, knowledge of bioinformatics tools should be given to the students. Bioinformatics can be included in their curriculum so that they will be well-versed on the latest technique. This might improve their research skills in the future.

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Source of support: Nil; Conflict of interest: None Declared