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Comparative overview of Bachelor of Science (microbiology) degree program structure across different countries

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Abstract
A number of countries have national curricula, and most states in United States of America follow common guidelines for a core curriculum. Based on assumption, around the world there must be a general implementation that a curriculum should cover most basic conceptual courses and other courses required for professional development. The initial thought to formulate a curriculum should be primarily based on level of content knowledge imparted in School Education. I think the other obvious reasons are availability of resources such as textbooks, availability of specialized instructors, teaching technology, quality of teaching assessment methods etc. The other factors which may affect development and successful implementation of curriculum are cultural differences, language, poverty, inadequate orientation and training etc. For this project, I evaluated undergraduate microbiology program degree program curriculum structure of eight universities across four grouped nations; Asia, North America, Europe and Southern Island to complement diversity to this study. The selection of Universities was based on availability of curriculum and program overview. Comparison of curriculum was made between neighboring countries such as India and Bangladesh, New Zealand and Australia, United Kingdom and Ireland, Australia and New Zealand. Further curriculum analysis included comparison of microbiology courses, non-microbiology courses and other science courses among different universities across countries. The comparison also identified similar and specific courses part of curriculum in neighboring and distant universities.

Keywords: curriculum, microbiology, undergraduate, course

1. Introduction
The overall purpose of B.S. (Microbiology) Degree program is to increase content knowledge, technical and professional expertise in the area of biological sciences specifically microbiology. Successful completion of this degree program will prepare individuals to work in academia and industry by equipping both conceptual knowledge and ability for application of acquired knowledge and laboratory experiences. It is assumed that there will not be many differences in microbiology, non-microbiology and other professional courses across countries taking into account objectives of undergraduate microbiology program.

2. Overview
The main aim of this project is to understand, compare and evaluate structure of Bachelor of Science (Microbiology) (B.S.) Degree Program Curriculum Structure offered in Eight Countries. This study covered both quantitative and qualitative differences of B.S. Microbiology Program Curriculum Structure. These quantitative differences were assessed by comparing Microbiology, Non-Microbiology and Other courses offered in this degree program. Comparative Qualitative analysis was achieved by analysis of specialized microbiology and non-microbiology courses offered in eight universities. The major purpose of this study was to first explain complete structure of undergraduate microbiology degree program offered across countries, percentage content differences, identify common courses, and determine any specific courses. The overall purpose of B.S. (Microbiology) Degree program is to increase content knowledge, technical and professional expertise in the area of biological sciences specifically microbiology. Successful completion of this degree program will prepare individuals to work in academia and industry by equipping both conceptual knowledge and ability for application of acquired knowledge and laboratory experiences. It is assumed that there will not be many differences in microbiology, non-microbiology and other professional courses across countries taking into account objectives of undergraduate microbiology program.

3. Methodology
Internet search tools such as Google Search, GradSchools.Com and Peterson Guide were used to select the institutions offering B.S. (Microbiology) undergraduate degree program across countries based on availability of the curriculum. The pdf copy of selected program of study was downloaded, and division of courses was done on basis of microbiology, non-science courses and non-microbiology courses. Microbiology courses were divided on the basis of relatedness to biology; non-microbiology courses included physics, chemistry and statistics courses, and non-science courses such as scientist writing, communication. In Microsoft Excel file, total number of Microbiology, Non-microbiology and non- science courses were recorded and further calculated for every institution.

Analysis was performed in excel by preparing advanced graphs (circular) for neighbouring Universities course analysis, and common comparison (Histograms and Vein Diagrams) of microbiology and non-microbiology courses for all the universities (on percentage basis), and qualitative course analysis for all selected universities.

The eight institutions selected are as follows;

1. Miami University, United States of America
2. University of Guelph, Canada
3. University of Delhi, India
4. BRAC, Bangladesh
5. Cardiff University, United Kingdom
6. University College Dublin, Ireland
7. The University of Queensland, Australia
8. Otago University, New Zealand

4. Results

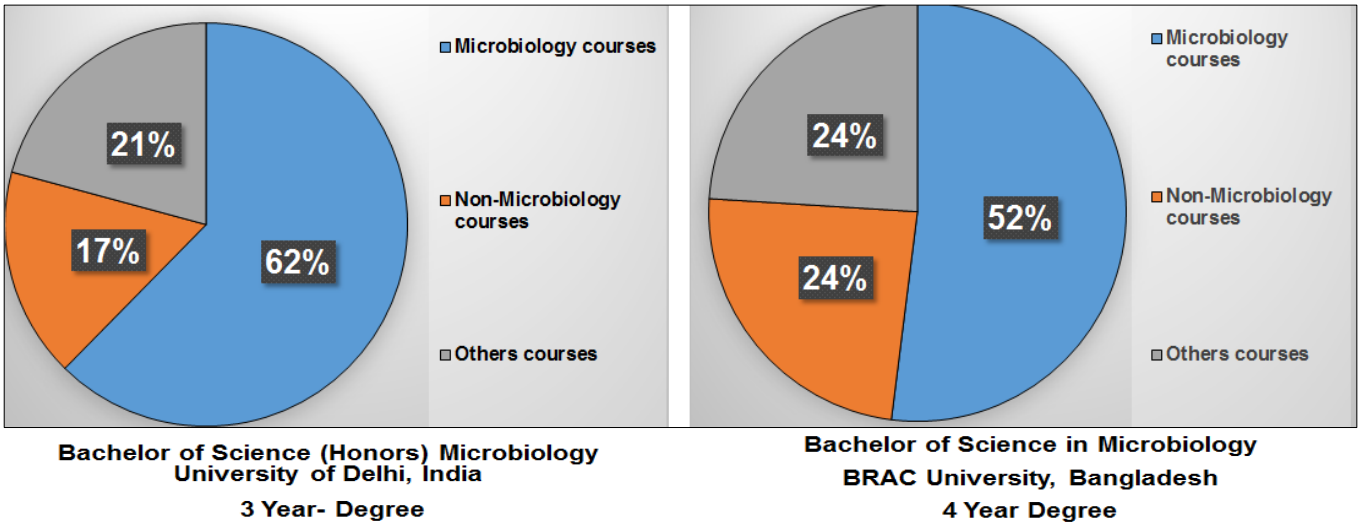

Fig 1: Comparison of Bachelor of Science (Microbiology) Degree Program between India-Bangladesh

Differences were observed in number of years required to complete this degree program which is three year in India and four year in Bangladesh. BRAC University, Bangladesh offered higher percentage of microbiology courses in comparison to University of Delhi, India. Percentages of Non-microbiology courses were considerably higher in BRAC University than offered by University of Delhi. Interestingly, University of Delhi offered higher percentage of other courses in comparison to BRAC University.

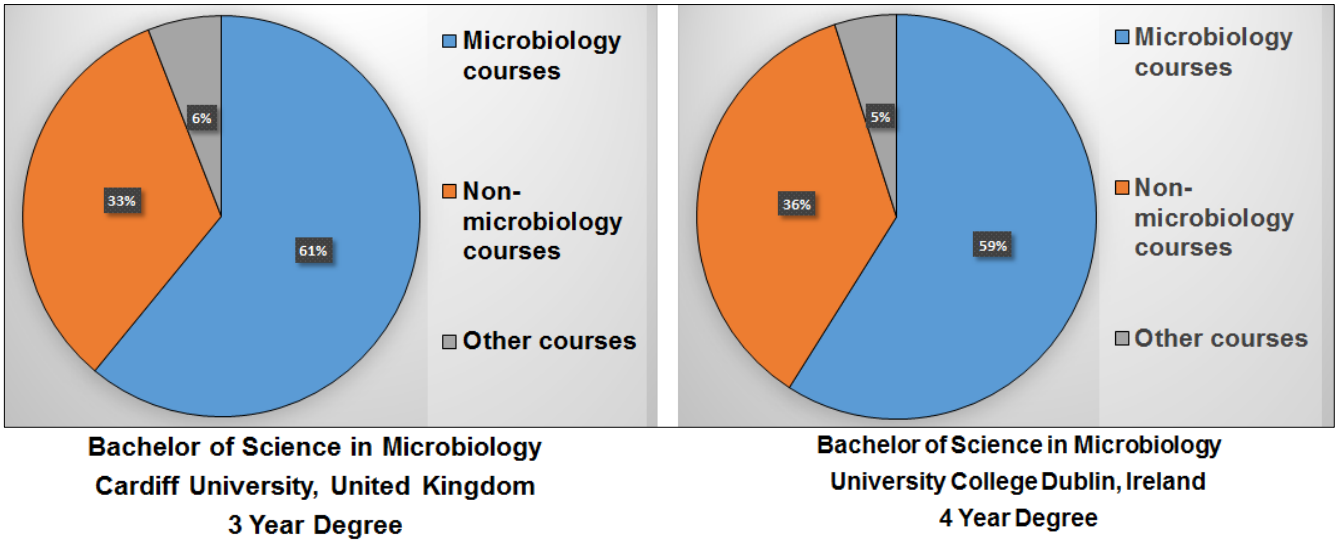

Fig 2: Comparison of Bachelor of Science (Microbiology) Degree Program between United Kingdom-Ireland.

Differences were observed in number of years required to complete this degree program which is Three year in United Kingdom and Four year in Ireland. Cardiff University, United Kingdom offered slightly higher percentage of microbiology courses in comparison to University College Dublin, Ireland. Percentages of Non-Microbiology courses offered were slightly higher in University College Dublin than offered by Cardiff University. Interestingly, very similar percentage trend for other courses offered by both University College Dublin and Cardiff University was observed.

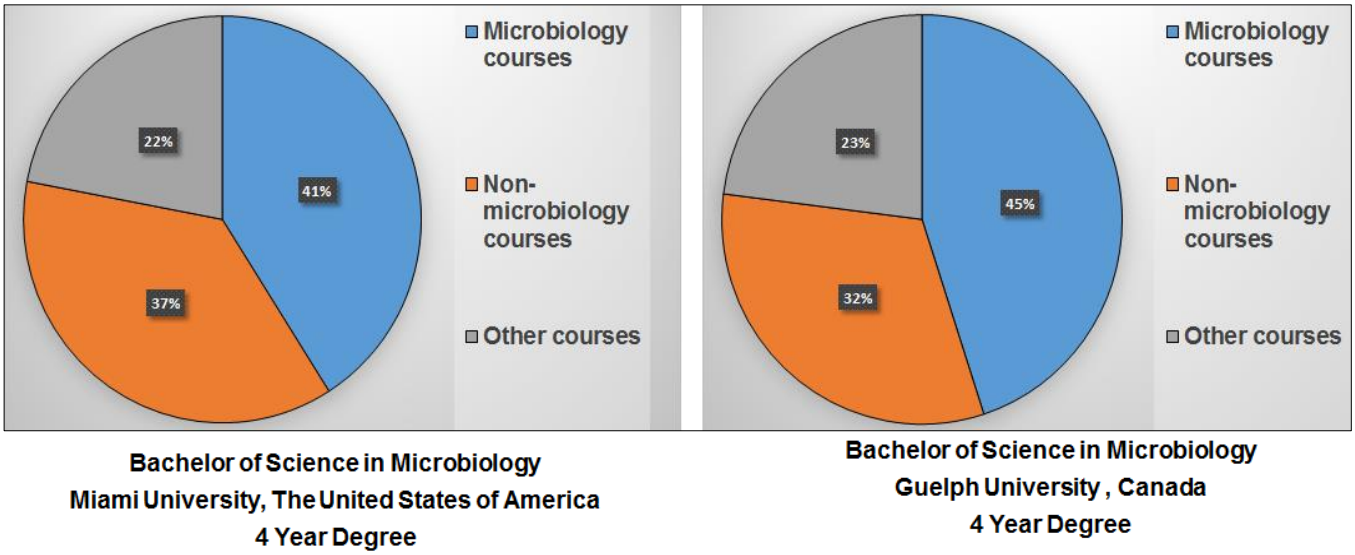

Fig 3: Comparison of Microbiology, Non-Microbiology, and other courses as part of B.S. Microbiology Degree Program Curriculum Structure between The United States of America and Canada

Comparison of percentage of microbiology courses part of undergraduate microbiology program curriculum structure between Miami University, USA and Guelph University, Canada revealed that both these universities showed no considerable different in courses. Percentage of non-microbiology courses offered by Miami University was higher than Guelph University. No considerable change in percentage of other courses was offered by Miami University when compared to Guelph University. Overall, both Miami University and Guelph University offered a program which is of four year duration.

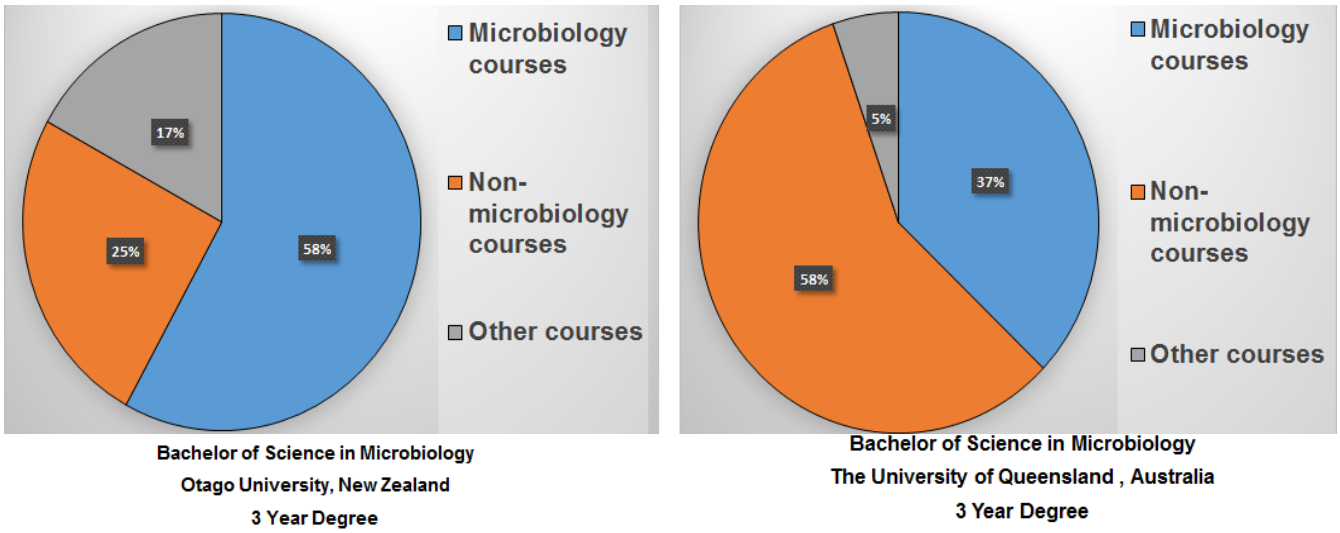

Fig 4: Comparison of Bachelor of Science (Microbiology) Degree Program Curriculum Structure between New Zealand and Australia.

No differences were observed in duration of undergraduate microbiology programs which is three year offered by Otago University, New Zealand and The University of Queensland, Australia. Percentage of microbiology courses offered by Otago was considerably higher than The University of Queensland. Interestingly, the percentage of Non-Microbiology courses offered by The University of Queensland was double than offered by Otago University. Otago University also offered much higher percentage of non-sciences courses in comparison to the University of Queensland.

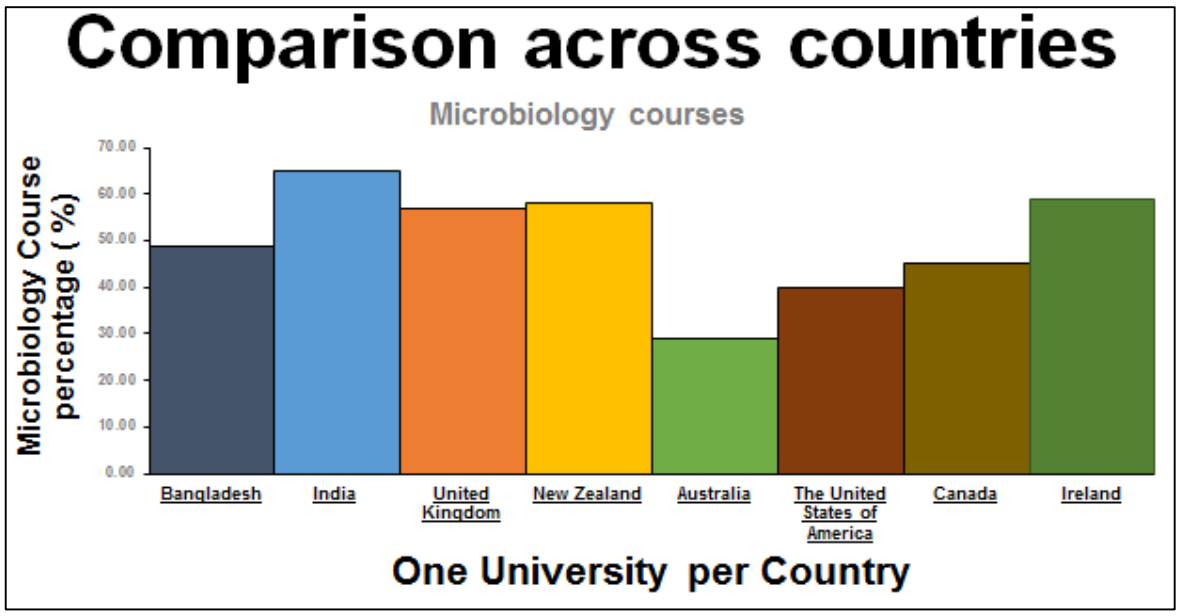

Fig 5: Comparison of percentage of Microbiology courses offered during Bachelor of Science Microbiology Degree Program curriculum among eight different countries.

Countries offering three year undergraduate microbiology program are India, United Kingdom, New Zealand, Australia, and four year undergraduate microbiology program are offered by Bangladesh, The United States of America, Canada and Ireland. Among three year undergraduate microbiology program degree institutions, India offered the highest percentage of microbiology courses and Australia the least. A similar comparison was made to understand differences in microbiology courses offered by four year undergraduate microbiology program institutions, I found out that Ireland offered the highest percentage of microbiology courses and The United States of America the least. Overall, India offered the highest and Australia offered the least percentage of microbiology courses during Bachelor of Science Microbiology Program.

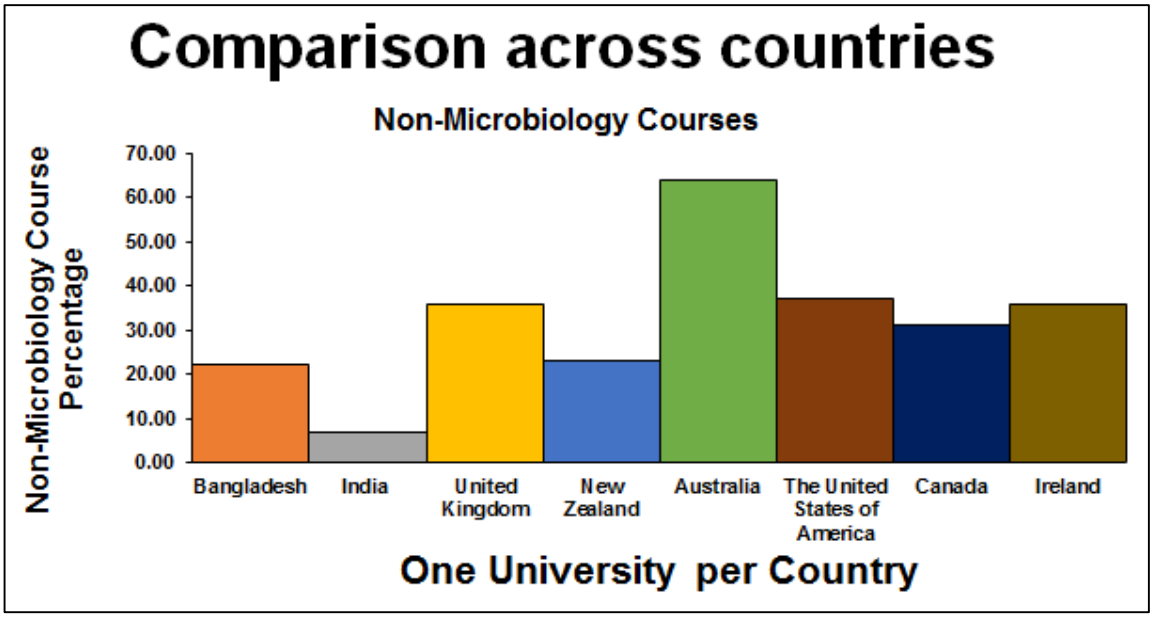

Fig 6: Comparison of percentage of Non-Microbiology courses offered during Bachelor of Science Microbiology Degree Program curriculum among eight different countries**.**

Countries offering three year undergraduate microbiology program are India, United Kingdom, New Zealand, Australia, and four year undergraduate microbiology program are offered by Bangladesh, The United States of America, Canada and Ireland. Among three year undergraduate microbiology program degree institutions, India offered the least percentage of non-microbiology courses and Australia the highest. A similar comparison was made to understand differences in non-microbiology courses offered by four year undergraduate microbiology program institutions, I found out that The United States of America offered the highest percentage of non-microbiology courses and lowest percentage by Bangladesh.

Overall, India offered the lowest and Australia offered the highest percentage of non-microbiology courses during Bachelor of Science Microbiology Degree Program.

5. Discussion and Conclusions

The United States of America, Canada, Bangladesh and Ireland offer Bachelor of Science (Microbiology) Undergraduate Degree Program which is of four year duration on the other hand India, Australia, New Zealand, and United Kingdom offers programs which are of three year duration. Assuming similar objectives of these microbiology programs, fewer differences in percentage of microbiology, non-microbiology, and non-science course were anticipated. Interestingly, both three and four year degree program offered considerable differences in percentage of microbiology, non-microbiology and non-science courses (Figure 1-4, Figure 5-6). The reasons behind these variations may be due to division of program in semester, module or year basis. It was also expected that microbiology program in neighbouring countries will be have less differences, however differences in duration as well considerable differences in percentage of microbiology, non-microbiology and non-sciences courses were observed among neighbouring countries such as India-Bangladesh (Figure 1), United Kingdom-Ireland (Figure 2), United States of America-Canada (Figure 3) and New Zealand-Australia (Figure 4). The percentage differences may be due to quality and quantity of Science specifically included as part of Biology Curriculum in School Education. Overall, India offered highest percentages of microbiology courses and Australia offered the least (Figure 5). The highest percentage of non-microbiology courses were offered in Australia with least percentage in India (Figure 6). These differences may be due to availability of teaching technology, resources, poverty and availability of jobs in related areas.

6. Acknowledgements

The University of Southern Mississippi, United States of America.

7. References

1. Miami University, United States of America
2. University of Guelph, Canada
3. University of Delhi, India
4. BRAC, Bangladesh
5. Cardiff University, United Kingdom
6. University College Dublin, Ireland
7. The University of Queensland, Australia
8. Otago University, New Zealand