

Relative Growth Rate And Core Research Areas Of Faculty Of Science Of Kumaun University: A Scientometric Approach

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Abstract

Purpose: The purpose of the study is to identify the relative growth rate and core research areas of faculty of science of Kumaun University using scientometric approach.

Methodology: The detailed bibliographies are compiled through direct interview of faculty members and university website. Total 320 research papers are collected by the different sources. These sources are online database SodhSindu, Research Gate and Google Scholar. However, some articles are also collected by the faculty members directly. Search strings 'Kumaun University', 'Chemistry', 'Physics', 'Botany', 'Geology', 'Name of Faculty Members', 'Year', etc are used to extract the articles. Statistical software SPSS 20 and MS Excel were used for refining, presentation and analysis of the collected data as per the objectives of the study. Statistical tools such as Relative Growth Rate (RGR) and Doubling Time (DT) are used.

Findings: The Overall Relative Growth Rate (RGR) has decreased from 0.33 at year 2010 to 0.08 at year 2014 in a span of five years and Doubling Time (DT) discloses that research output has increased from 2.16 at year 2010 to 8.46 at year 2014. Natural Products Chemistry, Forest Ecology, Astrophysics and Traditional Knowledge are most interested research areas of Faculty of Science, DSB Campus, Kumaun University.

Conclusion: Due to the decreasing trend the Doubling Time (DT) of publication output has been increased from 2 years to 9 years. However, 70% core research areas are from Natural Products Chemistry, Forest Ecology, Astrophysics and Traditional Knowledge and Tectonic Geomorphology of this university.

Key Words: University, Kumaun, Scientometric, Relative Growth Rate

INTRODUCTION

The intellectual world is viewing exceptional progress especially in the field of Information and Communication Technologies (ICTs). These changes have occurred in libraries also and consequently ICTs have become the most important components in transforming a hard core library to a more comprehensive knowledge resource centre. However, the purpose remains the same which is to provide global access to information and services for the enhancement of the knowledge of the society. This encourages and motivates information seekers to increase their research activities.

The purpose of education is to nurture young minds, who are the future of a nation. They have an ability to transform the conceptual knowledge into applied knowledge for the betterment of the society. The most important factor to evaluate the faculties of any university is their research contribution. The specialized research offer growth and development of the society.

The researches carried out by universities are the foundation for the development of the contemporary information society. Research reflects the image of a university and its search for new boundaries of information, knowledge and wisdom by providing suitable directions. Scientific research has transformed the life of the common people and it is a symbol of prosperity. Conservation means to preserve the traditional knowledge in the form of written documents. The purpose is to safe guard the cultural heritage of that particular time period. Extension of education serves the whole society through an easy accessibility to different courses. The progress of a university depends on the said criteria.

REVIEW OF RELATED LITERATURE

Vivekanandhan and Sivasamy (2017) study examined uncited scholarly communications in the field of pollution control through scientometric analysis. The Scopus database was chosen for the collection of data and total 52575 records were downloaded for the period of 1991 to 2015. **Jokić, Stepanić, Kamenar and Silobrčić (2016)** study purpose was to examined the research output of researchers doing research in natural and physical sciences at six Croatian Universities, namely, Dubrovnik, Osijek, Rijeka, Split, Zadar and Zagreb. The Academic Ranking of World Universities of year 2004 was used as a tool to explore the ranking of Croatian Universities. **Gupta, Kumbhar and Gupta (2015)** in their study stated about the

research output of top 6 universities of Karnataka State. The Scopus database was selected for the data collection and 5885 documents were downloaded for the period of 2007-2011. The share of research productivity of these universities was 2% of total Indian research output. **Balasubramani and Parameswaran (2014)** explained in their study about research output of faculty members of Banaras Hindu University. The Web of Science database was chosen for the study and 6943 documents were downloaded for the period of 2000-2011.

OBJECTIVES OF THE STUDY

1. To know the growth pattern of research output of periodical literature by the faculty members of science of DSB Campus, Kumaun University from 2010 to 2014.
2. To identify most predominant subject area in the field of Physics, Chemistry, Geology and Botany research by the faculty members.

METHODOLOGY

Data Collection

For this study the researcher has taken the secondary sources from online database as well as direct approach to the faculty members. The detailed bibliographies are compiled through direct interview of faculty members and university website. The required data was collected directly through faculty members and from the online database of SodhSindhu, Google Scholar and ResearchGate for the period of year 2010 to 2014. The researcher has used the search strings 'Kumaun University', 'Chemistry', 'Botany', 'Geology', 'Physics' and name of faculty members of Kumaun University are used to extract research papers from said database. A total 320 research articles were downloaded through database as well as directly collected from faculty members. Statistical software SPSS 20 and MS Excel were used for refining, presentation and analysis of the collected data as per the objectives of the study.

Statistical Tools

The Relative Growth Rate (RGR) and Doubling Time (DT) statistical tools are applied for the analysis. The mean relative growth rate (RGR) over the specific period

of interval can be calculated from the following formula given by **Krishnamoorthy, Ramakrishna and Devi (2009)**.

$$RGR = \text{Loge}W2 - \text{Loge}W1 / T2 - T1$$

where,

RGR – Mean relative growth rate over the specific period of interval

LogeW1 – log of initial number of articles

LogeW2 – log of final number of articles after a specific period of interval

T2-T1 – Unit difference between the initial time and the final time

The year is taken here as the unit of time.

Doubling time for publication

$$DT(a) = .693/RGR$$

ANALYSIS AND INTERPRETATION OF DATA

Growth pattern of research output of periodical literature by the faculty members of science of DSB Campus, Kumaun University from 2010 to 2014

The researcher has chosen faculties' articles, which are published in different electronic and print journals for the period of 2010 to 2014. Relative Growth Rate (RGR) and Doubling Time (DT) methods are applied by him for obtaining Growth pattern of research output of periodical literature by the faculty members of science of DSB Campus, Kumaun University.

Overall Growth Pattern

It can be observed from the Table 1 that the growth rate has decreased from 0.33 at year 2010 to 0.08 at year 2014 in a span of five years. However, Doubling Time discloses that research output of Faculty Science, DSB Campus, Kumaun University has increased from 2.16 at year 2010 to 8.46 at year 2014.

Table 1 Relative growth rate (RGR) and doubling time (DT) of publications

Year	Frequency of Publications	Cumulative Total	log W1	log W2	RGR	DT
2010	59	59	-	1.770852	-	-
2011	67	126	1.770852	2.100371	0.329519	2.103068
2012	65	191	2.100371	2.281033	0.180663	3.835875
2013	74	265	2.281033	2.423246	0.142213	4.872989
2014	55	320	2.423246	2.50515	0.081904	8.461114

Department Wise Growth Pattern of Faculty of Science

Department of Botany

It can be observed from the Table 2 that the growth rate has decreased from 0.34 at year 2010 to 0.09 at year 2014 in a span of five years. However, Doubling Time discloses in Table 2 that research output of Department of Botany, DSB Campus, Kumaun University has increased from 2.04 at year 2010 to 7.04 at year 2014.

Table 2 RGR and DT of publications of Department of Botany

Year	Frequency of Publications	Cumulative Total	log W1	log W2	RGR	DT
2010	21	21	-	1.322219	-	-
2011	25	46	1.322219	1.662758	0.340539	2.035012
2012	33	79	1.662758	1.897627	0.234869	2.950578
2013	35	114	1.897627	2.056905	0.159278	4.35089
2014	29	143	2.056905	2.155336	0.098431	7.040452

Department of Chemistry

It can be observed from the Table 3 that the Relative Growth Rate (RGR) has decreased from 0.25 at year 2010 to 0.06 at year 2014 in a span of five years. However, Doubling Time (DT) in Table 3 discloses that research output of Department of Chemistry, DSB Campus, Kumaun University has increased from 2.77 at year 2010 to 11.24 at year 2014.

Table 3 RGR and DT of publications of Department of Chemistry

Year	Frequency of Publications	Cumulative Total	log W1	log W2	RGR	DT
2010	18	18	-	1.255273	-	-
2011	14	32	1.255273	1.50515	0.249877	2.773359
2012	10	42	1.50515	1.623249	0.118099	5.867943
2013	17	59	1.623249	1.770852	0.147603	4.695035
2014	9	68	1.770852	1.832509	0.061657	11.23962

Department of Geology

It can be observed from the Table 4 that the Relative Growth Rate (RGR) has decreased from 0.30 at year 2010 to 0.04 at year 2014 in a span of five years. However, Doubling Time (DT) in Table 4 discloses that research output of Department of Geology, DSB Campus, Kumaun University has increased from 2.30 at year 2010 to 15.54 at year 2014.

Table 4 RGR and DT of Publications of Department of Geology

Year	Frequency of Publications	Cumulative Total	log W1	log W2	RGR	DT
2010	9	9		0.954243		
2011	9	18	0.954243	1.255273	0.30103	2.302096
2012	12	30	1.255273	1.477121	0.221849	3.12375
2013	7	37	1.477121	1.568202	0.09108	7.608656
2014	4	41	1.568202	1.612784	0.044582	15.54434

Department of Physics

It can be observed from the Table 5 that the Relative Growth Rate (RGR) has decreased from 0.44 at year 2010 to 0.09 at year 2014 in a span of five years. However, Doubling Time in Table 5 discloses that research output of Department of Physics, DSB Campus, Kumaun University has increased from 1.59 at year 2010 to 7.52 at year 2014.

Table 5 RGR and DT of Publications of Department of Physics

Year	Frequency of Publications	Cumulative Total	log W1	log W2	RGR	DT
2010	11	11		1.04139		
2011	19	30	1.04139	1.47712	0.43573	1.59044
2012	10	40	1.47712	1.60206	0.12494	5.54672
2013	15	55	1.60206	1.74036	0.1383	5.01075
2014	13	68	1.74036	1.83251	0.09215	7.52066

Predominant subject areas in the field of Physics, Chemistry, Geology and Botany

The researcher obtains predominant subject areas in the field of Physics, Chemistry, Geology and Botany with the help of subject experts in their respective fields. Tables 6 reveal that 14 core research areas in which faculty members of Botany Department have contributed mostly articles. The most favoured subject is Forest Ecology with a share of 43 articles (28.7%) and least favoured subject is Bryophyte with a share of 1 article (0.7%). However, Traditional Knowledge share second most interest area with a percent share of 17.3 (26 articles), followed by Microbiology (16 articles, 10.7%), Biotechnology (15 articles, 10%), Pteridophyta (11 articles, 7.3%), Taxonomy (7 articles, 4.7%), Medicinal plant (7 articles, 4.7%), etc.

Table 6 Core Research Areas of Botany

Subject Areas	Frequency of Publications	Percentage (%)
Forest Ecology	43	28.7
Traditional Knowledge	26	17.3
Microbiology	16	10.7
Biotechnology	15	10.0
Pteridophyta	11	7.3
Bryophyta	10	6.7
Taxonomy	7	4.7
Medicinal Plant	7	4.7
Economic Botany	4	2.7
Lichen	3	2.0
Fungi	3	2.0
Agroforestry	2	1.3
Gymnosperm	2	1.3
Bryophyte	1	0.7

Tables 7 reveal that 6 core research areas in which faculty members of Chemistry Department have contributed mostly articles. The most favoured subject is Natural Products Chemistry with a share of 51 articles (58%) and least favoured subject is Organic Synthesis with a share of 1 article (1.1%). However, Medicinal Chemistry share second most interest area with a percent share of 23.9 (21 articles), followed by Bio-Organic Chemistry (7 articles, 8%), Environmental Chemistry (5 articles, 5.7%), and Nano Chemistry (3 articles, 3.4%).

Table 7 Core Research Areas of Chemistry

Subject Areas	Frequency of Publications	Percentage (%)
Natural Products Chemistry	51	58.0
Medicinal Chemistry	21	23.9
Environmental Chemistry	5	5.7
Bio-Organic Chemistry	7	8.0
Nano Chemistry	3	3.4
Organic Synthesis	1	1.1

Tables 8 reveal that 6 core research areas in which faculty members of Physics Department have contributed mostly articles. The most favoured subject is Astrophysics with a share of 36 articles (50.7%) and least favoured subject is High Energy Physics with a share of 5 articles (7%). However, Atmospheric Physics share second most interest area with a percent share of 12.7 (9 articles), followed by Spectroscopy (8 articles, 11.3%), Solar Physics (7 articles, 9.9%), and Condensed Matter Physics (6 articles, 8.5%).

Table 8 Core Research Areas of Physics

Subject Areas	Frequency of Publications	Percentage (%)
Astrophysics	36	50.7
Atmospheric Physics	9	12.7
Spectroscopy	8	11.3
Solar Physics	7	9.9
Condensed Matter Physics	6	8.5
High Energy Physics	5	7.0

Tables 9 reveal that nine (9) core research areas in which faculty members of Geology Department have contributed mostly articles. The most favoured subject is Tectonic Geomorphology with a share of 12 articles (28.6%) and least favoured subject is Sedimentology with a share of 1 article (2.4%). However, Environmental Geology share second most interest area with a percent share of 19 (8 articles), followed by Petrology (7 articles, 16.7%), Solar Physics (4 articles, 9.5%), Paleontology (4 articles, 9.5%), Remote Sensing (2 articles, 4.8%), etc.

Table 9 Core Research Areas of Geology

Subject Areas	Frequency of Publications	Percentage (%)
Tectonic Geomorphology	12	28.6
Environmental Geology	8	19.0
Petrology	7	16.7
Engineering Geology	4	9.5
Paleontology	4	9.5
Remote Sensing	2	4.8
Geodesy	2	4.8
Geochemistry	2	4.8
Sedimentology	1	2.4

Major Subject Areas of Faculty of science

Top ten subjects are selected for the predictions of core subjects' research areas. Table 10 exhibits that Natural Products Chemistry subject and Forest Ecology are most interested research areas of Faculty of Science, DSB Campus, Kumaun University with a percent share of 15.94 and 13.44. Astrophysics and Traditional Knowledge comes third and fourth place with a share percent of 11.25 and 8.13. However, Medicinal Chemistry (6.56%), Microbiology (5%), Biotechnology (4.69%) and Pteridophyta (3.44%) are also favourite subjects of the faculty members.

Table 10 Major Subject Areas of Faculty of Science

Core Subjects	Frequency of Publications	Percentage (%)
Natural Products Chemistry	51	15.94
Forest Ecology	43	13.44
Astrophysics	36	11.25
Traditional Knowledge	26	8.13
Medicinal Chemistry	21	6.56
Microbiology	16	5.00
Biotechnology	15	4.69
Pteridophyta	11	3.44
Bryophyta	10	3.13
Atmospheric Physics	9	2.81

FINDINGS

The following findings are drawn from data analysis:

- The Overall Relative Growth Rate (RGR) has decreased from 0.33 at year 2010 to 0.08 at year 2014 in a span of five years and Doubling Time (DT) discloses that research output of Faculty Science, DSB Campus, Kumaun University has increased from 2.16 at year 2010 to 8.46 at year 2014.
- The Relative Growth Rate (RGR) of Department of Botany, DSB Campus, Kumaun University has decreased from 0.34 at year 2010 to 0.09 at year 2014 in a span of five years and Doubling Time (DT) has increased from 2.04 at year 2010 to 7.04 at year 2014.
- The Relative Growth Rate (RGR) of Department of Chemistry, DSB Campus, Kumaun University has decreased from 0.25 at year 2010 to 0.06 at year 2014 in a span of five years and Doubling Time (DT) has increased from 2.77 at year 2010 to 11.24 at year 2014. Maximum articles are publishing in the year 2010 and minimum in year 2014 with a share of 18 and 9 papers.
- The Relative Growth Rate (RGR) of Department of Geology, DSB Campus, Kumaun University has decreased from 0.30 at year 2010 to 0.04 at year 2014 in a span of five years and Doubling Time (DT) has increased from 2.30 at year 2010 to 15.54 at year 2014. Maximum articles are publishing in the year 2012 and minimum in year 2014 with a share of 12 and 4 papers.
- Relative Growth Rate (RGR) of Department of Physics, DSB Campus, Kumaun University has decreased from 0.44 at year 2010 to 0.09 at year 2014

in a span of five years and Doubling Time has increased from 1.59 at year 2010 to 7.52 at year 2014. Maximum articles are publishing in the year 2011 and minimum in year 2012 with a share of 19 and 10 papers.

- There are fourteen (14) core research areas in which faculty members of Botany Department, DSB Campus, Kumaun University have contributed mostly articles. The most favoured subjects' areas are Forest Ecology, Traditional Knowledge and Microbiology.
- There are Six (6) core research areas in which faculty members of Chemistry Department, DSB Campus, Kumaun University have contributed mostly articles. The most favoured subjects' areas are Natural Products Chemistry, Medicinal Chemistry and Bio-Organic Chemistry.
- There are six (6) core research areas in which faculty members of Physics Department, DSB Campus, Kumaun University have contributed mostly articles. The most favoured subjects' areas are Astrophysics, Atmospheric Physics and Spectroscopy.
- There are nine (9) core research areas in which faculty members of Geology Department, DSB Campus, Kumaun University have contributed mostly articles. The most favoured subjects' areas are Tectonic Geomorphology, Environmental Geology and Petrology.

Conclusions

From above findings following conclusions are drawn:

- There is a decreasing trend in research output of Faculty of Science, Kumaun University during the time period of 2010 to 2014. This is the reason the Doubling Time (DT) of publication output has been increases from 2 years to 9 years.
- It has been observed from findings that faculty members of Botany Department, DSB Campus, Kumaun University are doing research in fourteen (14) core research areas. Only Forest Ecology, Traditional Knowledge, Microbiology and Biotechnology are sharing more than 65% contributions.
- It has been observed from findings that faculty members of Chemistry Department, DSB Campus, Kumaun University are doing research in six (6)

core research areas. Only Natural products and Medicinal Chemistry are sharing more than 80% contributions.

- It has been observed from findings that faculty members of Physics Department, DSB Campus, Kumaun University are doing research in six (6) core research areas. Only Astrophysics, Atmospheric Physics and Spectroscopy are sharing more than 70% contributions.
- It has been observed from findings that faculty members of Geology Department, DSB Campus, Kumaun University are doing research in nine (9) core research areas. Only Tectonic Geomorphology, Environmental Geology and Petrology are sharing 64% contributions.

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