

Fellowships and Funding Opportunities for School Students: The Way Forward

Strategies for Achieving
Career Goals in Scientific Research

Muthamilarasan Mehanathan



Indian National Science Academy
Bahadur Shah Zafar Marg, New Delhi
2019

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New Delhi



INDIAN NATIONAL SCIENCE ACADEMY

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Foreword

One of the mandates of INSA is to identify, create, nurture and celebrate scientific excellence in the country. A considerable fraction of the activities of INSA focus on capacity building through a variety of novel programs under its Science and Society initiative. An important element of this initiative is the Remote Area Lectures program, wherein the Fellows, Young Scientists and the Members of Indian National Young Academy of Sciences are encouraged and supported to travel to remote corners of the country, interact with school children and help develop their interaction with the world outside and if need be, mentor them. This has been a successful initiative and around 100 lectures annually are conducted across the country. INSA also works closely with the Indian Academy of Science and the National Academy of Science, India on all such initiatives.

This book provides students at the high school level, a road map for career building and lists opportunities that have been created by various agencies. We hope that this book will help many to learn about the limitless possibilities that now exist for a career in science. I am all the more pleased to note that the author himself is from a remote region and has worked his way to the highest level of science. It is heartening to note that he has been widely recognized including the prestigious INSA young scientist's medal and therefore, this narrative is based on a personal journey.

INSA will continue to bring out such books that assist young minds and mould their motivation into careers in science. I do hope that the book will serve a useful purpose and compliment the author again for writing on such a theme. I would like to place on record my thanks to, Dr Ashok Singhvi, Vice President, INSA, for his invaluable help with the editing of the book, Dr N Sathyamurthy and Dr Gadadhar Misra for informal reviews of the book.



AK Sood
President, INSA

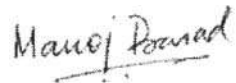
Bengaluru, February 20, 2019

Preface

The book *'Fellowships and Funding Opportunities for School Students: Way Forward'* authored by one of my beloved scholars, Dr Muthamilarasan aims at motivating the school students to achieve their career goals in scientific research. The book will allow the students to have a better understanding of career opportunities in sciences, how to frame the roadmap, what are the different scholarships and awards available, how to get into national institutes and universities, what are the internship opportunities available for the students, and how to build a strong curriculum vitae.

I am also pleased to know that the book is an outcome of the Remote Area Lecture scheme of the Indian National Science Academy (INSA), New Delhi, and in this purview, the book details the important skills (language, communication, value-added knowledge, etc.) required for accomplishing the career objectives and the strategies to improve these skills in the students from rural background. There is no doubt that the book would serve as the first point of information for the high-schoolers aspiring to pursue their career in scientific research.

At this juncture, I heartily appreciate the efforts of INSA in promoting this activity. I also thank Dr. AK Singhvi, Vice-President (Science & Society), INSA and Dr. Seema Mandal, Assistant Executive Director (Science & Society), INSA for expertly implementing the Remote Area Lecture scheme.



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Author

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Glossary

AICTE	All India Council for Technical Education, New Delhi
AIEED	All India Entrance Examination for Design
AIIMS	All India Institute of Medical Sciences
AILET	All India Law Entrance Test
AIPVT	All India Pre-Veterinary Test
AORC	Assured Opportunity for Research Careers
AvH	Alexander von Humboldt Fellowship
BDS	Bachelor of Dental Surgery
BE	Bachelor of Engineering
BITSAT	Birla Institute of Technology and Science Admission Test
BSc	Bachelor of Science
BTech	Bachelor of Technology
CCMB	Centre for Cellular & Molecular Biology, Hyderabad, Telangana
CEO	Chief Executive Officer
CGPA	Cumulative Grade Points Average
CLAT	Common Law Admission Test
CPT	Common Proficiency Test
CSIR	Council for Scientific and Industrial Research, Government of India
CV	Curriculum Vitae
DAAD	Deutscher Akademischer Austauschdienst (German Academic Exchange Service)
DBT	Department of Biotechnology, Government of India
DRDO	Defence Research and Development Organization, Government of India

DST	Department of Science & Technology, Government of India
GATE	Graduate Aptitude Test in Engineering
GFTI	Government Funded Technical Institutes
HR	Human Resources
HRA	House Rent Allowance
HSEE	Humanities and Social Sciences Entrance Examination
IASc	Indian Academy of Sciences, Bangalore
IAT	IISER Aptitude Test
ICAR	Indian Council of Agricultural Research, Government of India
ICMR	Indian Council for Medical Research, Government of India
IIIT	Indian Institute of Information Technology
IISc	Indian Institute of Sciences, Bangalore
IISER	Indian Institute of Science Education and Research
IIT	Indian Institute of Technology
IMU-CET	Indian Maritime University Common Entrance Test
INSA	Indian National Science Academy, New Delhi
INSPIRE	Innovation in Science Pursuit for Inspired Research (DST)
JEE	Joint Entrance Examination
JNCASR	Jawaharlal Nehru Centre For Advanced Scientific Research, Bangalore
JNU	Jawaharlal Nehru University, New Delhi
JPSP	Japan Society for the Promotion of Science
JRF	Junior Research Fellow
KVPY	Kishore Vaigyanik Protsahan Yojana
LSAT	Law School Admission Test
ME	Master of Engineering
MNS	Military Nursing Service

MOOC	Massive Online Open Courses
MSc	Master of Science
MTech	Master of Technology
MU OET	Manipal University Online Entrance Test
NASI	National Academy of Sciences, India
NATA	National Aptitude Test
NCERT	National Council of Educational Research and Training
NCHMCT	National Council for Hotel Management and Catering Technology
NEET	National Eligibility Cum Entrance Test
NET	National Eligibility Test
NID DAT	National Institute of Design conducts Design Aptitude Test
NIFT	National Institute of Fashion Technology
NIT	National Institute of Technology
N-PDF	National Post-Doctoral Fellowship
PG	Post-Graduation
PhD	Doctor of Philosophy
RA	Research Associate
SEATS	Scheme for Early Attraction of Talent (INSPIRE)
SERB	Science & Engineering Research Board (DST)
SHE	Scholarship for Higher Education (INSPIRE)
SRF	Senior Research Fellow
TIFR	Tata Institute of Fundamental Research
TISS-BAT	Tata Institute of Social Sciences–Bachelor’s Admission Test
TNSCST	Tamil Nadu State Council for Science and Technology
UG	Under-Graduation
UGC	University Grants Commission, Government of India
URL	Uniform Resource Locator

Choosing Science as a Career

1.1 Branches of Modern Science

The term 'science' has been derived from the Latin word, *Scientia*, meaning 'knowledge'. Science deals with the collection, organization and application of knowledge for the betterment of mankind. There are three major branches of science, *viz.*, natural, social and formal sciences. The natural science is broadly classified into two namely, physical science and biological science. Physical science studies the inanimate natural objects of the universe and beyond. Physics, chemistry, astronomy and earth science are the main components of physical science. On the other hand, different subjects that aim to study the life of living organisms are collectively called biological science (or life science). The work undertaken in these branches of science to add, improve and enrich the knowledge is termed 'research' (French. *recherche* – to seek). Scientific research could be basic or applied research (Table 1). Basic research refers to the studies that are necessary to understand the scientific phenomena (but not limited to mere observation and testing of facts). Applied research denotes the application of basic scientific knowledge to solve practical problems.

Table 1. The fundamental differences between basic and applied researches

Research	Basic	Applied
Knowledge type	Discovery / invention (Science)	Application / innovation (Technology)
Objective	To understand	To find a solution
Motivation	Intellectual curiosity	Curiosity to solve a problem
Outcome	Academic (publications & reports)	Practical (tools & techniques)

Basic research utilizes the resources available to generate new knowledge. The applied research further uses the results of basic research to innovate usable products (Fig. 1).

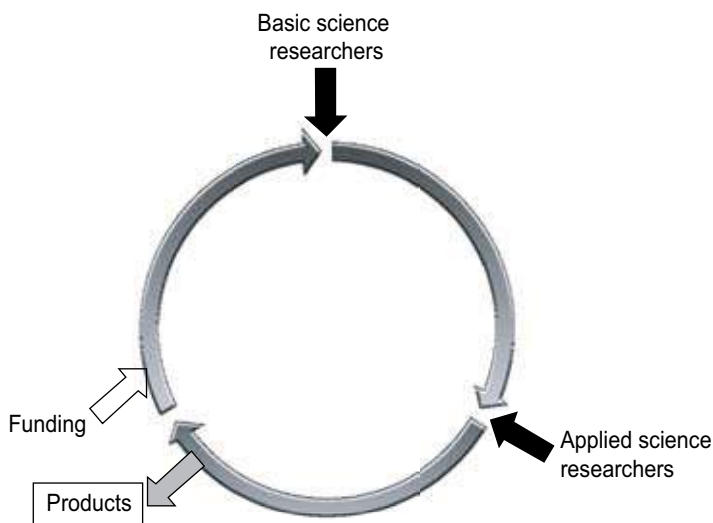


Fig. 1. The interplay between basic and applied science research to develop innovative products for the use of humanity

India has several funding agencies under different ministries to fund and implement scientific research at universities and research institutions. For example, the Department of Biotechnology is one of the funding bodies of the Ministry of Science & Technology that supports research and development in the areas related to biotechnology¹.

The three national science academies of India namely, Indian National Science Academy, New Delhi (INSA)²; National Academy of Sciences, Allahabad (NASI)³; Indian Academy of Sciences, Bangalore (IAS)⁴ work closely with the ministries and other funding bodies to nurture and promote excellence in scientific and technological research and inform public to government about science and evidence-based results.

1 <http://www.dbtindia.nic.in/>

2 <http://www.insaindia.res.in/>

3 <http://www.nasi.org.in/>

4 <https://www.ias.ac.in/>

1.2 Why Awareness about Scientific Research is Important?

School students, particularly from rural areas lack awareness about career options that exist in scientific research. For example, in Tamil Nadu, there is a common belief among the students at the high-school level, that pursuing medicine is prestigious and rewarding. It is regrettable to see that the parents, and to an extent, the management of schools place undue emphasis on their wards to score higher marks in their final examinations for securing a seat in medicine. It is a matter of prestige to both the family and the school administration that their ward gets a seat to pursue MBBS degree. The consequences of this trend, however, are devastating. The above approach not only mounts undue mental pressure on the students but also drives them to make erroneous decisions (like committing suicide), in cases when some of them are not able to perform up to the mark. Tamil Nadu ranks the highest in the number of students committing suicide, though not all the cases could be related to their academic failure (Fig. 2).

State	No. of student suicides (2014-2016)
Tamil Nadu	2789
Karnataka	1707
Telangana	1193
Kerala	1132
Andhra Pradesh	988
TOTAL	7809

Fig. 2. A survey of suicide rates among the students of southern states during 2014-2016⁵

5 Times of India (Bengaluru; Jan 6, 2018)

The second choice of students is, engineering. There was a boom in engineering colleges, a decade ago. Till date, 571 engineering colleges operate in Tamil Nadu itself (Fig. 3), resulting in maximum engineering graduates passing-out from the state. However, higher unemployment rates among such graduates have now resulted in the downfall of uptake of engineering as a career option. According to AICTE, Tamil Nadu has the highest number of engineering seats (279,000), among which 48 % of the seats were unfilled in the academic year 2016-17⁶. It is disappointing to see the colleges taking desperate measures to secure student strength by offering freebies and fee discounts. However, no college is able to ensure job security.

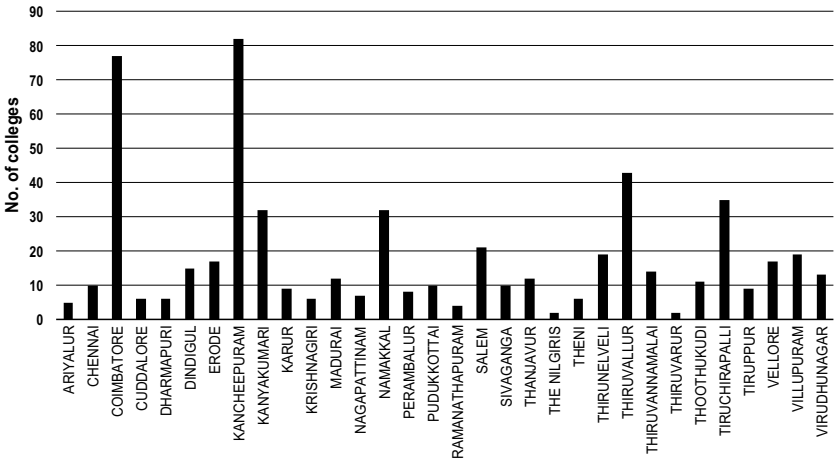


Fig. 3. Number of engineering colleges in the districts of Tamil Nadu⁷

In this scenario, the students at high-school should make themselves aware of the career perspectives in scientific research. An important part to realize is that one should introspect hard to find the areas of interest, identify his/her core competence and strive to work in these areas. Success accrues when professional work becomes one’s hobby, to be pursued on a 24x7 basis. Thus, the discussion below applies to those, who enjoy the fun

6 *Indian Express* (New Delhi; Jan 29, 2018)

7 <http://www.tneahelp.in/tnlistofcolleges.php>

of doing science, are inquisitive about nature and are keen to learn more about it.

As said in section 1.1, several disciplines and sub-disciplines exist in natural science that can be of interest to a student, for pursuing it as his/her career. More recent trends of interdisciplinary science seek to use a blend of disciplines to address and understand various aspects of Nature.

1.3 How to Identify Whether I Have a Passion for Science?

Identifying the passion for science would help in choosing the right career stream for the student. The aptitude, personality and interest (API) of the student must be studied in this regard. Giving a fair response to the following questions might help the reader in finding out their interest in the sciences.

A. Aptitude

1. *What is your favorite subject and why?*

- i. Physics
- ii. Chemistry
- iii. Biology
- iv. Other

2. *What is your least favorite subject and why?*

- i. Physics
- ii. Chemistry
- iii. Biology
- iv. Other

B. Personality

1. Does the word 'scientist' or 'researcher' fascinate you?
2. Do you read any article or news item related to your favorite subject in addition to the textbooks?
3. Do you watch videos or online classes on your favorite subject?
4. Do you read the chapters in the textbook (of your favorite subject) before being taught in the school?

5. Do you feel excited to explain your friends or family about the subject you have studied or been taught?

C. Interest

1. *If asked to present a model in 'science fair', what would you choose?*
 - i. Prepare a model from my favorite subject
 - ii. Prepare a model that my friends suggest
 - iii. Opt-out
2. *While preparing a model of your choice, will you do any one of the following to gain additional knowledge?*
 - i. Visit the library
 - ii. Browse through the internet
 - iii. Discuss with the subject coordinator (teacher)
 - iv. None
3. *Do you agree or disagree with the following statements about your favorite subject?*
 - i. It is essential and valuable for me to get high scores in my favorite subject
 - ii. I expect to achieve better scores in my favorite subject than other students

Choosing either physics, chemistry or biology in question A[1] shows the interest of candidate in science; however, the response to other questions should also be carefully studied to understand the passion of the student for science (Remember, passion is something that one wants to do naturally and, as said above, success in life happens only when the passion and professions converge).

Assuming that the student has answered affirmatively, and the analysis indicates their interest in science, the following sections of this book informs about the career opportunities and discusses the ways to frame a roadmap, tells about the different scholarships and awards available for school students. It will also talk about the process of gaining admission into national institutions and universities, the internship opportunities, and advise on how to build a strong curriculum vitae.

1.4 How to Develop My Interests in the Sciences?

For any activity, motivation is important. This could be intrinsic or extrinsic (Fig. 4). Intrinsic motivation to pursue a career in science could be judged and fine-tuned by evaluating the aptitude, personality and interest of the student. This includes determination, self-reliance and awareness, and confidence. On the other hand, parents and teachers are the main sources of extrinsic motivation who provide support, encouragement and rewards to the student. Both the parent and teacher should know the value of achievement in learning a subject and the value of what is to be learned. Thus, a teacher transmits knowledge by generating enjoyment in learning and provides confidence and assurance to the student. The student thus understands not only the value of achievement in learning a subject and the value of what is to be learned but also visualizes the success as a realistic possibility and motivate himself to master the subject.

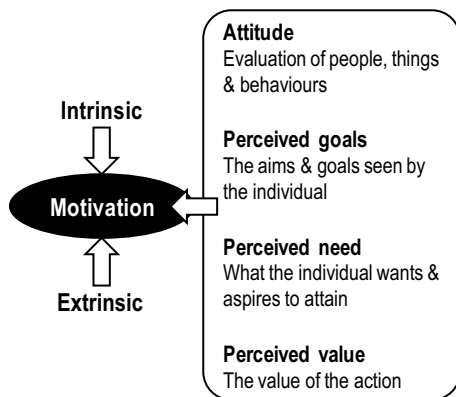


Fig. 4. The sources and other variables of motivation

Gaining basic knowledge in the field of interest is important. School-level textbooks give first-hand information on all the aspects of science that a student should know, but developing the habit of 'reading' is always rewarding. Many find the library as an alien planet, but that is acceptable to an extent, for a school student. However, one should not ignore the use of internet in enhancing his/her knowledge. Searching for the keyword of one's subject-interest brings thousands of resources (text, pictures, videos, quizzes, etc.) to their study table (Fig. 5).

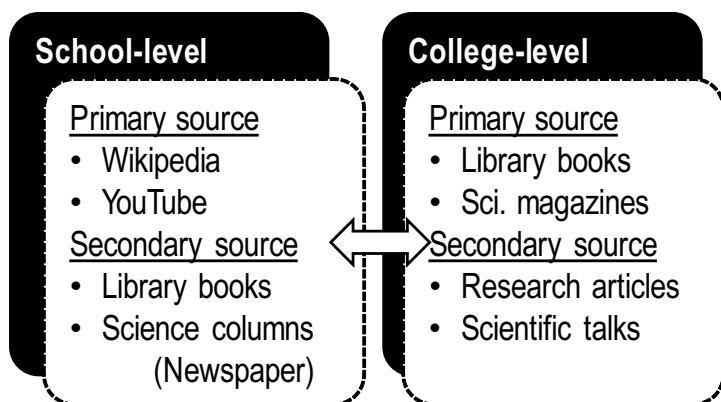


Fig. 5. The sources of information for students at different levels

Also, there are several interesting websites available for school students to browse through their topic of interests (Table 2).

Table 2. Some reliable web resources that provide first-hand information to school students

Name	URL	Information
Wikipedia*	https://www.wikipedia.org/	An online encyclopedia that provides primary information about almost everything known to humanity
edX	https://www.edx.org/	An online learning destination and MOOC provider, offering high-quality courses from the world's best universities and institutions
Brightstorm	https://www.brightstorm.com/	Videos of subjects covering high-school age curriculum (Math, Science, English and AP)
Khan Academy	https://www.khanacademy.org/	Free online coaching on topics related to math, science & engineering, computing, arts & humanities, economics & finance and tutorials to prepare for competitive exams
HowStuffWorks	https://www.howstuffworks.com/	A source of unbiased, reliable, easy-to-understand answers and explanations of how the world actually works
Instructables	https://www.instructables.com/	Learn how to make anything with Instructables. Easy to follow step-by-step instructions, online classes, and a vibrant maker community

*Referring to Wikipedia is not recommended from college-level education

1.5 Where to Begin?

The Indian education system offers four major streams after class 10. These are;

- i. Science A group (Physics, Chemistry, Mathematics),
- ii. Science B group (Physics, Chemistry, Biology),
- iii. Commerce group (Accounts, Statistics, Economics, Business studies),
and
- iv. Arts/Humanities group (History, Geography, Psychology, Political Science).

Students who aspire to pursue science as a career will need to choose either of groups A or B. However, interdisciplinary sciences and research integrating different fields of study are gaining more attention to address the gaps in knowledge. Those who opt for the other two groups shall integrate science into their field of specialization to develop a career in science through interdisciplinary mode. This book is aimed at students of groups A and B.

Framing the Roadmap

In journey of life, traveling without a map/plan may mislead one to an unplanned destination, and in the process, delays the journey. At times, such instances also make one tired and exhausted. Thus, a clear cut and well-thought-out career path is important for any individual to build their professional career. This section guides how to frame the career trajectory for professional success.

2.1 Is it too Early to Have a Roadmap Now?

At times, it may seem premature for school children to plan for future careers. In fact, it is never too early to do so as both clarity and timing are key to career growth. It is, therefore, important to plan the career path well in time, so as to be ready in meeting the academic challenges.

In the planning of a career, the academic goals of the candidate, degrees to be secured to achieve the desired goal, competitive examinations, and financial implication and supports (fellowships/scholarships) available during the period of study should be examined and planned for. Depending on the levels of development, roadmap could be classified into three; (i) rough, (ii) draft, and (iii) fine map. Rough map considers all the possibilities in one's academic career, and it might include one or more fields that the student wants to pursue (Fig. 6). It is advisable to have a rough map at the school level.

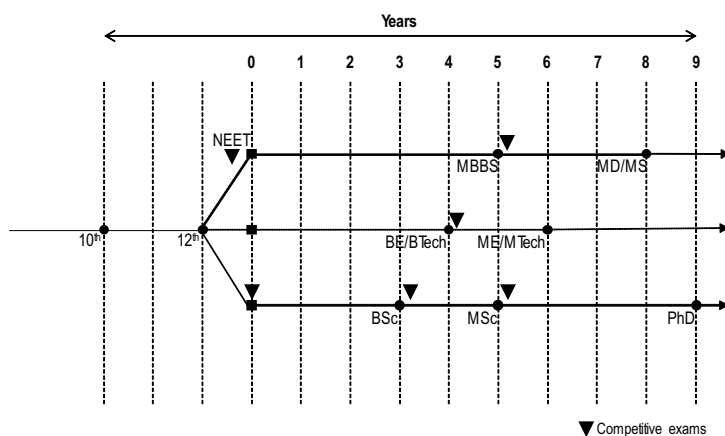


Fig. 6. ROUGH MAP: A typical roadmap recommended for students at school-level to have an idea about the academic prospects

The map above plots the minimal timeline and competitive exams required to be qualified for pursuing different degrees in natural sciences. The rough map gives the student an idea of the following;

- How much time is required to complete a degree?
- What are the competitive exams that are to be qualified for scholarships/stipends?
- What to do after obtaining a specific degree?

One may avoid the following considerations in his decision-making process:

- Opting for the same course, his/her friend has taken to study.
- Choose the college in the same locality just because it is near home (Section 4.1).
- Peer pressure and the pressure of parents to take up a certain subject (Section 4.5).

With time, the rough map gets transformed into a draft map, where the student identifies the specific subject for which he/she has a passion (Fig. 7).

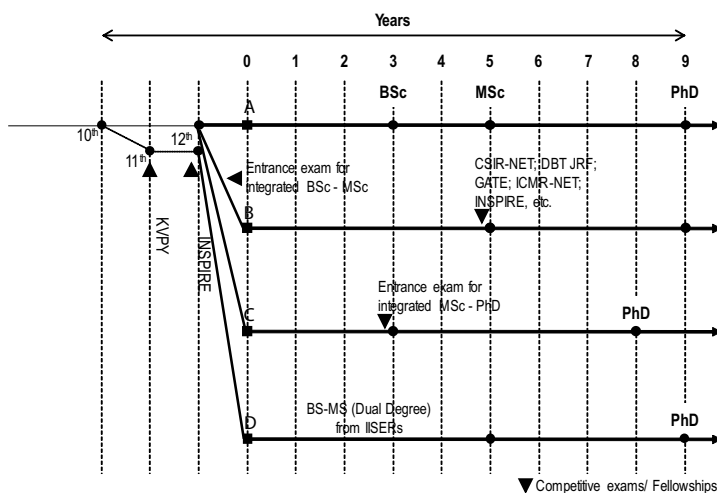


Fig. 7. DRAFT MAP: A map showing the different ways to pursue PhD in Sciences.

A draft map analyzes different ways to pursue a degree of choice. For example, those who want to pursue a PhD in Sciences has several ways (Fig. 7) to attain a doctorate.

- A. Enroll for a BSc degree in a college affiliated to a state university, pursue an MSc degree after completing BSc (in the same college or another). Then, enroll for PhD (that would take a minimum of 5 years) in the state university or institute.
- B. Some national-level examinations exist for pursuing integrated BSc-MSc degree. These are five-year integrated programmes where the student may also get a monthly stipend.
- C. Upon completion of MSc, the student will need to qualify the National Eligibility Test (NET) conducted by CSIR, UGC, ICMR, DBT, etc. or a university-level eligibility test. Students successful in any of these examinations are eligible for a stipend of 31000 INR (plus HRA) per month for the first two years and, then 35000 INR (plus HRA) per month for the rest three years during their tenure as a PhD scholar⁸. An annual contingency grant will also be provided to students to

8 DST Circular No. SR/S9/Z-08/2018 dated 30.01.2019

meet their academic expenses. Academic institutions have their own research program, and depending on the subject of choice, these offer additional avenues.

- D. Pursuing BSc degree in a college affiliated to a state university and qualifying the exams for 'integrated MSc-PhD' programme. The student may get stipend during MSc (as permissible by the agency), and the PhD stipend may be equivalent to the amount mentioned above.
- E. Indian Institute of Science Education & Research (campuses are in Berhampur, Bhopal, Kolkata, Mohali, Pune, Trivandrum and Tirupati and more on the anvil) offers a five-year BS-MS (Dual Degree) programme.
- F. Securing Kishore Vigyanic Protshahan Yojana (KVPY) fellowship at class 11 and INSPIRE at the 11/12th level provide the 4th route through IISERs. These are however, highly competitive.

Some of the institutions/universities that offer 'integrated MSc-PhD programmes' are: IISERs; Guru Gobind Singh Indraprastha University (New Delhi); Rajiv Gandhi Centre for Biotechnology (Haryana); Jawaharlal Nehru University (New Delhi); University of Hyderabad (Telangana); Centre for Cellular & Molecular Biology (Telangana); Jawaharlal Nehru Centre for Advanced Scientific Research (Bangalore); and Indian Institute of Science (Bangalore). This is an indicative list and by no means exhaustive.

Unlike the other two maps, the fine map carries more clarity on the academic trajectory. It does not have any optional routes and includes the details of available resources (fellowships and funds) to support the education (Fig. 8).

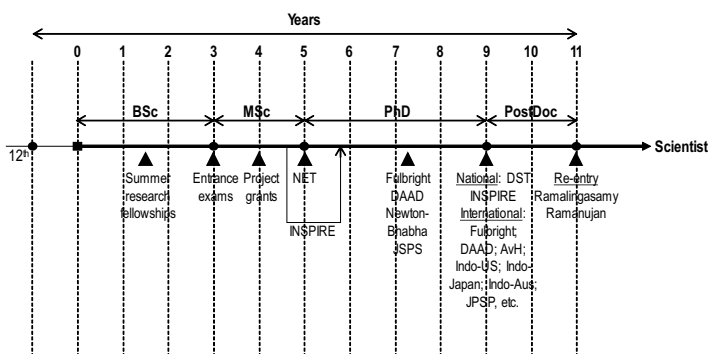


Fig. 8. FINE MAP: A map consisting of all the details required to complete the journey to becoming a Scientist in a reputed national laboratory

The map above shows a typical journey of most of the scientists recruited in national laboratories and universities in India (Section 3 discusses the fellowships, shown in Fig. 8).

While pursuing the BSc degree, a prospective candidate should undergo at least one internship in any national laboratory through different fellowship schemes (see, Section 4). These provide the candidate an additional exposure to a state-of-the-art research environment, which he/she can use to pursue his/her PhD degree. The three Indian Science Academies, INSA, IASc and NASI together offer Summer Research Fellowship to students to work on research-oriented projects under the guidance of scientists in national laboratories. Approximately, 2000 such fellowships are offered to students every year with travel and living expenses paid.⁹ Similar fellowships are also offered by JNCASR, Bangalore; CCMB, Hyderabad; TIFR, Mumbai, etc.

With this exposure, the candidate will be more equipped to attempt national-level entrance tests for MSc in central universities (like JNU, New Delhi) and/or national institutes (like IISERs & IITs). The MSc curriculum has a six- to twelve-month internship requirements in the final year, which the candidate can use to visit another state-of-the-art laboratory or get

⁹ <http://web-japps.ias.ac.in:8080/fellowship2018/index.html>

his/her own funding to pursue the internship dissertation in the home institution.

The Tamil Nadu State Council for Science and Technology (TNSCST) and some other state councils offer project schemes that provide financial support to students who have dissertation work in their regular curriculum¹⁰. The scheme supports minor research projects during UG/PG (Engineering), PG courses of science, medicine, agriculture, veterinary, and even social science. The councils not only provide financial assistance but also conducts seminar-cum-exhibition of the projects undertaken by the students, where the students present their findings before the peer group. Rewards are given to selected projects and models.

Qualifying NET or any equivalent examinations is one of the prerequisites for pursuing PhD. NET is an examination that enables the successful candidates to join as a junior research fellow (JRF) for a PhD degree. This subject-specific examination is conducted by several government agencies including the Council of Scientific and Industrial Research (CSIR); University Grants Commission (UGC); Indian Council of Medical Research (ICMR), etc. In biology, the Department of Biotechnology, Ministry of Science and Technology, Govt. of India also conducts an examination called 'Biotechnology Eligibility Test'. In some cases, qualifying the Graduate Aptitude Test in Engineering (GATE) is permissible for pursuing PhD.

A few fellowships are offered to students who are already enrolled for a PhD. The CSIR-SRF is offered to students who have completed two years into their PhD programme¹¹. Similarly, the Rajiv Gandhi National Fellowship by UGC is offered to the students in SC/ST category to pursue PhD¹². UGC also offers a similar fellowship to OBC (National Fellowship for OBC Candidates¹³) and minority category students (Maulana Azad National Fellowship for Minority Students¹⁴).

10 <http://www.tanscst.nic.in/student.html>

11 <http://csirhrdg.res.in/jrfsfra2.htm>

12 <https://www.ugc.ac.in/rgnf/>

13 <https://www.ugc.ac.in/nfobc/>

14 <https://www.ugc.ac.in/manf/>

Innovation in Science Pursuit for Inspired Research¹⁵ (INSPIRE; Fig. 9), a flagship programme of Department of Science & Technology, Ministry of Science & Technology, Govt. of India allows the post-graduates to pursue PhD, provided the candidate is (i) a university 1st Rank holder in a particular subject at PG level examination in Basic and Applied Science courses, and (ii) is an INSPIRE scholar, who has secured aggregate marks of 65 % are above at the two-year MSc or five-year Integrated MSc/MS. INSPIRE fellowships are also available from the first year of the five-year BS-MS program in IISERs.

Recently, the Department of Science & Technology has constituted an Inter-Ministerial Empowered Committee to provide additional incentives to doctoral students for enhancing the value, quality and experience in research¹⁶.

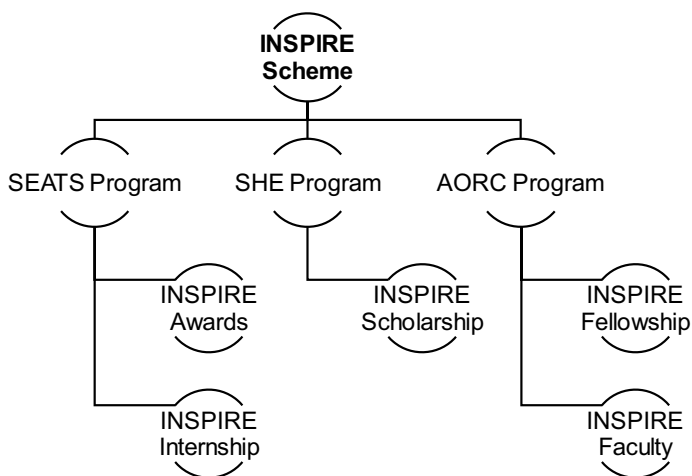


Fig. 9. Different fellowships available under the three components of INSPIRE program namely Scheme for Early Attraction of Talents (SEATS), Scholarship for Higher Education (SHE) and Assured Opportunity for Research Careers (AORC)

While undertaking thesis research in India (Section 5.3), the candidate as a PhD student has several opportunities to visit an international

15 <http://www.inspire-dst.gov.in/inspire.html>

16 DST Circular No. SR/S9/Z-08/2018 dated 02.02.2019

laboratory on a short-term basis to perform a part of his/her research. Several schemes such as Fulbright-Nehru Doctoral Research Fellowship (US), Newton-Bhabha PhD Placements Programme (UK), Raman-Charpak Fellowship (France), Deutscher Akademischer Austauschdienst (DAAD; Germany), Japan Society for the Promotion of Science (Japan), etc. are available for the PhD students to carry out short-term research abroad. Information on these fellowships are available on the web, and a simple search provides all the information on their scope and application process. Most of these fellowships are with financial support that would cover the cost of travel and living.

A prospective PhD research extends for five years, and after completion, the candidate may go for Post-Doctoral research in India or abroad. The INSPIRE-AORC scheme allows the candidate to undertake research in any Indian laboratory for a period of five years, and the host institute may absorb the candidate for a permanent position during this tenure. Within India, several Post-Doctoral fellowships are available including National Post-Doctoral Fellowship (DST-SERB); DBT-Research Associate (DBT); DS Kothari Post-Doctoral Fellowship (UGC); CSIR-RA; etc. for gaining additional experience in research. Research Projects funded by various ministries and several institutions have their own postdoctoral fellowship programs with good remunerations.

Similarly, several international fellowships are available for pursuing post-doctoral studies abroad. These include, Fulbright-Nehru Post-Doctoral Fellowship (US); Japan Society for the Promotion of Science (Japan); Alexander von Humbolt Fellowship (Germany); ETH Zurich Postdoctoral Fellowships (Switzerland); EMBO Long-Term Fellowship (European Nations); Human Frontier Science Program (all nations); Marie Skłodowska-Curie Post-Doctoral Research Fellowships (European Union); DBT- and DST-funded Indo-international fellowship programmes (country-specific), etc. The information on eligibility criteria, selection procedure, important dates and other details are available on the web.

There are two re-entry schemes namely, Ramalingaswamy Re-entry Fellowship and Ramanujan Fellowship awarded by the DBT and DST, respectively, for the post-docs in the international laboratory to return to India and secure a position in India (as a scientist in national laboratories or assistant/associate professor in central universities). The DST-SERB also

offers a SERB-Research Scientists Scheme for the awardees of INSPIRE Faculty and Ramanujan Fellowships, who fail to secure regular positions after completion of the regular tenure of five years in the respective schemes.

Thus, the fine map provides all the information about how to navigate in the right direction, what are the funding and fellowship opportunities available, what is the duration of several programmes, etc., that ultimately assist the student in achieving his/her career goals.

2.2 What are the Points to be Considered?

The questionnaire under Section 1.3 would have helped the student in identifying whether he/she has an interest in setting his/her career in scientific research. Raising similar questionnaire and answering it in a fair-way would help to identify the subject (other than science) which the students have a passion for, and what they want to become in life. Towards achieving this, a rough map has to be prepared. The following points are to be considered while drafting a career trajectory.

- a. While you have chosen what you want to become, look for all the possible opportunities to achieve the goal.
- b. Govt. of India has several fellowship schemes to provide funding and scholarships to students in every discipline and at every level. Awareness about this aspect is very important.
- c. Browse through the CV of experts who have made a distinction in your field of interest. See how they navigated towards achieving their success.
- d. Most of the schemes and fellowships are awarded through competitive exams. Self-study and careful preparation for this is important. The internet is the best place to find the resources for learning (tutorials on YouTube, eBooks, reference materials, previous year question papers, online quizzes, etc.)
- e. Prioritize joining a university or institute that has demonstrated a track record of excellence through the quality of its faculty.

After considering these points, use the outline given in Section 2.5 to prepare your roadmap.

2.3 Will Change in the Destination Affect the Journey?

It is completely normal to change the destination on valid grounds. However, the stage at which the candidate is, will have an impact on the duration. Some candidates with MBBS degree followed it by an MTech and PhD degree in (e.g.) nanomedicine or radiation oncology to pursue their research as a Scientist on the aspects of cancer theranostics, photothermal therapy, triggered drug delivery, photo-acoustic imaging, proton beam therapy, etc.

It is not uncommon to see post-graduates and PhDs move from one field to another. This enables the candidate to do inter-disciplinary research and enrich their work from more than one discipline. For example, a candidate from physics background can better understand the nuances of a wheelchair and its working for transporting the patients with ease and comfort, or a chemistry candidate is better trained to develop unique stains to localize a particular cell in plants for further studies by plant scientists.

Remember, 'passion' could be different from 'career'. A classic example is, Antonie van Leeuwenhoek (b. 1632), who invented the microscope. At the age of 16, Van Leeuwenhoek started his career as an apprentice at a linen-draper's shop. Six years later, he opened a draper's shop of his own. In 1660, he became the Chamberlain for the assembly chamber of the Delft sheriffs, and in 1669, he was also appointed as a land surveyor by the court of Holland. He also worked as an official 'wine-gauger' who is in charge of the city wine imports and taxation¹⁷. Irrespective of his career shifts, he was keen on developing optical lenses, and throughout his life, he has developed around 500 lenses. He also created at least 25 single-lens microscopes of different types¹⁸. This enabled the landmark discovery of bacteria in 1683. He was the first to discover protists species, vacuole of the cell, spermatozoa and banded pattern of muscular fibers³.

17 Source: <https://www.britannica.com/biography/Antonie-van-Leeuwenhoek>

18 https://en.wikipedia.org/wiki/Antonie_van_Leeuwenhoek

2.4 What is the Role of a Language?

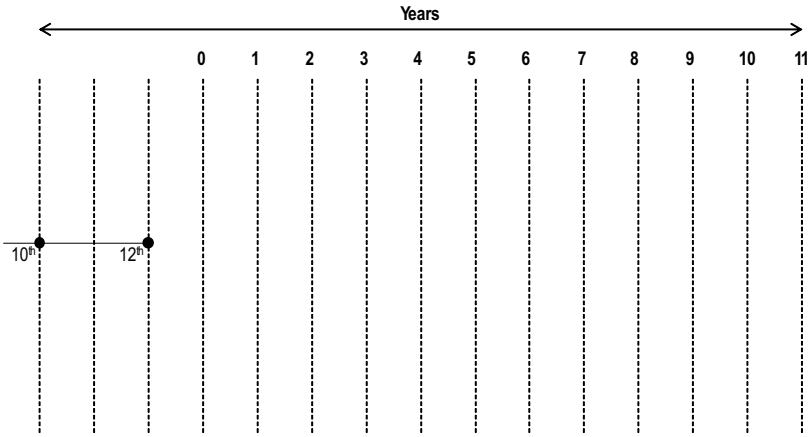
The term ‘competency’ denotes the ability to do something successfully or efficiently. ‘Academic competency’ is a prerequisite for achieving success in a career, and the resources available to enrich one’s knowledge (at school-level) are detailed in Section 1.4. However, communication skills and language are the keys to one’s success, and often, the students belonging to a rural background find themselves handicapped in this aspect. One could be professionally good, but to be able to convince the world about a discovery requires high level of communication skills. Except for initial phases in school, most other academic programmes in Science use English as their medium of instruction. Though English is taught as a subject in the schools, this knowledge is not sufficient to understand or comprehend the instructions and books at college-level. Even those who have studied in an English-medium face difficulty in understanding the texts authored by International experts. Thus, though regional languages must flourish, the current scenario in Science warrants a reasonable proficiency in English as a spoken and written medium of communication. Students should do well to improve their language skills.

In classes, the English teacher always insists on reading English newspapers, but students rarely follow their advice. But the ones, who tried, do realize the long-term benefits of skills in the English language. The internet era has brought many resources to learn English skillfully. The British Council of India has developed two online resources for teaching, training and learning English, which the student might find useful.

1. Learn*English* Kids : <http://learnenglishkids.britishcouncil.org/>
“The site has lots of free online games, songs, stories and activities for children (up to 10 years of age). For parents, it has articles on supporting children in learning English, videos on using English at home and information about face-to-face courses around the world.”
2. Learn*English* Teens : <http://learnenglishteens.britishcouncil.org/>
“LearnEnglish Teens can help improve your English with reading, writing and listening practice, tips for exams, grammar and vocabulary exercises, games and videos. You can also interact with other teenagers from all around the world.”

The schools should encourage students to use these two and other similar resources to hone their skills in English.

2.5 Prepare your Roadmap (*Students may use the outline below to develop a rough map of their career trajectory to show how they want to see themselves in the next ten years*)



Scholarships and Awards for School Students

A large proportion of rural students are unaware of the scholarships and awards available at school-level. These scholarships provide not only monetary support but also give social recognition and add credit to the academic profile of students. Students who have won in the school-level competitions are preferred for studies abroad. This section encourages the students to go through the details of all the awards and scholarships available to them and attempt to participate.

A comprehensive list of scholarships and awards available in different disciplines for school students is provided in Table 3. The management of the schools and teachers may follow this table and encourage the potential students to apply for the scholarships/awards. Many schemes require the schools to nominate or apply for, and in those cases, the schools may give this responsibility to a staff member who can be in-charge for scholarships and awards section.

Table 3. List of scholarships and awards available in different disciplines for school students

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process and reward details	Deadline
1	'Kishore Vaigyanik Protsahan Yojana (KVPY)' by Dept. of Science & Technology, Govt. of India	Maths and Science subjects	Stream SA: Class 11 Stream SX: Class 12	The student has to apply online (link is given below) and appear for aptitude test. The selected candidate will be called for an interview, and the winners will receive a monthly stipend (INR 5000) and contingency grants (INR 20000) during their graduation.	August of every year

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process and reward details	Deadline
2	'Innovation in Science Pursuit for Inspired Research (INSPIRE)' by Dept. of Science & Technology, Govt. of India	Scholarship in science	6 to 10	The school should try to nominate prospective students, and the winners will get INR 5000 for making a project and transportation cost for displaying the exhibits/project in the exhibition.	<i>Depends on the program</i>
	<i>Scheme for Early Attraction of Talent (SEATS)</i>				
	<i>INSPIRE Internship</i>	Internship in science	11 th	The school will nominate a prospective student to undergo internship in science camps.	
	<i>Scholarship for Higher Education (SHE)</i>	Scholarship for graduation	12 th (passed)	Students among the top 1% in 12 th standard Board Examinations and pursuing courses in Natural and Basic Sciences at the B.Sc. or Integrated M.Sc. levels, are eligible for INR 80000 per year.	
3	'CSIR Innovation Award for School Children' by Council of Scientific & Industrial Research, Govt. of India	Exhibition of project/ innovation/ idea	Below 18 years of age	The student should write in details about his/her project/ innovation/ idea and submit by post (duly forwarded by the school). The winners will get a cash prize of (INR 10000 to 100000) and certificate.	September of every year
4	'Youva Master Stroke All India Drawing Competition' by Navneet Education Limited	Drawing competition	Nursery to class 10	The school should register online and submit the entries. The winners will get attractive prizes (TV, iPad, laptop, etc.).	August of every year

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process and reward details	Deadline
5	'Google India Code to Learn Contest' by Google	Coding in computer science	5 to 10	The school's computer teacher will register online and submit the project. The winners will get a Chromebook laptop from Google.	August of every year
6	'HDFC Educational Crisis Scholarship' by HDFC Bank	Financial assistance	6 to 12	The student should apply online; however, it is a scholarship for students who are socially and economically disadvantaged. A financial assistance of up to INR 10000 is provided.	August of every year
7	'All India Art Competition' by Shanker Art Foundation	Drawing competition	Nursery to class 12	An individual or a school can apply online (two different modes of application for students and schools available). The winners will get medals and certificates.	August of every year
8	'Mahindra All India Talent Scholarship' by KC Mahindra Education Trust	Scholarship award	10 & 12 (passed)	The application form should be downloaded online, filled and sent to the organizer with supporting documents. The winners will receive the scholarship of INR 10000 per annum for a maximum of three years.	August of every year
9	'Korea-India Friendship Essay Competition' by Korean Cultural Centre India, Embassy of Republic of Korea	Essay writing	6 to 12	The topics for essay writing will be given in the organizers' webpage, and the students should write the essay and submit it by email (or post). The winners will get a free trip to Korea for six days and five nights.	August of every year

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process and reward details	Deadline
10	'Dr. A P J Abdul Kalam IGNITE Awards' by National Innovation Foundation, Govt. of India	Exhibition of project/ innovation/ idea	Up to class 12 (17 years of age)	The student should write in details about his/her project/ innovation/ idea and submit either by email or online or by post. The winners will present their project at NIF, Gujarat (the organizers will cover all expenses).	August of every year
11	'National Scholarship Exam' by National Institute of Career Education Foundation, Govt. of India	Scholarship exam	5 to 12	The student should download, print and fill the application form (http://www.niceedu.org/application-forms). The filled-in form should be sent to the organizers by post. Winners will get prize money.	September of every year
12	'Pre-Matric Scholarships' by Ministry of Minority Affairs, Govt. of India	Financial support		Students belonging to a minority community (Muslims, Sikhs, Christians, Buddhists, Jains and Zoroastrians/ Parsis) with an annual family income of not more than INR 1 lakh can apply online.	September of every year
	<i>Scheme for Minorities</i>		1 to 10		
	<i>Students with Disabilities</i>		9 or 10		
13	'OIL Awards & OIL Merit Scholarship' by Oil India Limited, Govt. of India	Cash award based on the academic score	10 th & 12 th	The student should apply online by submitting the scanned copies of mark sheets, testimonials, and other documents. The winner will get scholarship money.	August of every year

Strategies for Achieving Career Goals

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process and reward details	Deadline
14	Science Olympiad Foundation Scholarships	Financial assistance to girls from the economically weaker section	1 to 10 (Girls only)	School may recommend one girl student a year by submitting the application (link given below) in hardcopy with supporting documents. The selected student will receive INR 5000 to support her education.	October of every year
	<i>Girl Child Scholarship Scheme</i>				
	<i>Scholarship for Excellence in English</i>	Cash award for a student who has scored at least 90 % marks in English (annual aggregate)	1 to 10	Schools may nominate their students by submitting the application (link given below) in hardcopy with supporting documents. The selected student will receive INR 5000 and a certificate of merit.	December of every year
	<i>Academic Excellence Scholarship</i>	Award to a student who obtains highest cumulative marks in any 4 Olympiad exams during the year	1 to 12	Schools may nominate their students by submitting the application (link given below) in hardcopy with supporting documents.	<i>Not available</i>
15	'National Science Concours' by Foundation for Innovation & Experiential Learning	Several awards and benefits to students	6 to 12	Schools can register online to submit the applications, or the students can individually apply. The students will get to enroll for summer science camps, awarded with junior scientist award, get winter kit and certificate of participation.	November of every year

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process and reward details	Deadline
16.	'National Biennial Competition for Green Grassroots' by National Innovation Foundation, Govt. of India	Award to encourage hidden innovative and creative talent	1 to 12	The student (individual or group) should submit their application on plain paper containing the technical details of the innovation/ idea and supporting documents by post. The best three innovations will be awarded Rs. 500,000 (National First), Rs. 300,000 (National Second) and Rs. 100,000 (National Third) each in different categories. NIF may also give a Life Time Achievement Award of Rs 750,000 to an outstanding innovator with demonstrated lifelong creativity.	March (Biennial)

Weblinks

1. <http://www.kvpy.iisc.ernet.in/>
2. www.inspire-dst.gov.in
3. <http://www.csir.res.in/career-opportunities/results/csir-innovation-award-school-children>
4. <http://masterstroke.navneet.com/index.aspx#head>
5. <https://codetolearn.withgoogle.com>
6. https://www.hdfcbank.com/htdocs/common/ECSS_scholarship.htm
7. <http://childrenartcontest.com>
8. <https://www.kcmet.org/what-we-do-Scholarship-Grants.aspx>
9. <http://www.koreaindiaessay.com>
10. <http://nif.org.in/announcement/ignite-competition>
11. <http://www.niceedu.org/nse>
12. <https://scholarships.gov.in/>
13. [Provides information about the scholarships available from different Ministries of Govt. of India]
14. <https://oileservice.oilindia.in/OilAward/>
15. <http://www.sofworld.org/girl-child-scholarship-scheme-gcss>
16. <http://www.sofworld.org/scholarship-for-excellence-in-english-see>
17. <http://www.sofworld.org/academic-excellence-scholarship-aes>
18. <https://www.nationalscienceconcours.com/whatisnsc.php>
19. http://www.nif.org.in/announcement/biennial_competition

3.1 What is a Talent Search Examination?

Talent search examinations and/or Olympiads are the tests conducted by national and international bodies that evaluate the I.Q. of students in their field of interest (Table 4). Olympiads are conducted in several subjects; thus, giving a choice to the students to select their favorite subject. During the last decade, national and international talent search examinations were highly popular among schools, and the merit of schools was judged based on the students who have succeeded in Olympiads. Though the fame of Olympiads has diminished, the merit of these examinations has never been compromised.

Table 4. International Olympiads conducted in different subjects for school students

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process	Deadline	
1	'National Standard Examinations' by Homi Bhabha Centre for Science Education	Talent search examination (a five-stage procedure)		A student can enroll for NSE at his/her own institution if it is a registered NSE centre. If a student's own institution is not a registered NSE centre, it is still possible to participate in NSE by registering at a nearby centre.	September for Science stream and January for Mathematics	
			Astronomy			Before class 12
			Biology			
			Chemistry			
			Junior Science			Class 10
			Physics			Before 12
Mathematics	8 to 12					
2	'SOF-International Olympiad' by Science Olympiad Foundation	Talent search exams		The school has to register online along with the details of prospective students. SOF will conduct the examination at the school. The syllabus can be found at http://www.sofworld.org/	Depends on the subject stream	
			<i>Economics & Accountancy</i>			11 & 12
			<i>G.K.</i>			1 to 10
			<i>Cyber (Comp. Sci.)</i>			1 to 12
			<i>Science</i>			
			<i>Mathematics</i>			
			<i>English</i>			

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process	Deadline
3	'International Olympiad' by SilverZone Foundation	Talent search exams	1 to 12* (*for some exams, only those up to class 10 are eligible, see the webpage for details)	The school has to register online along with the details of prospective students. The syllabus can be found at http://www.silverzone.org/	August of every year
	<i>Mathematics (iOM)</i>				
	<i>Informatics (iiO)</i>				
	<i>Science (iOS)</i>				
	<i>English (iOEL)</i>				
	<i>French (iFLO)</i>				
	<i>Hindi (ABHO)</i>				
	<i>GK (SMGKO)</i>				
	<i>Talent Hunt (iTHO)</i>				
	<i>Social studies (iSSO)</i>				
<i>Reasoning & aptitude (iRAO)</i>					
4	'International Olympiad' by Humming Bird Edu. Pvt. Ltd	Talent search exams	11 & 12 3 to 12 1 to 12	The school has to register by email or hard copy along with the details of prospective students (http://hummingbirdeducation.com/download.aspx). Syllabus and study material will be sent to the students who have registered.	August of every year
	<i>Commerce Competency</i>				
	<i>Problem-solving</i>				
	<i>Mathematics & Science</i>				
	<i>Computer science (Cyber)</i>				
	<i>English</i>				
	<i>G.K.</i>				
	<i>Hindi</i>				
	<i>Math, Comp., Sci. & English</i>				
	<i>Multiple intelligence</i>				
	<i>Mathematics (Tamil medium)</i>				
	<i>Science (Tamil medium)</i>				
	<i>Spelling (Spell Bee)</i>				

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process	Deadline	
5	'International Olympiad' by Competition Promotion Society	Talent search exams		The school has to register by submitting a duly filled application in hard copy (http://www.cpsolympiads.org/). The syllabus is also available in the same link address.	September of every year	
			<i>Hindi Varchasva</i>			3 to 10
			<i>IQ Genius</i>			1 to 10
			<i>Whiz-Kid (Comp. Sci)</i>			1 to 12
			<i>Math wizard</i>			
			<i>Science Supremo</i>			
			<i>English Laureate</i>			
			<i>S.S.G.K. Maestro</i>			
6	International Olympiad' by National Science Concours	Talent search exams		The schools will nominate the students through online registration. Details are available at the link given below.	Depends on the subject stream	
			<i>Biology (IBO)</i>			Up to 12
			<i>Chemistry (IChO)</i>			11 & 12
			<i>Informatics (IOI)</i>			Up to 12
			<i>Linguistics (IOL)</i>			Up to 12
			<i>Math (IMO)</i>			Up to 12
			<i>Physics (IPhO)</i>			11 & 12
7	'International Finance Olympiad' by International Institute of Financial Markets and the Economic Times	Talent search exam and quiz (3 rounds)	8 to 12	The school has to register online along with the details of prospective students. The organizers will provide study materials.	August of every year	

S. No.	Scholarship/ Award Info	Discipline / Details	Eligibility	Application process	Deadline
8	'Geo Genius Geography Olympiad' by GEO-GENIUS	Talent search exam	2 to 10	The school has to register online (link is given below). The syllabus is also available in the same link address.	October of every year

Weblinks

1. <https://olympiads.hbcse.tifr.res.in/>
2. <http://www.sofworld.org/>
3. <http://www.silverzone.org/>
4. <http://hummingbirdeducation.com/product.aspx>
5. <http://www.cpsolympiads.org/>
6. <https://www.nationalscienceconcoours.com/olympiads.php>
7. <http://www.financeolympiad.in>
8. https://www.geogeniusindia.com/geography_olympiad.php

3.2 What are the Schemes that the National Academies Offer?

India has three premier science academies namely, INSA, New Delhi; NASI, Allahabad and IAS, Bangalore (see, Section 1.1 for their roles). These academies independently or jointly offer several programmes for the benefit of school as well as college students. As mentioned in Section 2.1, the academies jointly offer Summer Research Fellowship to the students at college-level to work on research-oriented projects under the guidance of scientists in National laboratories. Approximately 2000 such fellowships are offered every year with travel and living expenses paid.

INSA, New Delhi has a programme of lectures in remote/rural areas across India¹⁹. This program encourages and enables its Fellows/ Young Scientists/ Teacher Awardees and INYAS members to deliver Popular Science Lectures to students and teachers of schools and colleges in the remote/rural/non-metro areas. This book is an outcome of the INSA Rural Lecture Scheme.

19 http://insaindia.res.in/sciserv_lecture_by_insa.php

IAS, Bangalore offers 'Project Lifescape'²⁰. It is pursued in collaboration with the Centre for Ecological Sciences at the Indian Institute of Science to spread biodiversity literacy, especially within the high school and college student community, and to involve them in collecting first-hand information on the status of ecological habitats, and ongoing changes in a set of species of interest to humans.

NASI, Allahabad and the Department of Biotechnology, Govt. of India offer major capacity building programmes for students, particularly for children after class X board examination through their 'DNA Club'²¹. As a note of caution, it is to be noted that the data about DNA Club has not been updated in the official website of NASI, and therefore, the status of the scheme is unclear. Further, NASI has several interesting programmes for students from Class VI to XII²².

3.3 What Role does a School Play in Encouraging the Students?

Having read about the several opportunities available for the students to excel in their field of interest, the student may feel motivated to attempt one of the possibilities listed in Tables 3 and 4. As it is being said, 'participation is important than winning', the schools should also equally encourage the students to apply for the scholarships and awards.

The book makes the following recommendations to the school in this regard;

- a. A committee be formed to screen and shortlist prospective students to be nominated for the scholarships and awards. It should include the arts (drawing, model making, etc.), science (physics, chemistry and biology), mathematics, language, social science and geography.

20 https://www.ias.ac.in/Initiatives/Project_Lifescape/

21 <http://www.dbtindia.nic.in/programmes/bioresources-environment-and-bioenergy/the-national-bioresource-development-board/>

22 <http://www.nasi.org.in/DNA%20Club.htm>

- b. The committee will identify a candidate with creativity, innovative thinking, the ability to grasp and strong general knowledge, whichever required to succeed in the competition.
- c. A timetable similar to Tables 3 and 4 shall be kept for public display in the school (notice board). Integrating the timetable into the school diary (or in day-to-day activity book) would be informative to the students.
- d. Schools belonging to the same region may form 'knowledge clusters' to enable the students to share the resources (including the library, laboratory, etc.). Formulating different clubs like DNA Club, Geo Club, Eco Club will also encourage the students to participate actively and contribute to the clusters.
- e. Schools may print and circulate the study materials required for qualifying the competitive exams (like Olympiad). A nominal amount shall be charged to meet the expenses incurred towards preparing these materials.
- f. Schools may arrange for periodic lectures, talks, interactive sessions by experts and resource persons who are competent in different fields. Schools should readily welcome the experts visiting through schemes such as *INSA Rural Lecture Scheme*.
- g. Display of award-winning entries of each scheme (listed in Tables 3 and 4) on the notice board will encourage the students to participate in such schemes.
- h. Schools may arrange for a visit to nearby central institute/national laboratory to provide the students an exposure on state-of-the-art research being carried out in those places. For instance, the students from southern districts can visit Rajiv Gandhi Centre for Biotechnology, Trivandrum; ISRO Propulsion Complex, Mahendragiri; ICAR-National Research Centre for Banana, Trichy, etc.
- i. Schools may effectively use 'popularization of science' schemes to organize project day, where the students can make working models and display to the general public and field experts. In all the states, state science councils provide financial support to such programmes²³ and these should be explored.

23 <http://www.tanscst.nic.in/pop.html>

- j. An hour a week may be allotted (for these activities) in the regular time-table. Unless the school brings such activities into the curriculum, the student will not put full effort towards these.
- k. Schools should encourage the use of the library and the student who has frequently accessed the library in an academic year should be suitably rewarded in the annual/foundation day function.
- l. Schools should maintain the track-record of alumni, and successful ones shall be invited once or twice a year to interact with the students.

National Institutions and Central Universities

Looking into the biography of eminent scientists who hailed from the remote, rural and economically and socially backward areas reveals that they have pursued their graduation (or doctorate) in a national institute or central university, which enabled them to achieve their career goals and bring laurels to the country.

For example, Dr. APJ Abdul Kalam did his school in Schwartz Higher Secondary School, Ramanathapuram and graduated from Saint Joseph's College, Tiruchirappalli, Tamil Nadu. His post-graduation is from Madras Institute of Technology (MIT), a premier research institute that has introduced to India new areas of specialization: aeronautical engineering, automobile engineering, electronics engineering and instrumentation technology.

Dr. Kalam chose aeronautical engineering, and after graduating from MIT, joined the Aeronautical Development Establishment of the Defence Research and Development Organisation as a scientist after becoming a member of the Defence Research & Development Service (DRDS). Later, he was transferred to the Indian Space Research Organisation (ISRO) where he was the Project Director of India's first Satellite Launch Vehicle (SLV-III) which successfully deployed the *Rohini* satellite in near-earth orbit in July 1980.

Another example is Mr. Sundar Pichai, the CEO of Google Inc (2015 to till date). Pichai was born in Madurai, Tamil Nadu and completed his schooling in Jawahar Vidyalaya, Ashok Nagar, Chennai and completed the Class XII from Vana Vani school in the IIT-M Campus, Guindy, Chennai. However, for pursuing his under graduation, he chose Indian Institute of Technology, Kharagpur and did his BTech degree in Metallurgical Engineering. Later, he got his MS from Stanford University in Material

Sciences and Engineering, and an MBA from the Wharton School of the University of Pennsylvania.

These two examples reinstate the importance of pursuing higher studies in a national institute or central university.

4.1 Why I Should not Opt for a College in my Locality?

There is a trend in the rural regions that the family of the student normally decides and directs the student to join in a college that is near to their hometown. But the student and parents should imagine as what would have happened if Dr. Kalam pursued his higher studies in Ramanathapuram and nearby areas, or Mr. Sundar Pichai went to a private engineering college in Chennai for studying Metallurgical Engineering instead of going to IIT.

Except for IITs, NITs, IISERs, and a few universities, many central institutes do not offer undergraduate courses, and therefore, the students should aspire to join a college affiliated to the state/central university that has a quality curriculum.

4.2 What are the Autonomous Higher Education Institutes in India?

There are several autonomous higher education institutes in India, that are broadly classified into Indian Institutes of Technology (IIT), National Institutes of Technology (NIT), Indian Institutes of Information Technology (IIIT), Indian Institutes of Science Education and Research (IISER) and Government Funded Technical Institutes (GFTI) (*Appendix D*).

In addition, the various departments belonging to the ministries of Government of India govern several autonomous research institutes. For example, the Department of Biotechnology, Ministry of Science and Technology, Govt. of India has 17 autonomous institutes (Fig. 10). Similarly, the Department of Science and Technology has several autonomous institutions, and the Ministry of Earth Sciences has about 10 under its governance structure. The CSIR system has over 37 institutions.



Fig. 10. The autonomous research institutes of the Department of Biotechnology that offer PhD and Post-Doc opportunities for science students²⁴

All of these facilitate research in various branches of science, offering a student a wide canvass to choose from for his/her PhD and Post-Doctoral studies.

4.3 How to Find the Best Place for Me?

India has numerous research institutions and universities that provide quality teaching, research and career opportunities for the students. Therefore, the students have several options to find an apt institute for their higher studies (mostly, with financial support). Every institute has one or more niche branches, pursuing which, will add significant value to the learning process. Choice of institutions would require that the students do the following.

- a. Analyze the track record of the alumni in their field-of-interest from those institutes/universities,
- b. Compare the infrastructure of an international institute with the Indian institutes to find the competitive one,
- c. See the track record of the staff in the department of choice in respective institutes,
- d. See the publication/patent record to evaluate the track-record of faculty, department as well as the institute,

²⁴ <http://www.dbtindia.nic.in/>

- e. Check the profile of current students to see how competitive they are, and
- f. Do extensive web-search to identify the pros and cons of pursuing an education at an institute/department.

4.4 How Should I Prepare Myself?

Though several campuses in India offer quality higher education, qualifying a common or institute-specific entrance (like IIT - JEE, GATE, etc.) is mandatory to step into these campuses. IIT-JEE has two parts, viz., JEE-Main and JEE-Advanced. Also, few institutes equip two-tier screening for the qualified candidates. The first level will be an institute-specific entrance to the applicants who have already qualified a common entrance examination, following which the second-level screening will be performed through a personal interview. The following table summarizes the entrance examinations to be qualified for admission into conventional and unconventional undergraduate courses after class 12.

Table 5. Top entrance examinations for conventional and unconventional courses

S. No.	Exam	Purpose	Details
A Science			
	IAT	IISER Aptitude Test (IAT) 2019 has to be qualified for getting admission into the BS-MS (Dual Degree) program of IISERs	https://www.iiseradmission.in/
B Engineering			
1	JEE Main	National level entrance for admission to engineering programs at NITs, IIITs and centrally funded technical institutions like IIST, etc. *Male (unmarried) candidates are also eligible for Indian Navy B.Tech. course at Indian Naval Academy, Ezhimala, Kerala (See, https://www.joinindiannavy.gov.in)	https://jeemain.nic.in
2	JEE Advanced	Admission to the qualifying students is granted to all undergraduate engineering and other science programs offered at 16 IITs in India and ISM Dhanbad	https://www.jeeadv.ac.in/

S. No.	Exam	Purpose	Details
3	BITSAT	Birla Institute of Technology and Science Admission Test is for admission to the engineering degree courses at the BITS campuses in Pilani, Goa and Hyderabad	http://bitsadmission.com
4	Manipal MU OET	Manipal University Online Entrance Test is for admission in the Engineering courses offered at Manipal Institute of Technology	https://manipal.edu/mu/admission.html
C	Medicine		
1	NEET	For admission in MBBS/BDS courses	https://cbseneet.nic.in/
2	AIIMS MBBS	For admission to MBBS seats in AIIMS New Delhi and the other six AIIMS like institutions	http://mbbs.aiimsexams.org/
3	JIPMER Entrance	For admission to JIPMER	http://jipmer.edu.in/
4	AIPVT	All India Pre-Veterinary Test (AIPVT) is for admission to five years B.VSc and AH courses	https://aipvt.vci.nic.in/
5	MNS	Military Nursing Service (<i>for female candidates only</i>) for admission to 4 years B.Sc. (Nursing) course commencing at 6 Colleges of Nursing of Armed Forces Medical Services in India	http://joinindianarmy.nic.in
D	Architecture		
1	NATA	National Aptitude Test is for admission to B.Arch. courses in Government and Government-aided and un-aided colleges of Architecture	http://www.nata.in/
E	Defense and Marine		
1	NDA	The UPSC NDA exam is conducted to recruit candidates in the Army, Navy and Air Force	https://www.sarvgyan.com/articles/nda-2019
2	IMU-CET	Indian Maritime University Common Entrance Test for admission in Diploma in Nautical Science (DNS) after class 12th with a science background. The selected candidates are offered a B.Sc. (Nautical Science) degree	http://www.imu.edu.in
3	Indian Navy Sailors Recruitment	<i>Unmarried male candidates</i> qualified 12 th are eligible for enrolment as sailors for Senior Secondary Recruits (SSR)	https://www.joinindiannavy.gov.in

S. No.	Exam	Purpose	Details
F Hotel Management and Catering			
1	NCHMCT JEE	National Council for Hotel Management and Catering Technology conducts entrance for B.Sc. Hospitality and Hotel Administration and other courses of study at 21 central IHM, 14 state government IHM and 15 private IHM affiliated with NCHMCT	http://nchm.nic.in/
G Law			
1	CLAT	Common Law Admission Test (CLAT) is conducted for admission to undergraduate and postgraduate programmes at 14 National Law Universities	http://www.clat.ac.in/
2	LSAT	Law School Admission Test (LSAT) India is conducted for admission to Law programmes in participating colleges like Amity, UPES Dehradun, ITM Gurgaon, Faculty of Law Dehradun, RGSOIPL, for three-year LLB at IIT Kharagpur and others	https://www.lsac.org/jd/lsat/about-the-lsat
3	AILET	All India Law Entrance Test (AILET) is conducted for the selection of candidates seeking admission in B.A., LL.B. (Hons.)	http://nludelhi.ac.in/ailet2018.aspx
H Design			
1	AIEED	All India Entrance Examination for Design (AIEED) is conducted for candidates who wish to take admission in 4 years undergraduate programmes in design	https://www.aieed.com/
2	NIFT Entrance	National Institute of Fashion Technology (NIFT) conducts the entrance test for admission to its bachelor's programs; B.Des. in Fashion Design / Leather Design/ Accessory Design / Textile Design / Knitwear Design / Fashion Communication B.FTech. in Apparel Production	https://applyadmission.net/nift2018/Default.aspx
3	NID DAT	National Institute of Design conducts Design Aptitude Test for admission to its UG programmes at all their centers	http://admissions.nid.edu

S. No.	Exam	Purpose	Details
I Agriculture			
1	ICAR AIEEA-UG	All India Entrance Examination for Admission (AIEEA) to Bachelor's degree programmes in agriculture and allied subjects at Agricultural Universities across India including IARI	https://www.aieea.net/
J Others			
1	CPT for CA	Common Proficiency Test (CPT) is conducted by the Council of the Institute of Chartered Accountants of India (ICAI) which will lead to a person becoming a Chartered Accountant. ICAI will hold three levels of examinations; CPT (Common Proficiency Test), IPCC which is the Intermediate (Integrated Professional Competence) course and the final and three years of practical training under a practicing Chartered Accountant.	https://www.icai.org
2	TISS-BAT	Tata Institute of Social Sciences (TISS) Bachelor's Admission Test for admission in BA in Social Sciences offered in Guwahati, Hyderabad & Tuljapur campuses of TISS	https://admissions.tiss.edu/
3	HSEE	Humanities and Social Sciences Entrance Examination (HSEE) is a national level entrance test conducted every year by Indian Institute of Technology Madras for admission to the master programme (Integrated M.A. in Development Studies & Integrated M.A. in English Studies) offered by the Department of Humanities and Social Sciences (HSS) of the Institute.	http://hsee.iitm.ac.in/

NOTE: For pursuing PG courses and PhD after UG, a different set of entrance examinations are to be qualified which are not included/discussed in this book

Students should visit the weblink of the entrance exam that they wish to qualify and do the following;

- i. Identify the entrance examinations you want to attempt for getting admission into the programme of your choice.
- ii. Prepare a timetable using the below format and stick on the wall:

Name of the exam	Date of Advt.	Last date to apply	Date of exam	Date of announcement of results	Syllabus		Remarks
					Familiar topics	Unfamiliar topics	
1.							
2.							

- iii. Download the syllabus and previous year question papers.
- iv. Collect the study materials according to the syllabus and match them with your school curriculum to identify the familiar and non-familiar subjects. The subjects which are taught in the school are familiar ones, and the rest are non-familiar. Print everything.
- v. Refer to NCERT books for studying more about the familiar subjects (do not depend on the state-level books). The books can be accessed online at <http://ncert.nic.in/textbook/textbook.htm>
- vi. Watch online classes (see, Table 2) for non-familiar subjects (at least twice) to understand the fundamentals. Then, refer textbooks to study further.
- vii. Attempt to answer the previous year question papers and evaluate your scores to see where exactly you are and what has to be done to improve further.
- viii. Have a clear idea about the cut-offs and other screening/shortlisting procedures required in addition to qualifying the entrance exam.
- ix. Go for private coaching to approach and qualify the exams more systematically.

4.5 What Distractions I Would Possibly Encounter?

Journey in any career building is never smooth, and the same applies to academics. Securing the right place in the right institution will never be easy. Many students will find it hard to follow the nine points given in the previous section, amidst their regular academic schedules and, there are no short cuts. Only preparation brings success; *luck* if there exists such a thing, never plays any part. Also, as has been said, success is 99% perspiration and 1% inspiration.

Lack of self-motivation: The student must always imagine himself in the place where he wants to be in the future. Those who aspire to be a scientist should ‘imagine’ how professionally enjoyable the scientific position would be if he/she gets one. This lures the student to motivate themselves further. Having a role model and/or following the guidelines of a motivator brings little success for the candidates without self-motivation. Imagination creates a picture where the candidate wants to be in the future, and it is the hard-work that takes the candidate there. Remember the dictum, *no pain no gain*.

Friends and family: Things will collapse if there is no support from friends and family. They should understand your journey and support. Friends, many times want to spend time together or plan an activity which will suck up all the energy, and at the end of the day, the student would have wasted a day’s time. It is not advised to keep oneself away from all the familial and peer-related activities, but it is recommended to have them minimally, if possible. Also, forcing one’s dream into another is a pressure that almost all the students face. In most cases, students have to live the dream of their parents and to achieve what their parents want to.

Time: All we have is 24 hours a day to do our activities, of which we spend 6-8 h to sleep. The remaining time gets dispersed for several necessary and unnecessary activities, and at the end of the day, we will not have any time to study for a competitive exam. The next section talks about time-management to assist in resolving this issue.

4.6 What is ‘Prime-time’? What to do with That?

‘Biological prime-time’ is the time of the day when one will have the most energy, and therefore, the greatest potential to be productive²⁵. The prime-time varies between each other, and one has to identify their prime-time for performing highest-impact and most meaningful tasks during that time. Students have a rough idea of their prime-time since they allot ‘a particular time’ of the day to study a tough subject. The subject or topic

25 <https://alifeofproductivity.com/calculate-biological-prime-time/>

that a student finds hard to understand in regular hours will easily go into his/her brain when he/she reads it in 'prime-time'. One *must* allot that 'prime-time' to perform the tasks mentioned at the end of Section 4.3 (points v to viii). There are several resources available on the internet on how to identify and use the prime-time efficiently, which the student may read to learn further about this.

Internship Opportunities

'Internship' refers to the period a student spends in academia or industry to gain additional (or practical) knowledge in their field of interest, contribute to improvising the process, test a theory or hypothesis and submit a report on their observations to the home institute. This section provides information about internship opportunities available for the students and their importance.

5.1 Why is Interning Important?

Internship is academic training provided to the students in a different environment (lab or industry) to gain additional as well as practical knowledge in their field. Also, the internship provides the following benefits (Fig. 11).

- i. Working in industry as an 'intern' provides the student with a real-life experience of the professional world. Also, this is the first point in a student's academic life where knowledge gets translated to practice and products.
- ii. The student will get to know about himself and his position in terms of knowledge and talent.
- iii. The student will get chances to develop a professional network. 'Networking' is more important in any field and interning in a reputed company or laboratory will get the student an opportunity to meet the CEOs, high-profile scientists and other eminent academicians, who might help in climbing the academic ladder.
- iv. Interning enhances the CV (see Section 6.1). A strong curriculum vitae is important for getting a stable position and undergoing internship always add credit to the student.

- v. Working in a company as an intern will also provide the HR department of the company an opportunity to review the performance of the student. It will also secure a permanent job for the student.

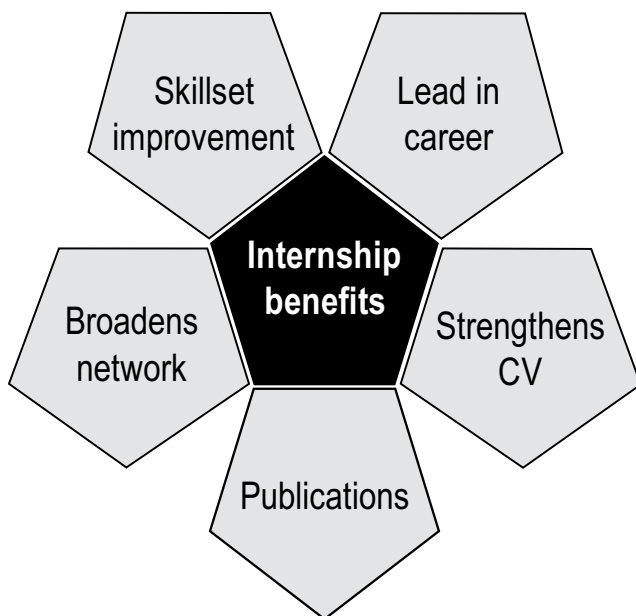


Fig. 11. The major outcomes of pursuing an internship

5.2 Is there Any ‘Internship’ Opportunity Available for School Students?

There are opportunities available for a student to undergo internship at school-level; however, no internship is offered in industries, considering the fact that industrial exposure is not required for school students.

INSPIRE Internship programme²⁶: Under the systematic plan of the programme, the brightest students of 11th grade are chosen and given the opportunity of interacting with researchers, doing practical in labs and

²⁶ <http://www.inspire-dst.gov.in/internship.html>

discussing various issues with learned faculty and scientists. The program not only enriches but also shapes the vision of students.

CCMB Young Innovators programme²⁷: Centre for Cellular and Molecular Biology, Hyderabad, Telangana identifies talented young students of class VIII to X and encourage them to appreciate the significance of science through this program. The students would spend two weeks to carry out experiments on their own and interact with the scientists of CCMB.

Young student scientist programme²⁸: The scheme offered by TNSCST identifies the prospective students and expose them to the science and research through a residential programme conducted in universities/ colleges of Tamil Nadu.

Symbiosis Summer School²⁹: Symbiosis Summer School, run by the Symbiosis International University (SIU), is a multidisciplinary program within a fully-residential school at Lavale, Pune. The summer program offers a learning environment with national and international faculty members within an intercultural community. The school will offer short-term certificate courses in a range of disciplines including filmmaking and photography, creative writing, liberal arts, performing arts like dance, theatre, Indian music, Indian classical dance, art and design and climate change.

Amity University Summer School Programme³⁰: Amity University (Noida, UP) offers two-week summer programs in Science & Technology, Management, Communication, Creative Programmes, Law, Hotel Management, Travel & Tourism, Psychology, and Foreign Languages. Amity offers a great opportunity to explore various subject fields and work towards discovering a career roadmap that suits the interests and personality traits of school students.

27 http://e-portal.cmb.res.in/ccmb_yip/

28 <http://www.tanscst.nic.in/yss.html>

29 <http://www.symbiosissummerschool.in/>

30 <http://www.amity.edu/summerschool/>

5.3 What is Thesis Research?

‘Thesis’ means ‘a long essay or dissertation involving personal research, written by a candidate for a university degree’³¹. Thesis research enables a student to promote an idea from the brain to the bench and practically test his theory (Fig. 12). Students in under- and post-graduation levels have to perform short-term research (from two to twelve months) and submit their observations in the form of a thesis towards partial fulfillment of the requirement of the degree. In the case of PhD, the complete duration of the study will be dedicated to pursue research, which is called ‘dissertation’ research.

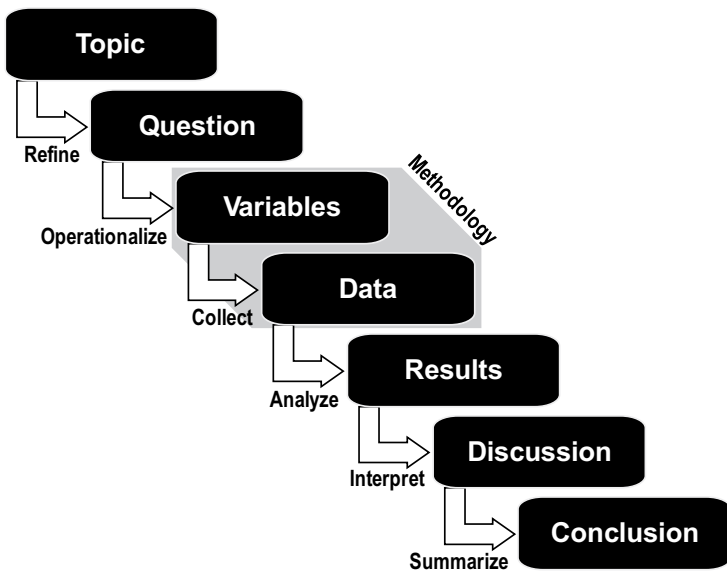


Fig. 12. The approach of conducting thesis research at graduate-level

Typically, a thesis is evaluated by at least two to three experts in the field. A viva-voce examination follows in which the students present their research work and based on the performance in the two, the degree is awarded.

31 <https://www.dictionary.com/browse/thesis?s=t>

Building a CV

This main objective of this section is to provide the students with a brief overview on constructing a strong CV.

6.1 What is a Curriculum Vitae?

Curriculum vitae (abbreviated as CV) is the record of one's education, professional accomplishments, experience and skill sets. A short version of the CV with statements on 'career objective' and 'career summary' is called 'résumé'. Among the two, CV is the most preferred one for applying to any position.

6.2 What are the Parts of a CV?

A typical CV contains the following major sections:

Header: The header will have the name, current designation, full postal address and contact details (phone, mobile and email - one each) of the candidate. In many cases, it also includes a passport size photograph.

Expertise: The skills and/or major scientific interest of the candidate will be enlisted. It should not be an exhaustive list.

Education: The education profile of the candidate will be summarized (preferably, with the recent education at first). The most preferred format is 'year – degree – institute/university – marks (% or CGPA)'

Professional Career: The positions, the candidate held will be listed with the recent one at first. The preferred format is 'Year – Position – Organization – Responsibilities'

Awards and Honors: This section will mention the academic and professional achievements of the candidate (however, it is not encouraged to mention the first prize won during a drawing competition held in your fifth grade!).

Personal profile: This will include the date of birth, marital status, language proficiency, etc. of the candidate.

References: Names, designation and contact details of at least two persons who are well acquainted with the candidate will be given. The employer/recruiter may contact these persons to get a fair judgment on the suitability, proficiency, expertise and competence of the candidate.

6.3 What is Important and What is Not?

A CV should not resemble a biographical note that describes all the details of the candidate. The candidate should be selective about the contents, and the most important thing is to discriminate what is important and what is not. There are a few points to ponder.

- i. Mentioning school education is not important if the candidate is a post-graduate or above.
- ii. Skill set should be realistic, and the candidate should not put false information on his/her CV.
- iii. The dates mentioned under the professional experience should match with the experience certificates/ relieving orders issued by the employer.
- iv. National and international recognition (scholarships, awards, etc.) should be highlighted and the school-level, college-level activities shall not be mentioned.
- v. Membership in professional bodies and scientific societies are an added advantage.
- vi. Do not put physical descriptions (height, weight, complexion, etc.)
- vii. Hobbies – Common list of hobbies or a strange one shall be avoided (however, nobody cares about the hobbies!)
- viii. Do not put private information (religious beliefs, etc.)

- ix. Funny email addresses (like ‘iamgreat@gmail.com,’ ‘don_kumar@hotmail.com,’ ‘cute_girl@crap.com,’ ‘cannabis_sativa@yahoo.com,’ etc.) should not be given a place in the CV.
- x. Confidential details (like Aadhaar number, DL number, etc.) should be avoided.
- xi. Colorful texts and creative fonts are not encouraged.
- xii. Avoid personal pronouns (“I,” “me,” “she,” or “my”). Always use third person mode.
- xiii. Grammatical mistakes will lead to outright rejection of the candidature!
- xiv. Do not mention the URLs or usernames of social media (Twitter handle, Facebook link, etc.)
- xv. Experts advise not to mention the pay scales (salary or stipend).
- xvi. The candidate need not mention why he left the previous employer.
- xvii. Mentioning volunteering activities will add merit.

6.4 What is ‘Plagiarism’?

‘Plagiarism’ [Latin. *Plagiarius* - kidnapper] is an act of stealing someone’s information/ idea/ innovation without giving credit to the originator. The article ‘What is Plagiarism?’³² defines the following as plagiarism (*students should always remember these points*);

- turning in someone else’s work as your own;
- copying words or ideas from someone else without giving due credit;
- failing to put a quotation in quotation marks;
- giving incorrect information about the source of a quotation;
- changing words but copying the sentence structure of a source without giving credit; and/or
- copying several words or ideas from a source that it makes up the majority of your work, whether you give credit or not.

In India, plagiarism is seen as a serious offense, and the University Grants Commission has formulated ‘Promotion of Academic Integrity and

32 <https://www.plagiarism.org/article/what-is-plagiarism>

Prevention of Plagiarism in Higher Educational Institutions' Regulations (2018)³³ that includes the students, faculty, researchers, and staff of all Higher Educational Institutions in the country. Stringent actions and punishments are defined in this regulation for the defaulters involved in the act of plagiarism. A reference is made to a recent publication from INSA, *Ethics in Science Education, Research and Governance*, where all dimensions of ethics are dealt with in detail (Muralidhar *et al.*, Ed 2019).

³³ https://www.ugc.ac.in/pdfnews/7771545_academic-integrity-Regulation2018.pdf

Directory of Autonomous Higher Education Institutes in India

S. No.	Institute Name*	Address	Phone/ Fax / Website
1	Indian Institutes of Science Education and Research, Berhampur	Transit campus (Govt. ITI), Engg School Road, Berhampur, Odisha-760010	Phone: 0680 2227 707 Website: http://www.iiserbpr.ac.in/
2	Indian Institutes of Science Education and Research Bhopal	Bhopal Bypass Road, Bhauri, Bhopal-462066, Madhya Pradesh	Website: https://www.iiserb.ac.in/
3	Indian Institutes of Science Education and Research Kolkata	Mohanpur-741246, West Bengal, India	Phone: 033-6634 0012 Website: http://www.iiserkol.ac.in/
4	Indian Institutes of Science Education and Research Mohali	Knowledge city, Sector 81, SAS Nagar, Manauli PO-140306	Website: http://www.iisermohali.ac.in/
5	Indian Institutes of Science Education and Research Pune	Dr. Homi Bhabha Road, Pashan, Pune-411008	Phone: 020-2590 8000 Website: http://www.iiserpune.ac.in/
6	Indian Institutes of Science Education and Research Thiruvananthapuram	Computer Science Building, College of Engineering Trivandrum Campus, Thiruvananthapuram-695016, Kerala	Phone: 0471 - 2597459/2597438 Website: http://www.iisertvm.ac.in/
7	Indian Institutes of Science Education and Research Tirupati	C/o Sree Rama Engineering College (Transit Campus), Rami Reddy Nagar, Karakambadi Road, Mangalam (P.O.) Tirupati -517507, Andhra Pradesh	Phone: 0877-2500 400 Website: http://www.iisertirupati.ac.in/
8	Indian Institute of Technology Bhubaneswar	Indian Institute of Technology Bhubaneswar (IITBBS), Argul, Jatni, Khurda-752050	Phone: 91-7064419604 Fax: 91-674-2572983 Website: www.iitbbs.ac.in

S. No.	Institute Name*	Address	Phone/ Fax / Website
9	Indian Institute of Technology Bombay	IIT Bombay, Powai, Mumbai –400076, Maharashtra, India	Phone: 91-22-25723645,25767041 Fax: 91-22-25723645, 25764041 Website: www.iitb.ac.in
10	Indian Institute of Technology Mandi	Kamand Campus, VPO Kamand, Distt. Mandi–175005 Himachal Pradesh India	Phone: 91-1905-267015 Fax: 91-1905-267009 Website: www.iitmandi.ac.in
11	Indian Institute of Technology Delhi	Indian Institute of Technology Delhi, Hauz Khas, New Delhi–110016, INDIA	Phone: 91-11-26591706 Website: www.iitd.ac.in
12	Indian Institute of Technology Indore	Indian Institute of Technology Indore Simrol, Khandwa Road–453552, Indore (MP) India	Phone: 0091-732-4306975,0091-732-4306994 Fax: +91-732-4306933 Website: www.iiti.ac.in
13	Indian Institute of Technology Kharagpur	Kharagpur–721302, India	Phone: 91-3222-282050 Fax: 91-3222-278242 Website: www.iitkgp.ac.in
14	Indian Institute of Technology Hyderabad	Kandi–502285, Sagareddy, Medak, Telangana, India	Phone: 91-40-23016102 Fax: 91-40-23016032 Website: www.iith.ac.in
15	Indian Institute of Technology Jodhpur	Nagaur Road, NH65, Karwad–342037, Jodhpur District, Rajasthan	Phone: 291-2801457,291-2801132,291-2801133 Fax: 0291-2516823 Website: www.iitj.ac.in
16	Indian Institute of Technology Kanpur	JEE Office, DOAA Building, IIT Kanpur, Kalyanpur, Kanpur, Uttar Pradesh–208016, India	Phone: 0512-2597325 Fax: 0512-2590103 Website: www.iitk.ac.in
17	Indian Institute of Technology Madras	IIT Madras P.O., Chennai–600036, INDIA	Phone: 91-44-22578035 Fax: 91-44-22578042 Website: www.iitm.ac.in
18	Indian Institute of Technology Gandhinagar	Palaj, Gandhinagar–382355, India	Phone: 07923952053 Website: www.iitgn.ac.in
19	Indian Institute of Technology Patna	Indian Institute of Technology Patna, Bihta, Patna–801103 (Bihar)	Phone: 91-612-3028103 Fax: 91-612-3028123 Website: www.iitp.ac.in

S. No.	Institute Name*	Address	Phone/ Fax / Website
20	Indian Institute of Technology Roorkee	Roorkee–247667, Uttarakhand, India	Phone: 91-1332-285200 Fax: 91-1332-284016 Website: www.iitr.ac.in
21	Indian Institute of Technology (ISM) Dhanbad	Indian Institute of Technology (Indian School of Mines), Dhanbad–826004, Jharkhand, India	Phone: 91-326-2235292 Fax: 91-326-2296612 Website: www.iitism.ac.in
22	Indian Institute of Technology Ropar	Nangal Road, Rupnagar, Punjab–140001	Phone: 91-1881-242186 Fax: 91-1881-223393 Website: www.iitrpr.ac.in
23	Indian Institute of Technology (BHU) Varanasi	Uttar Pradesh–221005	Phone: 91-7081144222 Fax: 91-542-2368428 Website: www.iitbhu.ac.in
24	Indian Institute of Technology Guwahati	Guwahati–781039, Assam, India	Phone: 91-361-2582193 Fax: 91-361-2582090 Website: www.iitg.ac.in
25	Indian Institute of Technology Bhilai	IIT Bhilai, Government Engineering College Campus, Old Dhamtari Road, Sejbahar, Raipur–492015, Chhattisgarh	Phone: 0771-2973622 Fax: 0771-2973601 Website: https://www.iitbhilai.ac.in
26	Indian Institute of Technology Goa	IIT Goa, Goa Engineering College Campus, Farmagudi, Ponda–403401, Goa, India	Phone: 08322490871 Fax: (0832) 2490 861 Website: www.iitgoa.ac.in
27	Indian Institute of Technology Palakkad	Ahalia Integrated Campus, Kozhipara, Palakkad 678557, Kerala	Phone: 04923226300 Website: iitpkd.ac.in
28	Indian Institute of Technology Tirupati	Chadalawada Nagar, Renigunta Road, Tirupati –517506, Chittoor (Dist) Andhra Pradesh	Phone: 91-877-2500303 Fax: 91-877-2500370 Website: www.iittp.ac.in
29	Indian Institute of Technology Jammu	Indian Institute of Technology Jammu, Jagti, PO Nagrota, NH-44 Jammu –181 221 J&K, India	Phone: 0-8082828215 Fax: 011-26582153 Website: http://iitjammu.ac.in/
30	Indian Institute of Technology Dharwad	IIT Dharwad, Near High Court, PB Road Post Dharwad–580001 Karnataka, India	Phone: 08362212822 Website: www.iitdh.ac.in

S. No.	Institute Name*	Address	Phone/ Fax / Website
31	Dr. B R Ambedkar National Institute of Technology, Jalandhar	N.I.T. Post Office, Jalandhar –144 011, India	Phone: 91-181-2690301 Fax: 91-181-2690320 Website: www.nitj.ac.in
32	Malaviya National Institute of Technology Jaipur	Jawaharlal Nehru Marg, Malviya Nagar, Jaipur–302017, Rajasthan	Phone: 91-141-27135031 Fax: 91-141-2529029 Website: www.mnit.ac.in
33	Maulana Azad National Institute of Technology Bhopal	Near Mata Mandir Bhopal–462003 (M.P.) India	Phone: 0755-4051210 Fax: 91-755 2670562 Website: www.manit.ac.in
34	Motilal Nehru National Institute of Technology Allahabad	Allahabad–211004, India	Phone: 91-0532-2271044, 2271047 Website: www.mnnit.ac.in
35	National Institute of Technology, Agartala	P.O.: National Institute of Technology, Agartala Barjala, Jirania–799046, Tripura (W)	Phone: 91-381-2348510 Fax: 91-381-2548512, 03812546360 Website: www.nita.ac.in
36	National Institute of Technology, Calicut	NIT Campus (P.O), CALICUT–673601, Kerala	Phone: 0495-2286110 Fax: 0495-2287250 Website: http://www.nitc.ac.in
37	National Institute of Technology, Delhi	A-7, Institutional Area, Near Satyawadi Raja Harish Chandra Hospital, Narela, New Delhi, Delhi–110040	Phone: 91-11-33861053 Fax: 91-11-27787503 Website: www.nitdelhi.ac.in
38	National Institute of Technology, Durgapur	Mahatma Gandhi Avenue, Durgapur–713209, West Bengal, India	Phone: 91-343-2754680 Fax: 91-343-2547375 Website: www.nitdgp.ac.in
39	National Institute of Technology, Goa	Farmagudi, Ponda, Goa–403401	Phone: 91-832-2404220 Fax: 91-832-2404202 Website: www.nitgoa.ac.in
40	National Institute of Technology, Hamirpur	Hamirpur–177005, Himachal Pradesh, India	Phone: 91-1972-254544 Website: www.nith.ac.in
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42	National Institute of Technology, Meghalaya	Bijni Complex, Laitumkhrach, Shillong–793003, Meghalaya, India	Phone: 91-364-2501294 Fax: 91-364-2501113 Website: www.nitmeghalaya.in

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44	National Institute of Technology, Patna	Ashok Rajpath, Patna–800005 (NIT Patna)	Phone: 91-612-2370419 Fax: 91-612-2670631 Website: www.nitp.ac.in
45	National Institute of Technology, Puducherry	National Institute of Technology Puducherry Thiruvettakudy, Karaikal, Puducherry–609609	Phone: 91-4368-265235-212 Fax: 91-4368-265230 Website: www.nitpy.ac.in
46	National Institute of Technology, Raipur	G.E. Road, Raipur–492010, Chhatisgarh, India	Phone: 91-9039006446 Fax: 91-771-2254600 Website: www.nitr.ac.in
47	National Institute of Technology, Sikkim	Barfung Block, Ravangla Sub-Division South, Sikkim –737139	Phone: 91-3595-260042 Fax: 91-3595-260018 Website: www.nitsikkim.ac.in
48	National Institute of Technology, Arunachal Pradesh	Yupia, District: Papum Pare–791112, Arunachal Pradesh	Phone: 91-360-2284801 Fax: 91-360- 2284972 Website: www.nitap.in
49	National Institute of Technology, Jamshedpur	NIT Campus, P.O. RIT Jamshedpur–831014, Jharkhand, India	Phone: 91-657-2407614 Fax: 91-657-2382246 Website: www.nitjsr.ac.in
50	National Institute of Technology, Kurukshetra	National Institute of Technology, Kurukshetra–136119, Haryana (India)	Phone: 91-1744-233223 Fax: 01744 238050 Website: www.nitkkr.ac.in
51	National Institute of Technology, Manipur	Langol, Imphal–795004, Manipur (India)	Phone: 91-385-2058566 Fax: 91-385-2445812 Website: www.nitmanipur.ac.in
52	National Institute of Technology, Mizoram	Chaltlang, Aizawl–796012, Mizoram, India	Phone: 91-389-2391236 Fax: 91-389-2391774 Website: www.nitmz.ac.in
53	National Institute of Technology, Rourkela	National Institute of Technology Rourkela–769008	Phone: 91-661-2462502 Fax: 91-661-2462038, Website: www.nitrkl.ac.in
54	National Institute of Technology, Silchar	REC Sub Post Office NIT, –788010, Silchar, Assam	Phone: 91-3842-242025 Fax: 91-3842- 224797 Website: www.nits.ac.in

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55	National Institute of Technology, Srinagar	Hazratbal Rd, Hazratbal, Srinagar–190006, Jammu and Kashmir, India	Phone: 91-194-2422032 Fax: 91-194-2420475 Website: www.nitsri.ac.in
56	National Institute of Technology, Tiruchirappalli	Tanjore Main Road, National Highway 67, Tiruchirappalli–620015, Tamil Nadu, India.	Phone: 91-431-2503931 Fax: 91-431-2503930 Website: www.nitt.edu
57	National Institute of Technology, Uttarakhand	Temporary Campus, Srinagar (Garwhal)–246174	Phone: 91-1346-257411 Fax: 91-1346- 251095 Website: www.nituk.ac.in
58	National Institute of Technology, Warangal	National Institute of Technology Warangal–506004 Telangana	Phone: 91-870-2462029 Fax: 91-870-2459547 Website: www.nitw.ac.in
59	Sardar Vallabhbhai National Institute of Technology, Surat	Ichchhanath, Surat-395007, Gujarat	Phone: 91-0261-2201843 Website: www.svnit.ac.in
60	Visvesvaraya National Institute of Technology, Nagpur	South Ambazari Road, Nagpur–440010, Maharashtra	Phone: 91-712-2801301 Website: www.vnit.ac.in
61	National Institute of Technology, Andhra Pradesh	Sri Vasavi Engineering College Campus, Pedatadepalli, Tadepalligudem–534102	Phone: 08818-284700 Fax: 08818-284705 Website: www.nitandhra.ac.in
62	Indian Institute of Information Technology (IIIT), Kota, Rajasthan	2nd Floor, Prabha Bhawan, MNIT Jaipur Campus, JLN Marg, Jaipur–302017	Phone: 0141-2715071,0141-2715075 Fax: 0141-2529154 Website: http://www.iiitkota.ac.in
63	Indian Institute of Information Technology (IIIT), Guwahati	Ambari, Gopinath Bordoloi (G.N.B.) Road, Guwahati–781001, India	Phone: 91-361-2132460,2630015 Website: www.iiitg.ac.in/
64	Indian Institute of Information Technology (IIIT) Kalyani, West Bengal	WEBEL IT Park Campus, Near Budha Park, P.O. Kalyani, Dist. Nadia–741235, West Bengal	Phone: 9831264161 Website: www.iiitkalyani.ac.in
65	Indian Institute of Information Technology (IIIT) Kilohrad, Sonapat, Haryana	Village- Kilrod, Haryana (India), NIT Kurukshetra–136119	Phone: 01744-233223 Fax: 01744-238050 Website: www.nitkr.ac.in

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66	Indian Institute of Information Technology (IIIT) Una, Himachal Pradesh	Camp office at National Institute of Technology Hamirpur-177005, Himachal Pradesh, India	Phone: 91-1972-254544 Fax: 01972-223834, 01972-222584 Website: www.iiit.ac.in
67	Indian Institute of Information Technology (IIIT), Sri City, Chittoor	630 Gnan Marg, Sri City, Satyavedu Mandal, Chittoor-517646, Andhra Pradesh, India	Phone: 91-7032851919,91-95503-80002,91955028002 Website: www.iiits.ac.in
68	Indian Institute of Information Technology (IIIT), Vadodara, Gujrat	C/o Block No.9, Government Engineering College, Sector-28, Gandhinagar-382028, Gujarat	Phone: 079-23977545 Website: www.iiitvadodara.ac.in
69	Indian Institute of Information Technology(IIIT), Allahabad	Devghat, Jhalwa, Allahabad-211015, Uttar Pradesh	Phone: 91-532-2922236 Fax: 91-532-2922125 Website: www.iiita.ac.in
70	Indian Institute of Information Technology, Design & Manufacturing, Kancheepuram	IIITDM Kancheepuram, Vandalur-Kelambakkam Road, Chennai-600127	Phone: 91-44-27476354 Website: www.iiitdm.ac.in
71	Pt. Dwarka Prasad Mishra Indian Institute of Information Technology, Design & Manufacture Jabalpur	Dumna Airport Road, P.O.: Khamaria, Jabalpur-482005, Madhya Pradesh, India	Phone: 91-761-2632273 Fax: 91-761-2632524 Website: www.iiitdmj.ac.in
72	Indian Institute of Information Technology Manipur	Indian Institute of Information Technology Manipur Mantripukhri, Imphal-795002	Website: www.iiitmanipur.ac.in
73	Indian Institute of Information Technology (IIIT) Srirangam, Tiruchirappalli	IIIT (Srirangam) Tiruchirappalli, NIT Campus, Tiruchirappalli-620015, Tamil Nadu	Fax: 04312500133 Website: www.iiitt.ac.in
74	Indian Institute of Information Technology (IIIT) Lucknow	Indian Institute of Information Technology, Allahabad Devghat, Jhalwa, Allahabad-211015	Phone: 0532-2922539 Website: https://iiitl.ac.in/
75	Indian Institute of Information Technology (IIIT) Dharwad	Registrar, IIIT-Dharwad, 3rd floor, IT Park, opp Glasshouse, Hubballi-580029	Phone: 0836-2250879 Website: www.iiitdwd.ac.in

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76	Indian Institute of Information Technology Design & Manufacturing Kurnool, Andhra Pradesh	Indian Institute of Information Technology Design and Manufacturing Near Dinnidevarapadu Village, Jaganathagattu Kurnool-518002, Andhra Pradesh	Website: www.iiitdmkl.ac.in
77	Indian Institute of Information Technology (IIIT) Kottayam	IIIT Kottayam, C/o IISER TVM Academic Complex, 4th Floor, GIFT Campus, Chavadimukku, Sreekariam (PO) Thiruvananthapuram-695017. Kerala, India	Phone: 04712599144 Fax: 0471 2778044 Website: http://www.iiitkottayam.ac.in/
78	Indian Institute of Information Technology (IIIT) Ranchi	IIIT-Ranchi, NIT Jamshedpur Campus, Jamshedpur-831014, Jharkhand, India	Phone: 91-657-2374248 Fax: 91-657-2374245 Website: http://www.iiitranchi.ac.in
79	Indian Institute of Information Technology (IIIT) Nagpur	Camp Office: VNIT Nagpur, 1st Floor, Old Library Building, Stores Section, South Ambazari Road, Nagpur-440010 (Maharashtra)	Phone: 0712-2801365 Fax: 0712-2223965 Website: www.iiitn.ac.in
80	Indian Institute of Information Technology (IIIT) Pune	'C' Building C/O Sidhant Campus, Talegaon Chakan Road, A/P Sadumbre, Tal. Maval, Dist Pune-412109	Phone: 02025507000 Fax: 02025507224 Website: www.iiitp.ac.in
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82	Indian Institute of Information Technology Bhopal	Maulana Azad National Institute of Technology (MANIT) Link Road Number 3, Near Kali Mata Mandir, Bhopal-462003, Madhya Pradesh	Phone: 91-755-4051000,4052000 Fax: +91-755 2670562 Website: www.manit.ac.in
83	Indian Institute of Information Technology Surat	SVNIT Campus, Ichchhanath, Surat	Phone: 02612201845 Fax: 02612227334 Website: http://www.svnit.ac.in/iiitsurat/

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85	Birla Institute of Technology, Mesra, Ranchi	Birla Institute of Technology Mesra, Ranchi-835215 (Jharkhand)	Phone: 91-651-2275868 Fax: 91-651-2276007 Website: www.bitmesra.ac.in
86	Indian Institute of Carpet Technology, Bhadohi	Ministry of Textiles, Govt. of India, Chauri Road, Bhadohi -221401 (UP)	Phone: 91-5414-225504 Fax: 225509 Website: www.iict.ac.in
87	Institute of Infrastructure, Technology, Research and Management-Ahmedabad	Near Khokhara Circle, Maninagar (East), Ahmedabad-380026	Phone: 91-79-29292910 Fax: 91-79-67775475 Website: www.iitram.ac.in
88	Institute of Technology, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur	Bilaspur-495009, Chhattisgarh	Phone: 91-7752-260453 Fax: 91-7752-260007 Website: www.ggu.ac.in
89	J.K. Institute of Applied Physics & Technology, Department of Electronics & Communication, University of Allahabad- Allahabad	J.K. Institute of Applied Physics & Technology, Science Faculty, University of Allahabad, Allahabad -211002, Uttar Pradesh, India	Phone: 91-532-2460068 Website: www.jkinstitutetpc.in
90	National Institute of Electronics and Information Technology, Aurangabad (Maharashtra)	Dr. B.A.M. University Campus, Aurangabad, Maharashtra	Phone: 91-240-2982021 Fax: 91-240-2982050 Website: nielit.gov.in/aurangabad
91	National Institute of Foundry & Forge Technology, Hatia, Ranchi	Hatia, Ranchi-834003, Jharkhand INDIA.	Phone: 0651-2292089 Website: www.nifft.ac.in
92	Mizoram University, Aizawl	Mizoram University, Tanhril, Aizawl-796004, Mizoram, P.O Box No. 190	Phone: 91-0389-2330654 Fax: 91-389-2330834 Website: www.mzu.edu.in
93	School of Engineering, Tezpur University, Napaam, Tezpur	School of Engineering Tezpur University Napaam, Tezpur-784028, Assam	Fax: 03712-267005 Website: www.tezu.ernet.in
94	School of Planning & Architecture, Bhopal	Neelbad Road, Bhopal Indore Bypass Road Bhauri, Bhopal-462030	Phone: 91-0755-2526822 Website: www.spabhopal.ac.in

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95	School of Planning & Architecture, New Delhi	4, Block-B, Indraprastha Estate, Near AGCR, New Delhi, Delhi-110002	Phone: 91-11-23722382 Fax: 91-11-23702383 Website: www.spa.ac.in
96	School of Planning & Architecture: Vijayawada	Beside ITI College, Near Ramesh Hospital, 5th Root, NH-5, Vijayawada-520010	Phone: 91-866-2469442 Fax: 91-866-2469451 Website: www.spav.ac.in
97	Indian Institute of Engineering Science and Technology, Shibpur	Indian Institute of Engineering Science and Technology, Shibpur P.O. Botanic Garden, Howrah-711103, India	Phone: 03326684561 Fax: 03326687575 Website: www.iiests.ac.in
98	International Institute of Information Technology, Naya Raipur	IIIT Naya Raipur, Plot No. 7, Sector 24, Naya Raipur-493661, Chhattisgarh	Phone: 91-771-2474026, 91-771-2474040 Website: www.iiitr.ac.in
99	International Institute of Information Technology, Bhubaneswar	Gothapatna, PO: Malipada Bhubaneswar-751003. India	Phone: 06743060561 Fax: 06743060509 Website: www.iiit-bh.ac.in
100	University of Hyderabad	P.O, Prof C R Rao Road, Gachibowli, Hyderabad-500046	Phone: 04023132101 Website: www.uohyd.ac.in
101	Jawaharlal Nehru University, Delhi	New Mehrauli Road, New Delhi-110067	Phone: 26738734 Website: https://www.jnu.ac.in

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