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Science and Engineering

SRI LANKA SCIENCE and ENGINEERING FAIR (SLSEF)

Ministry of Education	Institute of Engineers	National Science Foundation	Intel ®

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1.0 Introduction

1.1 What is SLSEF?

National Science Foundation (NSF) in collaboration with the Institution of Engineers, Sri Lanka and Intel® will be organizing the Sri Lanka Science and Engineering Fair (SLSEF) with the objective of enhancing the innovative thinking amongst school children and youth in the country. SLSEF is a platform for science students to discover their scientific genius and win public recognition at national and international level. National level winners of SLSEF will be eligible to represent Sri Lanka at International competitions such as Intel International Science and Engineering Fair (Intel ISEF) and International Exhibition for Young Innovators (IEYI).

1.2 Partners (NSF/IESL/Intel Sri Lanka)

National Science Foundation, Sri Lanka (NSF)

NSF is a government organization established under the Science and Technology Development Act No.11 of 1994. NSF is mandated to popularize science amongst the people.

Science Popularization Division of the NSF (SPD) conducts various activities to popularize science and inculcate scientific thinking amongst the school children and the general public under the theme "Science for all". The main goal of the division is to produce a scientifically and technologically literate society that can appreciate the value of scientific methods. (NSF official web site: www.nsf.ac.lk)

Institution of Engineers Sri Lanka (IESL)

The Institution of Engineers, Sri Lanka, (IESL), is the premier professional body for engineers in Sri Lanka. It has a history spanning a period of more than 100 years. Its membership which has grown over the years presently stands at around 10,000 covering almost all disciplines of engineering.

The 'Junior Inventor of the Year Competition' is a very famous competition among the young inventors which is organized annually by the IESL to promote creative and innovative thinking amongst school children. (IESL official web site: www.iesl.lk)

Intel®

Intel®, the world leader in silicon innovation, develops technologies, products and initiatives to continuously advance how people work and live. Intel® has invested more than $1 billion in its education programs, and continues to expand programs in areas of science and math education. (For more information visit www.intel.com/education.).

1.3 Objectives

- To buildup scientific temperament and a culture of innovation amongst the youth of the country, as well as to help popularize science and technology in the schools and amongst students. This would lead to development of the country as a knowledge economy.

- To capture innovative ideas from young inventors for the benefit of the industry and society.

- To promote and nurture innovations and inventions.

1.4 Intel International Science and Engineering Fair (Intel ISEF), USA

Intel ISEF is the world's largest pre-collegiate celebration of Science, held annually in May, Intel ISEF brings together more than 1,200 students from over 40 nations to compete for over 900 prizes. There is US$ 2 million to be won including scholarships, tuition grants, internships, scientific field trips and the grand prize: a trip to attend the Nobel Prize Ceremony in Stockholm, Sweden. Science Service founded the ISEF in 1950 and Intel is the title sponsor of this prestigious international competition.

1.5 International Exhibition for Young Inventors (IEYI)

International Exhibition for Young Inventors (IEYI) IEYI is organized by the International Forum for Invention Promotion (IFIP) with 38 member countries, worldwide. A total of more than 100 inventions from 16 countries are exhibited by almost 120 inventors at the International Exhibition for Young Inventors (IEYI). In 2004 Japan Institute of Invention and Innovation (JIII) initiated this program with the objective of encouragement of inventiveness. Young innovators from 33 countries participated in this Mega Fair. In 2005, MINDS, Malaysia hosted IEYI. With the consent of IFIP member countries, India has got an opportunity to host this prestigious Fair in 2006.

2.0 Participation Details

2.1 Categories

Category 1: 13 – 16 years
Category II: 17- 20 years
Category III: 21-35 years

Category I and II are eligible for participation in International Fairs, Intel, ISEF, IEYI. The selected projects in Category III would be provided help for development. If the projects have commercial applications, then needful support would be given for promotion amongst industry.

Age of participant will be as years completed on December 31, 20XX. If you have an idea that is original and innovative, you are eligible to participate, individually or in a team of 3.

2.2 Subjects/Fields

Subject Categories for participation at SLSEF are as follows:

1. Agriculture
2. Botany

3. Computer Science
4. Chemistry
5. Environmental Science
6. Earth Science / Space Science
7. Mathematics
8. Physics
9. Zoology

3.0 Participation Process

3.1 Introductory Programmes

Introductory workshops will be conducted at provincial level to make the school children aware on the SLSEF. Workshops will also include presentations on Creative Thinking, Project ideas on Engineering and Science, and writing up the Project Proposals.

3.2 Entry level

Students (category I & II) can apply by sending a project proposal to the NSF prepared according to the guidelines provided. Application forms and guidelines on preparation of the project proposal can be obtained from the NSF/ IESL or can be downloaded from the NSF official website.

Category III can directly apply from Synopsis Level (section 3.3).

3.3 Selection Level

Based on the evaluation of the project proposals suitable projects will be selected for further improvements. Guidance (from the local scientists attached to universities and research institutes) and necessary resources will be provided to the selected applicants to conduct the project.

3.4 Synopsis level

On completion of the project applicants are requested to submit a project synopsis.

Following forms should be submitted along with the Project Synopsis.

1. Students' Participation Form
2. Screening Report
3. No Objection Certificate (from School/ College Principal) and from other team Members (in case of Team Project)
4. Guides evaluation form

(The forms are in the Handbook / can be downloaded from the website).

A special committee reviews all the synopses received and select the most promising ones.

3.5 National level

Short listed applicants are invited to participate at the National level competitions. The winners of the national level will be eligible for the following.

Category I to II

- A Certificate and Award of Recognition
- A Cash Award
- An opportunity to improve your project at the SLSEF Coaching Camp
- An opportunity to participate at the International Fair

Category III

- A Certificate and Award of Recognition
- A Cash Award

The selected projects in Category III would be provided help for development. If the projects have commercial applications, then needful support would be given for promotion amongst industry.

3.6 Coaching Camps

Those who are eligible to participate at the International Fairs (Intel IESF, IEYI) undergo coaching sessions with the scientists to gear up for their participation at the International level.

4.0 Steps to a Prize winning Research Based Project

SLSEF is a stepping-stone to the Intel ISEF and IEYI. The judges therefore, select projects that are of a certain standard, and have global benchmarks. Your project should reflect that quality and be innovative, original and follow scientific methodology. Take the help of a guide, she/he could be a research scientist or a teacher. If you have decided to participate in SLSEF, choose your topic and start early. This will enable you to organize your project in the correct format, with sufficient data and results of the experiment. Read the following activities mentioned below to carry out your research based project.

1. Select your topic

The first step, selecting a project idea, is the most important. This is the first question or dilemma a student faces when starting a science fair project, because it can make the difference between a good and an excellent project. Keep two important things in mind while selecting your topic:

- First, choose a topic that interests you - you'll have lot more fun (and probably learn more)
- Second, while you're choosing a topic, check all the resources around you. This will help you in doing your project with ease.

For eg. - If you are doing a project on Neem leaves, ensure that you have the Neem tree in the surrounding region where you live.

2. Sourcing information on your project

After selecting your project topic, learn everything about it. Books on your topic are likely to be found in your local library or bookstore. You can use the many search engines available to find information or the links to various science related sites on the Internet. The more exhaustive your background literature search, the better you will be able to proceed with your project.

3. Make a plan

Make a plan as to how you will conduct your experiment. Your plan should include the following:

- The purpose of your experiment
- The variable or the things that you are going to change during the experiment
- Also note the parameters which remain constant during the experiment
- Your hypothesis or what you think the outcome of the project will be
- A detailed procedure outlining how you will conduct the experiment. Include the type of experiment to be conducted. Make a timetable and allot sufficient time to all stages of your work. Stick to the timetable as far as possible so that you finish your project on time.

4. Make a hypothesis

When you think you know what variables may be involved, think about ways to change one at a time. If you change more than one at a time, you will not know what variable is causing your observation. Sometimes variables are linked and work together to cause something. At first, try to choose variables that you think act independently of each other. At this point, you are ready to translate your questions into hypothesis. A hypothesis is a question, which has been reworded into a form that can be tested by an experiment. There is usually one hypothesis for each question you have. You must do at least one experiment to test each hypothesis. This is a very important step. If possible, ask a scientist to go over your hypothesis with you.

5. Design experiments to test your hypothesis

Design an experiment to test each hypothesis. Make a step-by-step list of what you will do to answer each question. This list is called an experimental procedure. For an experiment to give answers you can believe, it must have a "control". A control is a neutral "reference point" for comparison that allows you to see what changing a variable does by comparing it to not changing anything. It is difficult to develop effective controls. Without a control you cannot be sure that changing the variable causes your observations. A series of experiments that include a control is called a "controlled experiment". Experiments are usually repeated to guarantee that what you observe is reproducible. It is also repeated to obtain an average result. Reproducibility is a crucial requirement. Without it you cannot trust your results. Think of possible errors and record them or correct them if possible. Your results should be predictable, i.e. the same results should be obtained when the experiment is repeated. It is useful to choose a statistical test that will validate your results. This will also ensure that your results are not due to mere chance but are scientific in nature.

6. Do the experiments and record data

During each experimental 'run', you measure how much the variable affects the system under study. Each change of variable produces a different response in the system. You measure this response or record data in a table for this purpose. This is considered "raw data" since it has not been processed or interpreted yet. When raw data gets processed mathematically, for example, it becomes results.

7. Record your observations

Observations can be written descriptions of what you noticed during an experiment or problems encountered. Keep careful notes of everything you do and everything that happens. Observations are valuable when drawing conclusions and useful for locating experimental errors. But maintain a record of experimental details and data-log book. Do not rely on your memory.

8. Consult your guide

Discussions with your guide should be an ongoing activity. Your guide is very important in guiding you through your project till the end. He/ she will be able to give you all the required inputs to develop a research-based project. The guidance will ensure that you are working in the right direction and the methodology being used by you is correct.

9. Do your calculations

Use your raw data to calculate and arrive at conclusions. For example, you weigh a container. This weight is recorded in your raw data table as 'wt. of container'. You then add some soil to the container and weigh it again. This would be entered as 'wt. of container + soil'. In the calculation section, do the calculations to find out how much soil was used in this experimental run: (wt. of container + soil) - (wt. of container) = wt. of soil used. Each calculated answer is entered into a table in a 'Results' section using proper units.

10. Summarize results

Summarize what happened. This can be in the form of a table of processed numerical data or graphs. It could also be a written statement of what occurred during experiments. Studying tables and graphs, we can see trends that tell us how different variables cause our observations. Based on these trends, we can draw conclusions about the system under study. These conclusions help us confirm or deny our original hypothesis. Often, mathematical equations can be made from graphs. These equations allow us to predict how a change will affect the system without the need to do additional experiments. Apply appropriate statistics to analyze your data so that valid conclusions can be drawn.

11. Make your conclusions

Using the trends in your experimental data and your experimental observations, try to answer your original questions. Is your hypothesis correct? Now is the time to put together what happened and assess the experiments you did. It is possible that your observations lead you to conclude something different from your starting hypothesis. Do not alter results to fit a theory. If your results do not support your hypothesis, it doesn't matter. You still have done successful scientific research. The spirit of scientific inquiry requires an open mind.

12. Cost feasibility

If your project involves making a 'device' then put down the estimated cost of all the components required for that device. You must do a cost comparison with the existing products, if applicable. You should also state the source from which these components can be obtained.

Format of the Project Proposal

Section 1

Project Title : Should be brief but sufficiently indicative of nature of the project

Section 2

Research Field : Select the field of study from the following subject area , to which the proposed research must closely relates

1. Agriculture
2. Botany
3. Computer Science
4. Chemistry
5. Environmental Science
6. Earth Science / Space Science
7. Mathematics
8. Physics
9. Zoology

Section 3

Background and Justification
This section should highlight the scientific problem you seek to solve.
Must provide a literature survey that analyze the key issues related to the proposed research

Section 4

Objectives
Should be specific and directly related to the activities proposed.

Section 5

Research Plan

- Hypothesis to be tested
- Methodologies to be used
- Activities to be carried out
- Expected problems

Section 6

Time frame (Should be able to complete within 6 months)

Section 7

Facilities, Equipments and Other resources needed

Section 8

Summery of the budget (If required)