"Obviously, because of my disability, I need help. But I've always tried to overcome the limitations of my condition and lead as full a life as possible. I have traveled the world, from Antarctica to zero gravity. Overcome your limits!"

- Stephen Hawking

"High-Tech Walking!
Smart Vision for the Blind!"

"DESIGN AND CONSTRUCTION OF A DETECTOR OF OBSTACLES FOR BLIND PEOPLE"
BACKGROUND

In our country, only a few people with disabilities can get access to paid employment. The number of unemployed people with disabilities is very high, up to 80%, and so underemployed people or those who do not even access to the labor market in some cases have to resort to begging or rely on charity or on family and social assistance. (http://discapar.blogspot.com)

The lack of opportunities and the existence of negative attitudes are certainly the main causes of low participation of people with disabilities in the workforce and in the opportunities for education and training.

Through a study done this year by the Japanese Cooperation Agency JICA, it is estimated that 20% of the Paraguayan population has some kind of disability and in some regions of the country where the study was applied, only 2.5 of the population is receiving health care and other services. (http://www.teleton.org.py/web/interna.php?id=5)

In October 2014, and in compliance with the constitutional principle of equality of persons and the prohibition of discrimination, the President of our country appointed Sanchez Leguizamón, as the first blind ambassador of our country to the Government of the Dominican Republic. (http://www.paraguay.com/nacionales/primer-embajador-no-vidente-del-paraguay-117872).

The vice president of the Association of the Blind in Paraguay, Nelson Segovia, states that many barriers to people with visual disabilities still exist in our country to be able to work and to be included as part of our Paraguayan society. (http://www.vanguardia.com.py/v1/index.php/edicionimpresa/locales/item/20119-presentan-proyecto-de-inclusi%C3%B3n-social-para-personas-no-videntes#sthash.QNvxeIeSQ.dpuf).
STATEMENT OF THE PROBLEM

People with visual disabilities or who are blind have extreme difficulty to safely enjoy outdoor areas in a familiar environment, such as their home or backyard or other spaces they know which are safe. The biggest problem for them is moving from one place to another, and many blind people depend on outside help to do it, whether it is a dog trained for it or a cane. Many public spaces in our city do not have any kind of help to provide blind people with support when scrolling. There are common market canes (tools that help them move). The rods, sticks or other objects with sensors can be a tool that allows them to determine how far away the obstacles are and to be able to avoid an incident or accident and thus facilitate their movement in the environment.

JUSTIFICATION: The purpose of this device is to facilitate the movement of the blind, because currently in our market there isn’t a cane with an ultrasound sensor to detect obstacles and to facilitate the mobility of blind people.

OBJECTIVES

GENERAL: To design a cane or another object with a device to detect obstacles to the mobility of blind people.

SPECIFICS

a. Research visual impairment and blindness, tools needed by blind people as they move, sensors, types of sensors, ultrasonic sensors, LED, touch sensors, proximity sensors (position switches, capacitive sensors, inductive, photoelectric or infrared), microprocessors, robotics.
b. Participate in a workshop on Robotics with a specialist who will explain the operational process of sensors and microprocessors.
c. Design a stick or other objects that will incorporate the communication system to alert the blind user of the proximity of a particular obstacle.
d. Prepare the device that integrates the sensor to the microprocessor chosen and to adapt the device to the selected object.
e. Check the operational process through a screening of obstacles with different sounds.
f. Visit Santa Lucia’s Blind Association of Paraguay for demonstrations with the objects designed to blind people and then donate them to the Association.

PROBLEM

Can a stick or another object with an ultrasonic sensor device detect obstacles in the movement of blind people?
HYPOTHESIS

A stick or another object with an ultrasonic sensor device can detect obstacles in the movement of blind people.

VARIABLES

DEPENDENT

Obstacle detection in the displacement of the blind.

INDEPENDENT

Nano Microprocessor Arduino, ultrasonic sensor, battery case, Batteries, Cables, buzzer to communicate the distance according to sound frequency, cane, glasses, hats or visors or other objects that will adapt and incorporate the device.

INTERVENING

Device Design that integrates the sensor to the microprocessor, Design and Adaptation of the device to the Selected Object, Robotics and Technical Procedures for Development and testing of the detector device.

Guidelines and Criteria. 9th Grade A, B & C

EVALUATION

Total points of the project: 85 points, distributed in two semesters or periods as follows:

FIRST SEMESTER. STAGE 1: 20 P. GATHERING INFORMATION

1st FORMATIVE TUTORIAL: (9 p)

EVALUATION GROUP (5 p)

- Selects the most relevant, current and local information on the assigned topic and presents in the Evidence folder (2p)
- Presents clear and personal work: introduction, rationale, objectives: general and specific, problem definition, hypotheses and variables. (2p)
- Presents the Evidence Folder as required (1p)

INDIVIDUAL ASSESSMENT: (4p)

- Presents the Evidence Folder on time with the structure assigned by the teacher (2p)
- Points to: sources, bibliography and identification of / the topic researched / the group work and meetings/ name of the group/ leader of the group, member of the group (2p)

SUMMATIVE TUTORIAL: (11 p) - EXECUTING
GROUP EVALUATION (8p)

• Presents the report taking into account the structure of the established background (introduction, objectives: general and specific, problem definition, hypotheses and variables. (4p)

• The literature and other sources used (minimum 5 articles and 4 Web sites) are cited in the report. (1p)

• Presents the report on time (1p)

• Presents activities scheduled in the Chronogram sheet. (1p)

• The Evidence Folder is decorated and it contains the structure requested by the teacher (cover pages, dividers, annex) (1p)

INDIVIDUAL EVALUATION (3P)

• Answers the teacher’s questions about main concepts and group work. (1p)

• Participates and gets involved in the process (group work, group meetings, assigned role, etc.) (1p)

SECOND PERIOD. STAGE 2: 25 P. PERFORMANCE (Experimental)

1st. FORMATIVE TUTORIAL: (5p)

• Communicates in both, oral and written reports the results of the experiments performed. (2p)

• Follows the correct structure of the experimental work guided by the teacher (2p)

• Attends and brings all the materials requested for the lab experiment (1p)

SUMMATIVE TUTORIAL (20P)

EVALUATION GROUP (14 p)

• Follows the correct structure of the experimental work guided by the teacher (2p)

• Attends and Participates actively during the lab entrances (2p).

• Develops a study design (model, questionnaire, sample) (2p)

• The results are expressed clearly using graphs, charts, tables, photos, statistics (2p)

• The conclusions of the experimental work are expressed clearly and in accordance with the objectives of the research (2p)

• Designs the flyers or brochures (Diptych or Triptych draft). (2p)

• Uses the standard lab format to present the lab written report (2p)

INDIVIDUAL ASSESSMENT: (6p)

• Applies the rules of respect, tolerance and timeliness as the result of a critical and participatory attitude. (2p)

• Cooperates actively in the implementation of the work (2p)

• Attends lab entrances provided with all of the materials needed to perform the field work and / or experimental work. (2p)
FINAL PRESENTATION. STAGE 3: 40p – DRAWING CONCLUSIONS & COMMUNICATING RESULTS

1ST. FORMATIVE TUTORIAL : WRITING RESULTS (15p)

GROUP EVALUATION (10p)

• Cover pages, acknowledgments, index (3p)
• Body of work (correct order and sequence) (1p)
• Results: a) Surveys (1p) b) Cost Study, graphics and other (1p) c) Methodology (1p)
• Conclusion (1p)
• Annex (1p)
• Bibliography & References (1p)

INDIVIDUAL EVALUATION (5p)

• Applies the rules of respect, tolerance and timeliness as the result of a critical and participatory attitude. (2p)
• Cooperates actively in the implementation of the work (1p)
• Answers the questions formulated by the teacher about any part of the work or research or experiments performed (2p)

SUMMATIVE TUTORIAL (10p)

GROUP EVALUATION (7p)

• Presents the written report in a ringed booklet. (2p)
• Presents a PowerPoint in a pen drive as a complement for the oral presentation (2p)
• Presents the Evidence Folder with the work developed during the three periods with the teacher’s corrections (1p)
• Hands in the identification cards following the standard format and clips on the back (1p)
• Hands in the final flyers or brochures (3 or 5 samples) (1p)

INDIVIDUAL EVALUATION: (3p)

• Writes his/her personal conclusions (1p)
• Applies the rules of respect, tolerance and timeliness as the result of a critical and participatory attitude. (1p)
• Cooperates actively in the implementation of the work (1p)

ORAL DEFENSE (15p)

GROUP EVALUATION (5p)

• Presents the written report in a ringed booklet. (1p)
• Uses the PowerPoint as a visual support or complement to express the main ideas (1p)
• Presents the Evidence Folder with the work developed during the three periods (1p)
• Hands in the identification cards following the standard format and clips on the back (1p)
• Hands in the final flyers or brochures (1p)

INDIVIDUAL EVALUATION: (11p)

• Does not read from the PowerPoint or papers in his/her hands (1p)
• Uses the technical vocabulary appropriately (1p)
• Demonstrates ability to interpret the theme (1p)
• Explains clearly and with good diction the ideas, graphs, tables and diagrams (1p)
• Answers questions with confidence and without rambling (1p)
• Expresses conclusions consistent with the proposed objectives (1p)
• Takes and appropriate posture & behavior as well a positive attitude to express proper conduct and formality during the oral defense (1p)
• Comes with the correct uniform and name tags. (2p)
• Uses appropriate and effective visual support materials. (1p)

IMPORTANT OBSERVATIONS:

Procedural assessments are made through the tutorial system according to the schedule established by the institution.

The evaluation of the product is verified by:

a) Field trips and/ or experimental work with written reports.
b) A written presentation of the work done by the group using the standard formats in the Evidence Folder and in a Final Ringed Booklet.
c) Presentation of the best science fair projects nationally and internationally if the institution proposes to do so.
d) A Final Oral Defense will take place through an examination table, conformed for the purpose, with internal and external professionals who will listen and evaluate each group.

Cronogram – Science Annual Project 2015

<table>
<thead>
<tr>
<th>Activities</th>
<th>Deadlines</th>
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<tbody>
<tr>
<td>The teacher hands in the project topic to the groups with guidelines and normative.</td>
<td>Week 23 - 27 March.</td>
</tr>
<tr>
<td>Each group presents raw information about the topic as well as the evidence folder (structure &amp; decoration)</td>
<td>Week 13 - 17 April</td>
</tr>
<tr>
<td>1st Formative tutorial. The teacher returns Evidence Folder with first correction and guidelines for the first summative tutorial.</td>
<td>Week 4 - 8 May</td>
</tr>
<tr>
<td>1st Summative tutorial. Each group hands in the Evidence Folder ( introduction, objectives: general and specific, problem definition, subtopic, hypotheses and variables, bibliography)</td>
<td>Week 18 - 22 May</td>
</tr>
<tr>
<td>2nd Formative Tutorial: Robotics Workshop–Lab Reports, Methodology, type of investigation</td>
<td>Week 2 - 6 June</td>
</tr>
<tr>
<td>2nd Summative Tutorial: Implementation (product development, experimentation,)</td>
<td>Week 23 - 27 June</td>
</tr>
</tbody>
</table>
REMARKS: The dates above will be governed by the schedule of activities submitted by the Evaluation Department and might suffer changes that will be announced with anticipation.

STEPS FOR DEVELOPING A SCIENTIFIC PROJECT:

• DESIGNING A RESEARCH IDEA: The ideas are the first approach to the reality that will be investigated, sources may be: individual experiences, written materials, discoveries, personal conversations, observations of facts, beliefs, newspapers, etc.

• SUMMARY: It has to be written at the end of the research and after drawing conclusions. It is a synthesis of the project in no more than 150 words including key words and results, with the following requirements: Log of the institution (upper left), name of the Institution Area, Course, Project Name, Tutor, Project Summary (as title), authors (such as footer).

• INTRODUCTION: explains what is going to be researched, the background of problem, and the subject of the project, establishing the chapters to be developed in the investigation.

• OUTLINE OF THE PROBLEM OF RESEARCH: It is a formal explanation of the idea and structure of the research and the justification of the topic. Including the following steps

a) THE DEFINITION OF THE PROBLEM: Set by a question that covers briefly and concisely the problem of research.

b) OBJECTIVES: Establish a general idea of the intended research.

• GENERAL: Expresses the intent of the investigation or search.

• SPECIFIC: expresses the intermediate steps to reach the expected results:

c) BACKGROUND OR JUSTIFICATION: Indicates the reason for the investigation. It must describe the objective of the project following these steps: Relevance of the topic to research, feasibility & analysis of available resources.

• MAKING A HYPOTHESIS: A tentative explanation of a particular event or
phenomenon. It is stated in a true propositional form and tries to explain the actual relationships between variables.

- **VARIABLE**: An entity or attribute that can vary and whose variation is likely to be measured.

  a. **DEPENDENT VARIABLE**: Is that part of the hypothesis clearly known, and which are unknown elements that produce, modify and influence it. It is what you measure in the experiment and what is affected during the experiment. It responds to the independent variable. It is called dependent because it "depends" on the independent variable. In a scientific experiment, you cannot have a dependent variable without an independent variable.

  b. **INTERVENING VARIABLE**: facilitates a better understanding of the relationship between the independent and dependent variables when the variables appear to not have a definite connection.

  c. **INDEPENDENT VARIABLE**: An independent variable is the variable you have control over, what you can choose and manipulate. It is usually what you think will affect the dependent variable. In some cases, you may not be able to manipulate the independent variable. It may be something that is already there and is fixed, something you would like to evaluate with respect to how it affects something else, the dependent variable like color, kind, time.

  d. **CONTROL VARIABLE**: is something that is constant and unchanged in an experiment. A control variable is any factor that remains unchanged and strongly influences values; it is held constant to test the relative impact of an independent variable. In scientific experimentation, a control variable is the one that must not be changed throughout an experiment because it affects the independent variables and thus affects the outcome of the experiment.

- **CHAPTER I. THE THEORETICAL FRAMEWORK**: Consists of the literature review, identification, collection, query, retrieval, collection and processing of relevant information, so as to give theoretical support to scientific research.

- **CHAPTER II. METHODOLOGICAL DESIGN**: is a clear and concise statement of each of the stages of the investigation. The description of how the investigation will be conducted.

- **CHAPTER III. ANALYSIS OF RESULTS**: The process by which the student prepares and presents the research report with charts, diagrams and others, such as Surveys and Study of costs, Marketing Research, etc.

- **CONCLUSION**: The conclusion is a final comment or idea that summarizes the most important aspects of the topic as well as the results of the experiments or activities that took place during the course of the investigation. The conclusion should be expressed in a paragraph of small size and is designed to meet the following objectives:

  - Identify and summarize aspects of the subject that the student was expected to discover through the development of the project and research.
  - Encourage the student's reflection on the importance of the topic research to their daily lives or the environment in which they live.
• Provide a final comment on the results of the activity being performed, in order to provide a feedback to the students or to make suggestions that may improve the process that involves a scientific research.

• ANNEX: in this section additional information is attached (photos, clippings, diagrams, schedules, tables, etc.) and other materials to enrich the research.

• BIBLIOGRAPHY & REFERENCES: the name or names of the author - year of publishing - editorial - page. Internet pages, the page address.

REQUIREMENTS FOR A SCIENTIFIC REPORT.

Written reports for each tutorial will be monitored and evaluated by the teacher, according to the criteria presented in the corresponding item or term. The final written report must be drawn to computer, using the following guidelines:

• Font size 12.
• Type: Arial.
• Paper: A4.
• Margins: Left: 3.5 cm. Right: 1.5 cm. Top: 2.5 cm. Bottom: 2.5 cm.
• Line Spacing: 1.5 cm.

Evidence Folder Structure:

Cover Page 1.

• Name of the Institution.
• School Logo
• Project Title
• A graph or image related to the subject
• Slogan
• Asuncion, Paraguay
• Year.

Cover Page 2

• Project Topic
• Area: Basic Sciences and its Technologies.
• School: St. Ignacio of Loyola School
• Tutors of the Project
• Project Period: March to September

• 3 rd. pg. Acknowledgments
• 4 th. Pg. Index
• 5 th. - Introduction
• 6 th. – Background (Justification)
• 7 th – General and Specific Objectives
• 8 th – Brief description of the problem, a question
• 9 th – Hypothesis:
• 10th. - Variables:
• 11th. Chapter I - Theoretical Framework
• 12th. - Chapter II Methodology.
TOPICS TO RESEARCH

4. Devices for detecting obstacles. Types and operation.
5. Rights of Persons with Disabilities. Visual impairment in Paraguay and Inclusion systems or programs. Associations and other institutions for blind people in Paraguay

BIBLIOGRAPHY


Lic. Susana Ismael Basualdo