

# Popularization of Physics – the Jamaican experience



**Michael J. Ponnambalam**

*Physics Department, University of the West Indies, Kingston 7, Jamaica.*

**E-mail:** michael.ponnambalam@uwimona.edu.jm

(Received 25 July 2011, accepted 30 October 2011)

## Abstract

Physics is objective; however, its presentation is subjective. The laws of Physics may be cold to many; but the presentation of these laws can be very warm, lively, passionate – and even dramatic and poetic – if one has experienced with Einstein “a rapturous amazement at the harmony of natural law”. Through our Physics Outreach – and using the mantra, “Taste and see that Physics is fun” – we have succeeded in communicating a little bit of the wonder, the poetry, the drama, the dance and the excitement in Physics to several thousands of students. As a by-product, this work has nearly tripled the number of students in our Introductory Calculus-based Physics.

**Keywords:** Science in school, Teaching methods and strategies, Learning theory & science teaching.

## Resumen

La Física es el objetivo, in embargo, su presentación es subjetiva. Las leyes de la Física pueden ser frías para muchos, pero la presentación de estas leyes pueden ser muy cálidas, alegres, apasionadas – e incluso dramáticas y poéticas – si uno ha experimentado con Einstein “un asombro extasiado ante la armonía de la ley natural”. A través de nuestra Física de Alcance – y usando el mantra, “Prueba y verás que la Física es divertida” – hemos tenido éxito en la comunicación un poco de la maravilla, la poesía, el teatro, la danza y la emoción en la Física de varios miles de estudiantes. Como un sub-producto, este trabajo casi ha triplicado el número d estudiantes en nuestra Introdutoria Base-Cálculo de Física.

**Palabras clave:** Ciencia en la escuela, Enseñanza de métodos y estrategias, Teoría del aprendizaje y enseñanza de la ciencia.

**PACS:** 01.40.E-, 01.40.gb, 01.40.Ha

**ISSN 1870-9095**

## I. INTRODUCTION

The number of students doing our Introductory Calculus-based Physics was around 200 in the nineteen eighties. It started to come down slowly in the nineties. During the period 2000 – 2005, the decline was faster – reaching an all-time low of 81 in 2006. In order to popularize Physics and to reinvigorate our Physics Department, we launched the Physics Outreach in October 2006. Details on the various activities are given below. (Note: In Jamaica, the Primary School lasts for 6 years & the High School for 7 years.)

## II. WORKSHOP FOR 12<sup>TH</sup> & 13<sup>TH</sup> GRADERS

Some of our High School Physics teachers do not have a degree or interest in Physics. Further, several High Schools in Jamaica are not properly equipped to carry out their Physics experiments. Both of these have a strong negative effect on the students. To overcome these problems, we found out from some High School teachers as to the

Physics topic on which they needed the most help. On that topic, we offered a Week-long One Day Workshops in January 2007 for the 13<sup>th</sup> Graders i.e. final year students in High Schools. This week was carefully chosen during our semester break, so that our lab & lecture theatres would be free, and during the time when the High School students had finished their holidays and were back in School. Any School comes for only one day; gets the theory explained very well by one of us in two 90 minutes sessions in the morning, with a snack break in between. After lunch, the students do two experiments based on the theory they learn in the morning, one hands-on and the other computer-based. The data analysis and lab report are done later on by the students, and are graded by their teachers.

205 students from 18 High Schools participated in this Workshop. We obtained their feedback on the various aspects of the Workshop and gathered input from them on whether they would recommend the Workshop for the following year; and, if so, the Workshop topic. The Workshop was a wild success. The students, as well as their teachers, recommended the Workshop for both the Pre-final & Final year students i.e. the 12<sup>th</sup> and 13<sup>th</sup> Graders in High

Michael J. Ponnambalam

Schools. As per their wish, we have been conducting these Week-long One Day Workshops every year. In January 2011, we had 980 students from 25 High Schools. Their feedback is given in the Figs. 1a) to 1c).

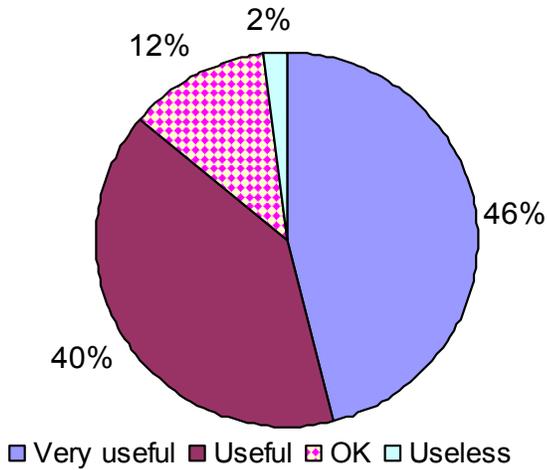


FIGURE 1a). Overall, the Workshop was:

It is consoling to see from Fig. 1a) that 46% of the students found the Workshop very useful, and another 40% useful. We believe that a good education should reach out to both the head and heart of the students – in agreement with the words of the Director of Public Affairs of the American Physical Society, Michael Lubell [1]: “Establishing an emotional connection is an essential precursor to communicating serious information. Lighting up the amygdala gets the rest of the human brain to pay attention”. The response in Fig. 1a) is primarily from the head; the response from the heart is given in Fig. 1b).

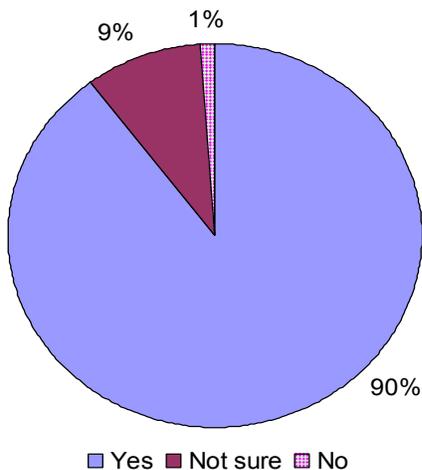


FIGURE 1b). I am glad I came to this Workshop:

It is consoling to see that 90% of the students were glad that they came to the Workshop. Further, 86% have mentioned that they would recommend it to their friends. Thus, we get a lot of free publicity through the students themselves. Further, in commenting on the Workshop, many students have used the following words: Good, great, interesting, educational, wonderful and excellent.

We believe that nonverbal messages are very important in communication and hence pay special attention to this.

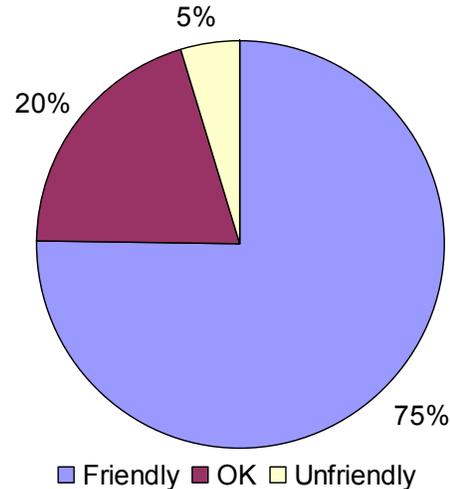


FIGURE 1c). The atmosphere during the Workshop was:

In Fig. 1c), 75% of the students have said that the atmosphere during the Workshop was friendly and 20% OK. 5% have found the atmosphere unfriendly. This was 2% last year, and around 1% the previous years. This increase is partly due to the increase in the number of students taking part in the Workshop. However, it also tells us that we need to give more attention to this aspect.

### III. FIELD TRIP FOR 11<sup>TH</sup> GRADERS

The success of the Workshop for the Pre-final & Final year students (i.e. 12<sup>th</sup> & 13<sup>th</sup> Graders) in High Schools, as well as the request from some teachers, prompted us to do something for the 11<sup>th</sup> Grade students. Knowing that for this group an All-day Workshop is not necessary, we arranged three days of 11<sup>th</sup> Grade Field Trip in January 2010 – during our semester break, and when the students were back from their holidays. We wanted to expose the youngsters to the following words of Poincare [2]: “The scientist does not study Nature because it is useful to do so. He studies it because he takes pleasure in it; and he takes pleasure in it because it is beautiful”. We wanted to give the students an opportunity to discover, experience and enjoy the beauty and fun in Physics, through the use of lively and interactive demonstrations, computer simulations and experiments – all related to their syllabus. Each day had a

two-hour morning session, and another two-hour afternoon session. Any School can send its students for any one session. Each two hour session accommodates a maximum of 80 students only and is coordinated by 8 persons (staff + B.Sc. students), so as to promote close interaction and active learning. During each session, around 40 students spend the first hour in the Hands-on Lab, while the remaining spend their first hour in the Computer Lab; during the second hour, they exchange their Labs.

The Field Trip became an instant success, with around 600 students from 14 High Schools; and they wanted the Field Trip again. Hence, that has become a part of our calendar, the second one being offered in January 2011. The 2011 Field Trip attracted around 550 students from 21 High Schools. This time, we did a sample survey during one of the sessions. The results are shown in Figs. 2a) and 2b).

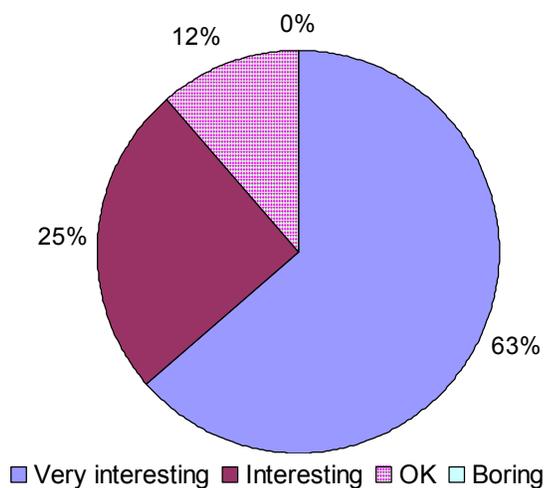


FIGURE 2a). The demos & expts in the Computer Lab were:

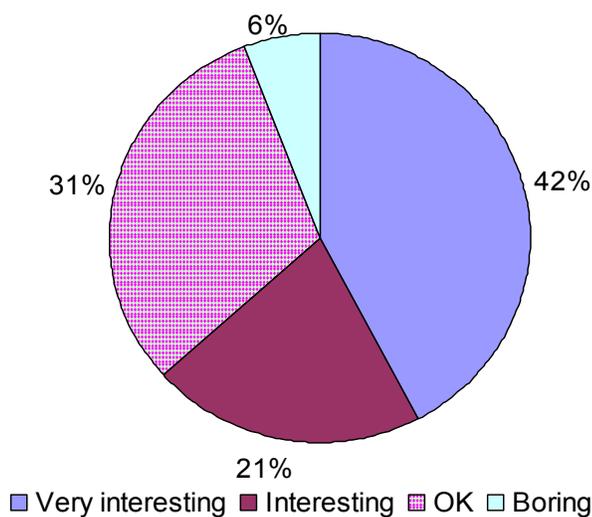


FIGURE 2b). The demos & expts in the Hands-on Lab were:

It is interesting to note from Fig. 2a) that 63% of the students found the demos and experiments in the Computer Lab very interesting, while another 25% found them interesting - giving a total of 88% - and that nobody found them boring. However, for the demos and experiments in the Hands-on Lab, we note in Fig. 2b) that 6% found them boring, while only 42% found them very interesting and another 21% found them interesting – giving a total of 63%. One possible reason for this big difference is that the Computer Lab is air-conditioned, while the Hands-on Lab is not. However, the real reason is very likely the fact that the younger generation is hooked on to computers. And, we teachers need to take this into account in our Outreach as well as lectures.

Further, 86% of the students have said that they would recommend this Field Trip to their friends. Again, we get a lot of free publicity through the students who come to the Field Trip. In the earlier questions, the students tick one of the answers given. However, in the final question in the survey, they are requested to tell us how they would describe the Field Trip to their friends using their own words. The most commonly used words are: Educational (40%), Interesting (26%) and Fun (13%) – these three together accounting for 79%. This clearly shows that Physics education can be interesting and fun!

#### IV. SCIENCE FAIRS

Our Faculty arranges Science Fairs for the 9<sup>th</sup> to 13<sup>th</sup> graders one to three times a year in different parts of the country, usually for 2 or 3 days. During these Fairs, all the High Schools near the Fair location are invited, and exposed to the various science programmes in the Faculty – including the admission requirements, scholarships available etc. We have used these opportunities to popularize Physics, using our hands-on demos and computer simulations, to around 6,000 students.

#### V. SCIENCE-FUN FOR PRIMARY SCHOOLS

Since 2006, we have been visiting (and a few times visited by) some Primary Schools, and entertaining the youngsters with our hands-on demos. The curiosity and enthusiasm of the youngsters were very impressive. From their faces, we could easily see that they enjoyed the programme immensely. One of the teachers reported that her students were ‘mesmerized.’ In Jamaica, at the University level and even at the High School level, one hears the prejudice that Physics is hard, and/or Physics is boring. However, it is very interesting to note that the little ones in Primary Schools don’t have any such prejudice. They enjoy Science/Physics and are very open to it. Hence, we arranged a Week-long “*Science Is Fun*” Field Trip in May 2011 strictly for the Primary School students. Each day had a two-hour morning session, and another two-hour afternoon session. Any School can send its students for any

Michael J. Ponnambalam

one session. Each two hour session accommodates a maximum of 80 students only and is coordinated by 8 persons (staff + B.Sc. students), so as to promote close interaction and active learning. During each session, around 40 students spend the first hour in the Hands-on Lab, while the remaining spend their first hour in the Virtual Lab; during the second hour, they exchange their Labs. To quote the invitation letter: “We would like to offer your students a chance to enjoy Science for two hours, and discover for themselves that: i) Science is fun, ii) Science is cool, and iii) Science is good for them”.

750 students from 17 Primary Schools profited from this Field Trip, and their feedback is highly positive. 47% of the students found the computer games/experiments exciting, while another 41% found them interesting – giving a total of 88%. A similar response was seen for the hands-on demos and experiments. In these questions, the students tick one of the given responses. However, in the final question, they write on a blank space the type of words they would use in describing the Field Trip to their friends. The results are summarized in Fig. 3.

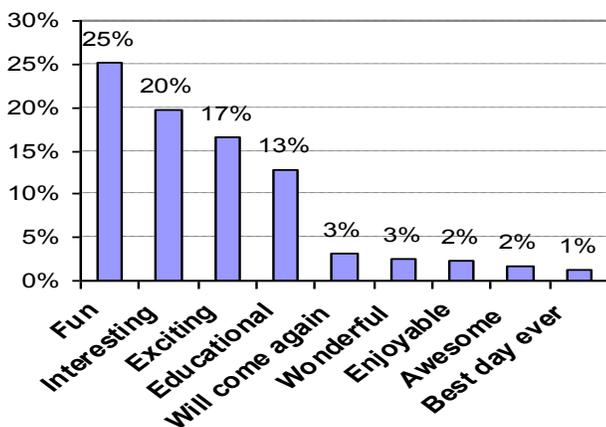


FIGURE 3. The Science-Fun Field Trip was:

The leading four responses are: Fun (25%), Interesting (20%), Exciting (17%) and Educational (13%). Together, these account for 75%. It is very interesting to notice that the dominant response is “Fun”. It is equally interesting to observe that “Educational” is among the top 4 responses, meaning that fun and science education can go together.

## VI. CONCLUSION

Physics is objective; however, its presentation is subjective. The facts/laws of Physics may be cold to many; but, the presentation of these laws can be very warm, lively, passionate – and even dramatic and poetic – if the presenter has a passionate love for Physics. The poet Lord Byron [3] is right when he said: “There’s music in all things”. Through our Physics Outreach, we have succeeded in communicating a little bit of the wonder, the poetry, the drama, the dance and the excitement in Physics. We have shown that “education” and “fun” can go together. We have enabled thousands of students in High Schools and Primary Schools to “taste and see that Physics is fun”. As a by-product, the number of students in Introductory Calculus-based Physics in our University has nearly tripled from 81 in 2006 to 233 in 2010. This is a verification of the following words of Alan Chodos [4], Associate Executive Officer of the American Physical Society: “If we could get members to go to K-12 schools and levitate a magnet or something, we really think these efforts would bring great rewards.” Teaching/training the High School Physics teachers is an important area, where we have been lagging. We are catching up on that – with Week-long Workshops for High School Teachers in August 2011 – one for those who teach the 10<sup>th</sup> & 11<sup>th</sup> Graders, and another one for those who teach the 12<sup>th</sup> & 13<sup>th</sup> Graders.

## ACKNOWLEDGEMENTS

The author would like to express his gratitude: i) to the Administration of the University of the West Indies and to Mr. Oswald DeLisser for their financial support to the Physics Outreach; ii) to Dr. Joseph Skobla (former Dept. Head) for his moral support; and iii) to Dr. Michael Taylor & Dr. Paul Aiken for their years of dedicated work for the Workshop for 12<sup>th</sup> & 13<sup>th</sup> Graders.

## REFERENCES

- [1] Lubell, M., American Physical Society/APS News, p.6 (2007).
- [2] Chandrasekhar, S., *Beauty and the Quest for Beauty in Science*, Physics Today **32**, 25 (1979).
- [3] Byron, Lord, Don Juan, Canto XV, Stanza 5. [http://archive.org/stream/workslordbyron10unkngoog/workslordbyron10unkngoog\\_djvu.txt](http://archive.org/stream/workslordbyron10unkngoog/workslordbyron10unkngoog_djvu.txt) Retrieved on 23/07/2011
- [4] Chodos, A., *Outreach is an orphan*, American Physical Society/APS News, p. 8 (2005).