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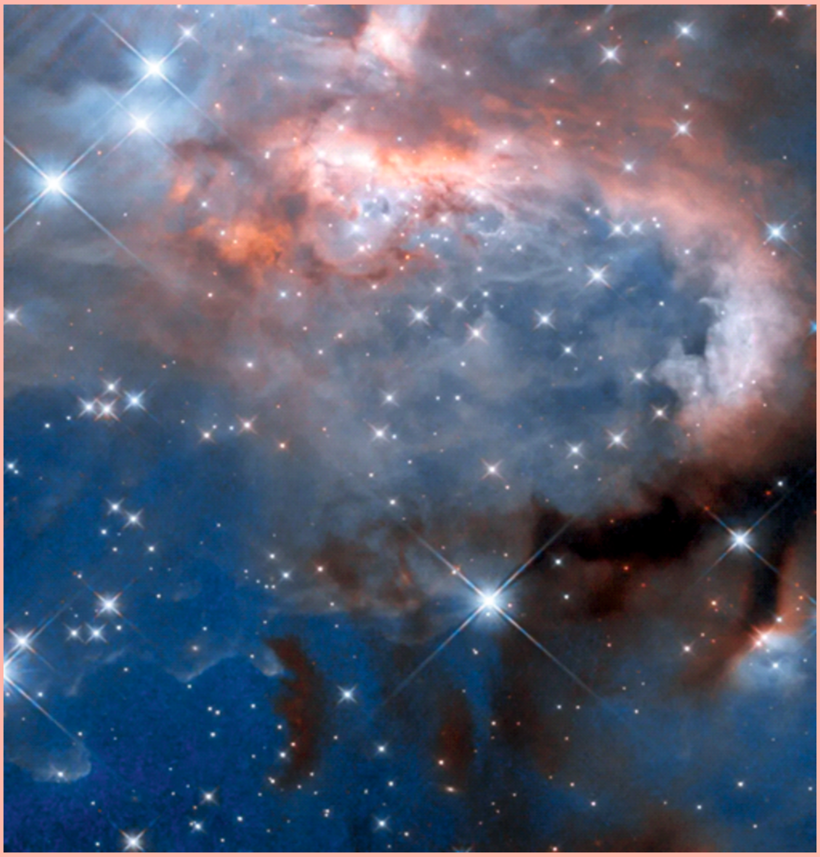

Named RCW 7, the nebula is located just over 5300 light-years from Earth in the constellation Puppis. Nebulae are areas of space that are rich in the raw material needed to form new stars. Under the influence of gravity, parts of these molecular clouds collapse until they coalesce into protostars, surrounded by spinning discs of leftover gas and dust. In the case of RCW 7, the protostars forming here are particularly massive, giving off strongly ionising radiation and fierce stellar winds that have transformed it into what is known as a H II region. The ultraviolet radiation from the massive protostars excites the hydrogen, causing it to emit light and giving this nebula its soft pinkish glow. Here Hubble is studying a particular massive protostellar binary named IRAS 07299-1651, still in its glowing cocoon of gas in the curling clouds towards the top of the nebula. To expose this star and its siblings, this image was captured using the Wide Field Camera 3 in near-infrared light. The massive protostars here are brightest in ultraviolet light, but they emit plenty of infrared light which can pass through much of the gas and dust around them and be seen by Hubble.

(Read More Link : https://www.nasa.gov/image-article/hubble-captures-infant-stars-transforming-a-nebula/)

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The Bulletin is the official organ of the IAPT. It is a monthly journal devoted to upgrading physics education at all levels through dissemination of didactical information of physics and related areas. Further, the Bulletin also highlights information about the activities of IAPT.

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Editorial

… But I go on forever

The central theme of Alfred Lord Tennyson's famous poem, '*The Brook'* unfolds through the celebrated lines, which appear as many as four times in the legendary verse –

"For men may come and men may go,

But I go on forever."

It tells about the winding journey of the brook in its process of getting merged with the river whereby its speed gets contained, restrained, guarded, but the flow stands to remain eternal.

It makes one wonder if there is something, about which we have read in physics, that goes on forever! An answer may be obtained by making a probe into the conservation principles which are the leading foundations of our understanding of physics. First, let us pick up the principle of conservation of mass, which states that matter cannot be created, nor destroyed but can only be transformed. It essentially points to the fact that accumulation of matter at any part of the universe is accompanied with an equivalent depletion of mass elsewhere. The principle gets mathematically represented by an equation of continuity.

This equation was first developed by the Swiss mathematician Leonhard Euler in the 18^{th} century. However, it remains a matter of debate as to who first provided the equation of continuity – Euler or the Bernoullies, Johann and Daniel. The latter are known for making extensive studies with fluid mechanics as a consequence of which they arrived at the equation of continuity, which found very significant applications in incompressible as well as compressible fluids. However, the equation was subjected to refinement by the French physicist Jean le Rond d'Alembert in the 18^{th} century and further finesse by the German mathematician Leonhard L. Lorenz in the 19^{th} century, to give it the present form using the 'divergence' operator.

The equation of continuity pervades into multiple domains of physics such as thermodynamics, electromagnetism, quantum and statistical mechanics. The role of the equation is to describe *the flow* of some quantity, better be called entity. It needs to be related with a *flux* and hence 'divergence' becomes so crucial. In fluid mechanics it is the product of the density of the fluid and its velocity; in case of thermal conduction it is the heat energy flux; whereas in electromagnetism we end up dealing with the flux of the current density. By relating them with the conservation of mass, energy and charge, as per the dictate of the situation, the equation of continuity establishes a balance between the flow into a volume and the flow out of it. The equation becomes the fountain head for obtaining the definitions of thermal and electrical conductivity (Ohm's and Kirchoff's laws), and the displacement current in the iconic fourth Maxwell's equation.

The reason behind the preference for using the word 'entity' gets substantiated when we consider its manifestation in quantum and statistical mechanics. For the former it is the flow of the probability current, whereas in the latter it is the phase space distribution function. It can be extended to the study of charge transport mechanism in a semiconductor, where the flow relates to the electron density. In special relativity, the entity is the 4-current, arising out of the four-vector formalism, or the stress-energy tensor. In case of general relativity, where the space-time is curved, the entities remain the same, but the equation takes into account the covariant divergence in place of the ordinary divergence.

'The Brook' of Tennyson in literary parlance is a ballad, where the flow of the stream has been personified. The narrator recounts her story of life from birth to death, where she talks about her "chattering, bubbling and babbling over pebbles and stones" and concludes with the profound and the alluding view about herself remaining immortal. Similarly, in physics the flow of each entity described above does have a source and a sink; but the stream, despite variations in the parameters concerned, itself remains omnipresent guided by the continuity equation. This perpetual flow takes into its stride manifold entities, thereby exhibiting a *Unity in Diversity*.

Chinmoy Kumar Ghosh

Physics News

New calculation approach allows more accurate predictions of how atoms ionize when impacted by high-energy electrons

During electron-impact ionization (EII), high-energy electrons collide with atoms, knocking away one or more of their outer electrons. EII is among the main processes affecting the balance of charges in hot plasma, but so far, its cross-section has proven incredibly difficult to study through theoretical calculations. This new research present new calculations for the EII cross-section, which closely match with their experimental results. The researchers tested their approach by calculating both the single- and double-EII cross-sections of multiply charged xenon ions, across a broad range of collision energies. They then compared these theoretical values with real experimental results. In most cases, their theoretical cross-sections agreed closely with their experiments—only becoming less accurate at lower collision energies, on the threshold of where ionization can occur. Based on this success, Schippers and colleagues now hope their approach could offer important guidance for EII cross-section calculations in future studies.

Read more at: https://phys.org/news/2024-06-approach-accurate-atoms-ionize-impacted.html

Original paper: The European Physical Journal D (2024). DOI: 10.1140/epjd/s10053-024-00854-2

Determining refractive index at relativistic speeds

If you studied advanced physics at high school, there's a good chance that you remember Snell's law, which states how a ray of light bends when it crosses a boundary between two media. The theoretical formulation of the law of optical refraction was initiated by Descartes in the early 17th century. Descartes considered the conservation of the tangential component of the velocity of a particle, as well as light, as it crosses a boundary between media. Descartes' metaphysical theory was rejected by Fermat by introducing the "least time principle" that was named after him. Shyamal Biswas and his research group members at the University of Hyderabad in India have now extended Descartes' metaphysical theory to determine the mechanical refractive index for relativistic particles entering media at all possible speeds. The researchers' calculations of the mechanical refractive index for particles traveling at different speeds up to that of light exactly matches with Descartes' result at the non-relativistic limit and Fermat's result at the ultra-relativistic limit.

Read more at: https://phys.org/news/2024-06-refractive-index-relativistic.html

Original paper: The European Physical Journal D (2024). DOI: 10.1140/epjd/s10053-024-00849-z

Re-analyzing LHC Run 2 data with cutting-edge analysis techniques allowed physicists to address old discrepancy

Supersymmetry (SUSY) is an exciting and beautiful theory that answers some of the open questions in particle physics. It predicts that all known particles have a "superpartner" with somewhat different properties. The CMS collaboration decided to reanalyze the same 2016-2018 data with upgraded analysis techniques. The new analysis looks for the simultaneous production of pairs of stops. Each stop decays into a top quark accompanied by several lighter quark or gluon jets. Using this novel method, the CMS collaboration was able to accurately predict the dominant background in this analysis from observed data, without relying on simulations with large uncertainties associated with the modeling of the jet multiplicity distribution. With a much more sensitive analysis method in place, the physicists are now eagerly looking forward to analyzing the data of the ongoing LHC Run 3 to go even further and to find where Nature hides its answers.

Read more at: https://phys.org/news/2024-06-lhc-edge-analysis-techniques-physicists.html

Original paper: The CMS Physics Analysis Summary: cms-results.web.cern.ch/cms-re US-23-001/index.html

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Physics terms and their Etymologies for the Classroom use

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When a physics teacher enters her classroom, it offers a good number of challenges. Apart from presenting the topic following the guidelines of the curriculum she normally plans to touch upon a few additional relevant ideas and concepts along with the historical perspectives of the topic to keep the class interesting. A discussion on the etymology of the scientific terms particularly those in physics in this context may prove quite useful. An introduction to a very interesting area of science has been presented here with a special reference to physics. These may be used as supplementary materials for keeping the students' attention unabated in the classroom.

As all of us will appreciate that the physics we transact in the classroom is a relatively young subject and began to get its shape from 16th century onwards. The concepts and ideas developed in the area had to look for suitable terms to express them. Since the emergence of modern science took place in Europe the languages spoken in Europe proved to be handy in providing names from some sort of similia with the physical situation described. When modern science began get shape in Europe in the 17th century the scientists involved tried to pick up words from Latin, Greek or old forms of some of the European languages as the most of the languages now spoken in Europe have their roots there. With the more and more use of them we now consider them to be the part of the English language vocabulary, but most of the words possess an interesting etymological history. In this article an attempt will be made to introduce with the etymology of some of the oft-used terms of physics.

To start with let us pick up the word 'etymology' itself. Now we know that etymology refers to a branch of knowledge that deals with the origin of words. How a word is being used to convey a particular sense and how this might have evolved over time is an interesting study. A teacher can focus on the etymology of the terms used in her subject area, so that she may use them in a classroom situation to draw the attention of the students. This provides an interesting tool to a teacher. The term etymology comes from the Greek word '*etumos*' meaning true. '*Etumologia*' was the study of the true meanings of the words. However, it still had to pass through the old French word '*ethimologie*' before being turned into 'etymology' and become an English word. So, that way one can appreciate that this is not a typical English word but has made its way to the English lexicon through some circuitous routes. This is true for so many terms of physics. The word physics incidentally comes from Greek word '*physika*' that means 'pertaining to natural things.' One can easily understand that it is one of the reasons why physics began its journey as 'natural philosophy.' It implied that physics is essentially a philosophy connected to the things observed in nature and possibly a branch of knowledge that would provide explanations for the observations.

The terms like particle, speed, velocity, acceleration, or force are some of the very common introductory concepts that are first placed before the students in schools, and the physics students so to speak can never run away from them. The word speed has come from '*spowan*' that belongs to Germanic and the literal meaning is to 'move forward' or 'to prosper'. Naturally this goes with the spirit of speed. Velocity comes from '*velocitas*', a Latin word meaning 'swift'. Velocity may be large or small but its original meaning makes it rapid. Acceleration is also of Latin origin coming from the word '*accelerare'* meaning 'to quicken'. One can understand how appropriately the word for acceleration has been adopted. And in this connection if we search for the origin of retardation its root can be traced back to Latin verb '*retardare*', meaning 'to hinder' or 'to make slow'. Force comes from a Latin word '*fortis*' that implies strong. Obviously in English language the word strong has a different connotation in various situations involved. Yet it is not very difficult to find a connection between the force and strength. That way this word has gone through some sort of an evolution. The word 'forte' derived from it has now been adopted in English and the base meaning remaining same as 'strong'.

Force comes as the product of mass and acceleration and mass comes from the Greek word '*maza*'. Incidentally '*maza*' in ancient Greece used to refer to a cake of barley that could be kneaded into a lump. These lumps used to resemble like a typical 'mass' that we talk in physics today. The concept of point mass came later, and we brought the idea of point mass to deal with several ideal situations in physics. In dynamics we use the concept of point mass and in kinematics we talk about the extended mass or a rigid body that is of course a realistic one. In a classroom we talk about mass large or small but we know that the mass in the laws of motion should be a point mass and that is essentially a theoretical concept.

When Newton first introduced the concept of momentum through his laws of motion in late 17th century, he conceived of a new physical quantity that could be formed by taking the product of a mass and its velocity. Hence the quantity had a direction at a particular instant depending on the direction of the velocity. The word he picked up exactly the same word from Latin, and it was '*momentum'*. We need to keep in mind that like other luminaries of his time Newton was also very proficient in Latin and that prompted him to write his very famous book Principia, published in 1687 in Latin only. Some of the concepts for describing the physical world were introduced there for the first time. The Latin word '*momentum*' means a moment of time. Apparently, it does not have any direct connection with mass or velocity, but the deep insight of Newton could possibly identify momentum in the real world would be a fast-changing quantity and the even only a change in the direction of the velocity may bring about a change in momentum. So, the moment of time is an integral concept of 'momentum'. The other important physical quantity in this context is time and it comes from Old English word '*tima*'. This word used to refer to good or bad time with suitable prefixes and was of philosophical use. One can understand that the concept of time in a language or in a society is always available from philosophical or social point of view whether science had emerged in that society or not. People talk about good time, bad time, and in number of idioms and proverbs time has a very special connotation. However, the scientific approach to time differs from the philosophical concept of time. Yet, that way it was borrowed from social of philosophical use.

Let us move over to optics, where the very word comes from Greek '*optikos*'. This means anything pertaining to eyesight. And one can easily appreciate that the ancient Greeks could very much understand the connection between light that may be looked as a signal and our eyes that are essentially playing the roles of the detectors. Very familiar phenomena like reflection, refraction of dispersion associated with light come respectively from '*reflectere*', meaning to bend back, '*refrangere'* meaning to break up and *'dispergere'* meaning to scatter.

The return of the light from the surface of the reflector causes the bending of the beam in the direction from which it started. In refraction of light, a part of the light ray may come back reflected from the interface of the two media while another part enters the second medium. So, this is definitely a case of light ray getting breaking up, one into a reflected light ray and the other into a refracted beam of light. It is not very easy even for our present-day students to appreciate that when a refraction takes place a part of the light, however small that may be is likely to go back to the original medium through reflection. So, light really breaks up through partial reflection and partial refraction though one part may be much more than the other. One will have to appreciate the very high quality of observations by Greek pundits before they picked up these names for the respective physical phenomena.

Moreover, initially the dispersion of light drew its name from the Greek word for scattering. We now know that scattering is a different phenomenon from dispersion and there are various types of scattering. Newton showed the dispersion of light i.e. breaking down of composite light into different colors and it was named following the Latin word for scattering. Naturally the question comes how could the physicists find another suitable word for scattering? In fact, the scattering in physics possibly comes from an old English word *'scatter'* meaning to squander. The way light ray so speak gets spoilt through scattering this looks like a suitable word to describe the phenomenon.

One can notice that some of the terms in physics have come not only from nouns but also from verbs; though in English that are being used as a noun. Mirror is a noun but it comes from Latin '*mirare*' meaning to look at; interference is a combination of two Latin words '*inter*' and '*ferire*' meaning to 'strike among' or 'between'. Current, implies 'to run' as it comes from the Latin word *'currere'* once again a nice description of the phenomenon be it a current of water or electric current. Most interesting word in this regard is possibly the laboratory that comes from the word '*laborare*' implying 'to labour' or essentially to work hard'. Students of science know the role of laboratory and the etymology shows that it is a place meant for putting up labour, possibly hard labour to learn science in a complete way. Unfortunately, in the present time, the complaint of inadequate attention given to the laboratory component of different science subjects both by the teachers and students has become a matter of serious concern among the experts.

Table I. A few physics terms in English with their origin from various languages

Word in English	Original source word	Meaning of the original word	Source language
balance	bilancia	Two scales	Latin
circle	kirkos	A ring	Greek
centrifugal	Centrum+ fugere	center + fleeing	Latin
centripetal	centrum + petus	center + seeking	Latin
convection	convere	Carry together	Latin
cathode	kathodos	A going down	Greek
femto (SI prefix for 10^{-15})	femten	fifteen	Danish
gauge	gauger	Instrument of measurement	French
pico (SI prefix for 10^{-12})	pico	A little bit	Spanish
friction	ficare	To rub	Latin
equipment	skipa	To arrange ship or man	Norse
beats	beatan	To strike repeatedly	Old English
force	fortis	strong	Latin
pivot	piva	A pipe (?)	Italian
slug	sluggje	A heavy, slow person	Norwegian
robot	robotnik	serf	Czech
calibrate	qalib+rate	Mold for casting metal (?)	Arabic

With the new breakthroughs in various branches of science and technology new phenomena are discovered, instruments and techniques are being developed. All these new things demand new names. And while looking for the suitable names, the scientists and researchers try to follow a principle. They try to pick up a suitable word may be from some ancient or modern languages so, as to, express the situation in a clear way. For example, a modern concept is described by the word 'clone' or 'cloning' and it comes from Latinized form of Greek word '*klon*' with the meaning 'to twig'. The word computer has come from the Latin word '*putare'* that means 'to calculate,' 'to count' or 'to think' or 'to sum up.' One can see how all these properties can be attributed to a computer we now use. The word 'digital' has been derived from the Latin word '*digitus'*. 'Digitus' however become *'digitalis'* in Latin itself and that entered English lexicon as 'digital' in late 15th century. However, the meaning was interesting. It referred to steps or was related to finger or fingers. One can understand how this is now being used to indicate happenings in steps. This contrasts with the analog devices where the continuous variations are detected. Incidentally, the word that was only on casual use, has taken a leap in its use from 1950s and the reasons are not difficult to guess. And we just do not know if newer innovations will make use of some obscure words to describe the function of a newly developed technology.

It appears with newer and newer scientific concepts coming to the fore scientists will tend to look back to the ancient languages for finding suitable words for them. Since number of languages have connection with ancient languages like Latin or Greek the words may be found out with more ease in different languages apart from English. In our country Sanskrit plays a similar role. We have been able to get large number of terms for basic science in different Indian languages drawing them from Sanskrit. With these inputs from Sanskrit the study of science in different Indian languages had definitely become convenient. However, for the modern and advanced scientific terms we depend on English as the modern research findings and innovations are essentially reported in English irrespective of the country where that has been done. In the process the English terms get coined first and spread fast. We do use them and that is definitely more convenient. However still these names often are drawn for Latin Greek or other ancient European languages as through these processes the terms can make faster inroads to the vocabulary many European languages. So not only the new terminologies but their etymologies are still very important. And a closer look at their etymologies makes the terms easier for the scientific community to accept and understand.

References

1. A Brief Etymology of Words Used in Physics or Does Your Chewing Gum Lose Its Flavor on the Fulcrum Overnight? George W. Goth, *Physics Teacher*, v26 n9 p 576-77, Dec 1988.
2. The Origins of Physics Words, P Binder; Eur. J. Phys. 45 (2024) 025801 (28pp) https://iopscience.iop.org/article/10.1088/1361-6404/ad0f9b/pdf
3. Etymology of Physics Terminologies, Bhupati Chakrabarti. Science and Culture, Vol 85, Nos 7-8 July - August 2019, p 268-270.

Article

Fostering Science Education: The Vital Role of Offline Workshops Aand Hands-on Activities Blended with Online Exercises

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The Background

In the digital age where screens dominate our lives and virtual experiences abound, online seminars have become increasingly prevalent in science education, offering convenience and accessibility. Globally, online initiatives in disseminating recent trends of science along with cutting-edge research have become very popular and are specially being targeted for senior undergraduate and postgraduate students and research scholars. Certainly, it is one of the pertinent ways to meet the requirement of the desired taste in this regard. But it has been a matter of experience of the authors that in most cases, no follow-up activities complement the earlier one. The organizers are not confident enough about how many participants are attentive in live online activities when they are in 'no-video' and 'no-audio' mode. While it is a matter of concern, the factual position is that no such concrete study has been carried out in detail, especially in the Indian science scenario, to quantify the number of students getting benefitted from online activities and, also to which extent. In this context, we also mention that the learners mainly addressed by such kinds of online activities belong to a pretty small percentage of the total volume of learners at different levels of studies. The bulk (junior, secondary, and senior secondary students) of the population remains unaddressed. Only the proper nourishment of themselves at their formative stage builds up the sound edifice of national education.

In the context of above, it may be noted that even for the great thinkers like Prof. D. P. Khandelwal and Prof. B. Saraf mainly limited the focus of their academic activities among college-level students and beyond. This is understandable as at the formative stage, the Indian Association of Physics Teachers (IAPT) had very few school teachers as its members. But, this practice is still in force even though a sizable number of school teachers are activists of IAPT who manage the NSEs at the ground. This is true not only for IAPT, the current activities of various other similar organisations like Science Academies, Associations and Societies still do not take into their fold the range of junior and secondary teachers and students. Practically, no online science event has ever been organised to stem the possible rot in the domain of school science education that the National School Curriculum Framework (NSCF) 2023 expressed in their recent documents as an important observation. Of course, it is also seemingly impossible to make any course corrections in this regard from a purely online platform. The usefulness of offline workshops and hands-on activities with face-to-face interaction in school science education cannot be ignored for the much-needed remedial measures for its improvement. Rather, offline workshops still hold significant advantages over their online counterparts, particularly in fostering hands-on learning experiences and local-level engagement. One of the key advantages of offline workshops is the opportunity for face-to-face interaction between students and instructors.

The Context

It is being humbly admitted by the authors that they are not against the importance of online activities in fostering science education. On the other hand, in a world that emphasises globalisation and interconnectedness, the adage 'think globally, act locally' resonates deeply, highlighting the importance of understanding global scientific concepts while engaging in tangible, local activities; offline events should be appropriately mixed with virtual exercises.

This easily explores why offline workshops and hands-on activities are crucial for science education, with a focus on school-level activities, emphasising the effectiveness of intensive offline efforts at the local level compared to online seminars on a global scale. However, it is being highlighted that an optimum blending of offline activities with judicious mixing of online exercises can provide an enlightening environment for students at different educational levels, where the time and money requirements as well as face-to-face interactions with experts are optimised.

Offline versus Online

Firstly, offline workshops offer a unique opportunity for students to engage directly with scientific concepts outside the confines of a digital interface. Through hands-on experiments, demonstrations, and interactive sessions, under the supervision of the school teachers, students can experience the principles of science firsthand, stimulating their curiosity and fostering a deeper understanding of the subject matter and the teachers undergo much needed self-orientation for professional development. Moreover, hands-on training with physical presence and the scope of interaction with experts and peers foster critical thinking and problem-solving skills essential for scientific inquiry. Many people have devised excellent simulations for the betterment of the level of understanding of learners. But this activity only using online platforms is not enough for the purpose. For instance, a physics workshop where students build simple machines like pulleys and levers allows them to witness the laws of motion in action, enhancing their comprehension beyond what textbooks or virtual simulations can provide. Unlike online seminars, which primarily rely on the passive consumption of information, offline workshops actively engage students in the learning process, fostering a more immersive educational experience. We state with great emphasis that there is no other alternative to hands-on experiments in science education. By grappling with real-world challenges and experimenting with different solutions, the students learn to think creatively and analytically and the teachers learn how to augment their classroom transactions with experiments. In the domain of biological sciences, a simple and highly inexpensive arrangement of photosynthesis experiments, built on used plastic water bottles, can stimulate much interest among the students both in biological as well as physical processes. This hands-on approach not only enhances their understanding of biological concepts but also cultivates skills such as observation, inference, and hypothesis testing, which are invaluable in scientific research and discovery. In traditional classroom settings, instructors can provide immediate feedback, clarify doubts, and tailor instruction to meet the individual needs of students. This personalised approach to teaching is often lacking in online seminars, where communication is mediated through digital platforms and may lack the nuance and immediacy of face-to-face interaction.

Furthermore, offline workshops promote collaboration and teamwork, mirroring the collaborative nature of scientific endeavours on a global scale. By working together to design experiments, troubleshoot problems, and analyse data, students learn to communicate effectively, respect diverse perspectives, and leverage collective intelligence. For example, a science workshop where students collaborate to conduct experiments with low-cost and no-cost items and analyse their results encourages teamwork and peer learning, fostering a supportive learning environment conducive to scientific exploration. Additionally, offline workshops provide opportunities for students to connect with their local communities and apply scientific knowledge to address real-world issues. This localised approach to education not only enhances relevance and accessibility but also fosters a sense of ownership and pride among participants. In contrast, online seminars often cater to a global audience and may struggle to address the diverse needs of learners from different backgrounds and contexts. Offline workshops create intensive engagement for teachers and the taught at the local level allowing teachers to address specific needs and challenges within their communities. This aligns with the ethos of "think globally, act locally," encouraging students to consider the global implications of scientific phenomena while taking action within their immediate surroundings. For instance, an environmental science workshop might involve students conducting water quality tests in local rivers or designing sustainable solutions for reducing waste in their school cafeterias. By engaging in such activities, students not only get their understanding of environmental issues deepened but also develop a sense of responsibility and stewardship towards their local ecosystems.

Can blended form of conducting training be tried?

It may be emphasised how a perfect blend of online and offline activities leads to an augmentation of the efficacy of a proposed programme. It is obvious that, for an offline workshop of finite-time duration on physics experiments, much time is generally spent in explaining the objectives of the workshop, introducing its content in detail, forming groups and assigning experiments, and reporting, etc. If a manual of the experiments and the live videos of the experiments are uploaded earlier in the WA group of the participants before convening an online meeting of the group, the students have enough time to get exposure on the details of the experiments before joining the meeting. The student-participants, in the meeting, will get explanations of the arrangement and procedures of the experiments from the resource persons. They can clear their doubts in this online meeting also. Finally, students' groups will also be formed in this meeting and some experiments will be allotted for each group. In this way, the considerable time necessary for offline workshops can be saved. So, more time would be available for performing the experiments in an offline workshop. In the offline feedback session, students will avail the scope of interacting with the resource persons only for the 'new' observations they have observed and questions encountered, while performing the experiments. However, the discussion part may be conducted later from an online platform in the presence of the supervisors and other concerned resource persons. Finally, the participants will submit their lab reports on experiments via an online classroom. In fact, the procedure of using a blended platform was followed in the 2022 edition of the C.K. Majumdar Memorial Summer Workshop in Physics (CKMMSWP).

In view of the above discussion, we have tried to highlight that we should use perfectly blended platforms (offline and online) for better contribution to science education, especially at the school level. In this context, let us explain the advantages of the implementation of the EBS (Exhibition in Basic Science), an ongoing project of The Regional Council (RC) 15 of the IAPT and its allies.

The RC 15 conducted in the recent epidemic period, the National Graduate Physics Examination (NGPE) Part-C in 2020 and 2021 from a blended platform. In the mixed platform, the organisers instructed the examinees how to participate in an experimental test from an online platform and how the supervision and proctoring were conducted therefrom. Both the programmes were successful and everyone concerned was satisfied. In fact, after the success of these tests, the RC 15 conducted several experiment-based programmes mostly for school children. These programmes were organised as the parts of celebrating the birth centenary of Prof. D.P. Khandelwal in this pandemic period. In 2022, the CKMMSWP was also conducted using a blended platform.

It may also be recalled that RC-15 together with its allies is in the process of implementing this EBS project which, in reality, is a remedial measure of the NSCF 2023 observations as regards school science education. The document noted that science classes in schools are not supported by demonstration of experiments and there is no correlation between what students learn in classrooms and beyond. NSCF 2023 has also observed that nothing could be done for rectification as the school timetable is too rigid. This observation of NSCF 2023 is absolutely true. The essentials of the EBS project had been explained before 110 school science teachers, representing more than thirty schools in a seminar. In the feedback forms the teacher participants noted unanimously that EBS objectives could be realised.

What are the EBS objectives? A group of 50/60 students spread over different classes would be trained in selected low-cost experiments covering the entire gamut of science disciplines in the secondary stage with the help of their teachers in assistance with IAPT-Midnapore College Centre for Scientific Culture (CSC) activists and the representatives of the allies. In the process of creating this Active Group of Students (AGS), the teachers undergo self-orientation in academic matters, particularly in science experiments. They will empower themselves in supervising students' projects. Even they may be motivated to write research papers after critically examining the presentations of the concepts including the suggested experiments, in the science texts. Finally, they will guide their students to organise periodic educational science exhibitions benefiting everybody inside and outside the school community. Eventually, an environment of teaching and learning science through experiments will prevail on school campuses, and more and more students will be attracted to science disciplines for their higher studies. It is not a one-time activity limited to a particular period. This is a perpetual project to be continued for time to come. It is expected at the end of the beginning year, the AGS together with their teachers will organise the science exhibition. In the new year, the final-year students will leave the school but the new students will join the AGS. The new entrants would be trained by their seniors. A joint effort of the teachers and the taught will bring in new experiments and new exhibits. Attempts will be made to give a new look to old experiments. New activities and innovative project ideas will be generated and the teachers will find new themes for writing research papers in science education, even in mainstream science also. This way EBS will continue perpetually. ***The most important outcome of this exercise is that teachers can get assistance from AGS in conducting classroom demonstrations***. Right now, it is not possible due to a rigid school schedule. It is interesting to note that two /three schools are loudly thinking of having a CSC-like Centre in their campus. A similar idea was cherished by DPK while inaugurating the CSC in Midnapore College!

The Irony

But, with all the enthusiasm of the organisers, some schools are yet to invite them to initiate the activities, even after a lapse of six months. The organisers have given the needy schools the materials for conducting experiments, with funds collected from philanthropic organisations. Manuals are ready and the live videos of the experiments (in working conditions) are in the final preparatory stage. But the implementation of EBS fails to reach the desired target. The natural question will come: Why? The major reason is that available time in schools is too short to implement the EBS programme. The school timetable is really rigid so that it is difficult for the school authorities to find time for implementation of the EBS project. But, we feel, the root cause is the factor of psychological barriers. That's why most of the schools fail to consider EBS as their own activity.

Still a ray of hope …

Under the circumstances, much of the project implementation work has to be undertaken from a blended platform. Most of the instructions would be given from an online platform with the help of manuals and videos. The student would perform the experiments, as much as possible, from their home desks; other experiments would be done in school labs under the offline supervision of their teachers. To date, schools are being pursued so that they can afford time, though minimum, for the EBS project. The situation is somewhat tough in the first year. From the next year, everyone would feel and observe the positive impacts of the EBS exercise. An impetus from within may be expected to find time and utilise the same for EBS. Of course, compared to the first year, much less time will be required in the latter time as most of the exhibits have been studied well and most of the Active Groups of Students are well trained.

Conclusions

In conclusion, offline workshops and hands-on training with face-to-face interaction indeed play a vital role in science education by offering students tangible experiences, fostering critical thinking and collaboration, and connecting global scientific concepts with local action. Online seminars are also helpful in the context that they provide convenience and accessibility, and save much space and time as well as money. However, only online seminars cannot meet the level of depth, authenticity, and personalised attention afforded by offline workshops. Thus, for a particular project, the offline and online activities will be complementary to each other. We know that school education is the primary building block of our national education system. So, our greatest concern should be to uplift the school education system and the understanding level of learners. In our opinion, intensive offline efforts at the local level are often more effective in addressing the diverse needs of learners and fostering meaningful connections within the learning community. Online platforms must be used extensively as a forerunner of any offline activities. This view of organizing any programme, especially at the school level but applicable to the college level also, will be much more effective. By incorporating such activities into the school curriculum, educators can inspire the next generation of scientists, engineers, and innovators who are equipped to tackle the complex challenges facing our world. As we strive to think globally and act locally, offline workshops serve as catalysts for scientific exploration and discovery, empowering students to make meaningful contributions to their communities and the world at large. But, one has to keep in mind that, when such workshops are partially conducted through an online platform, participants can easily communicate with global experts.

Acknowledgement:

We thankfully acknowledge Dr. Chinmoy Kumar Ghosh for his valuable comments and suggestions in giving shape to the final form of the manuscript.

22nd Annual Convention of IAPT-GOA RC 21

The 22nd Annual Convention of IAPT, Goa Regional Council was held on Saturday, 6th April 2024 from 09.30 am to 06: 00 pm at Swami Vivekananda Hall, PES's RSN College of Arts and Science, Farmagudi Ponda Goa. Physics teachers and students of HSS, Colleges as well as Physics enthusiast from the state attended the convention.

Prof P K Ahluwalia, President, IAPT was the Chief Guest for the Inaugural function and Prof. V J Pissurlekar, Principal PES's RSN College, presided over the function.

The inaugural function commenced with Mr. Vishnu Naik captivating the audience with an invocation song, setting a serene and auspicious ambiance for the event. Breaking from tradition, the convention was inaugurated by the Chief Guest and other dignitaries by watering the sacred Tulsi plant. Dr Satish Keluskar, President Goa RC delivered the welcome address and briefly introduced the Chief Guest. Dr Reshma Raut Dessai, Secretary RC Goa provided insight into the organization's mission and outlined the activities planned for the day. In his presidential speech Prof Pissurlekar, welcomed all the dignitaries to his institution. He expressed concern about the number of students opting for pure science stream, in particular the dwindling number of students offering physics. Prof Ahluwalia in his inaugural speech congratulated RC, for being among the few vibrant RCs in India and diligently conducting the annual convention among other programmes every year. He also shared his views of quantum world and the immediate programmes that IAPT is working on, related to quantum computing all over India and urged all IAPT members to be part of this programme. The inaugural function concluded with the vote of thanks proposed by the Local Coordinator Dr. Girish Kundaikar.

Prof Ahluwalia, delivered key note address on the topic “Learning and teaching of Physics in the Era of Artificial Intelligence”. He gave an insight to GPT, development of prompt topic dependent engineering skills. He also emphasized on the importance of machine learning and requested teachers to be more focused on teaching. He said that the teacher's role will be enhanced towards personalized teaching and learning taking them beyond pulp information.

The technical session started with the first talk by Dr V. Girish, deputy director ISRO Space science programme. He spoke on the Evolution of star. In which he underlined the understanding of the processes involving the birth and death of a star as well of the fate of our sun in the next 4000 billion years.

In the second technical session Dr. Apratim Ganguly, LiGo India R &D staff scientist from IUCAA Pune, gave a comprehensive talk on “Science with LiGo India”.He shared his insights into the cutting-edge research conducted at LIGO-India. The participants were exposed to new vistas of gravitational wave astronomy and its significance towards advancing scientific understanding.

The annual general body meeting was held post lunch for all the life members in which the report of activities that were conducted throughout the year and the audited statement of accounts was presented. The future activities planned during the academic year 2024-25 were presented in the meeting. Special invitee for AGBM, President Prof Ahluwalia once again expressed his deep sense of pleasure of the activities conducted by IAPT Goa RC from its inception. He also mentioned about various upcoming activities of IAPT. Prof Ahluwalia virtually walked the audience through the IAPT website and highlighted on the ease of obtaining membership of IAPT on the website in addition to several other web facilities.

Followed by this was the captivating Experimental demonstration by Prof. Jayant Joshi from UGC DAE-CSR, BARC Centre, Mumbai. Dr. Joshi demonstrated innovative teaching methods and gave practical insights into effective pedagogical approaches, enhancing their teaching skills. .

The chief guest for valedictory function was Shri Shailesh Zingade, Director of Education, Govt. of Goa. In the valedictory function participants gave their feedback. The report of the entire day's session was presented by Mr. Irshad Shaik. The toppers of M.Sc., B.Sc., in Physics and Electronics, HSSC topper in the subject of Physics and PhD awardees in Physics were felicitated.

Two superannuated Physics Teachers, Dr Vishwajeet Kulkarni and Mrs Meena Sardesai were felicitated for their contribution in teaching Physics.

In his Speech the Chief Guest Shri. Shailesh Zingade encouraged the teachers to up to date with latest trends so that the student's community will benefit at large.

Dr Dessai, proposed the vote of thanks.

Reshma Raut Dessai

Secretary

Report

The Participation of Indian Team in the 24th Asian Physics Olympiad

The 24th **Asian Physics Olympiad 2024** is held at the **Universiti Tunku Abdul Rahman (UTAR) Kampar, Malaysia** from June 3 to 10, 2024. Indian team of seven students with two leaders and one observer participated in the international competition/activity. Based on the accepted criteria for the selection of the team of students to represent the country at the Asian Physics Olympiad on the basis of their performance in National Standard Examination (held on 24.11.23) and then the Indian National Physics Olympiad (held on 3.2.2024) a team of eight students was shortlisted to represent the country. Because of the some unforseen problem one student could not join the team. The Indian team consisted of the following member -

1. Aditya, Delhi.
2. Rhythm Kedia, Raipur.
3. Kanishk Jain, Pune.
4. Rajit Gupta, Kota.
5. Bhavesh Ramakrishnan, Delhi.
6. Eppa Laxmi, Hydrabad.
7. Dakshesh Mishra, Mumbai.

The team was accompanied by -

1. Dr. Vijay Kumar, Dean, Allied Sciences Graphic Era Hill University Dehradun, Coordinator APhO

2. Dr. Sitikantha D Das, Department of Physics I I T Kharagpur as Leaders and

3. Dr. B P Tyagi, Chief Coordinator (Examination) as the Observer.

Having been shortlisted for the Indian team, all the students assembled at Graphic Era Hill University Dehradun to attend the pre-departure camp in the Asian Physics Olympiad Laboratory established by IAPT at GEHU Dehradun on 27.5.24. During the camp from 27.5.24 to 1.6.24 the students were trained for an experimental skill to work on the experiments conducted at previous years of APhO held in different countries along with their theory classes as per the specified schedule from 8 am to 6 pm. The students were trained under the expert supervision of Prof. H C Verma Retd Professor IIT Kanpur, Prof. A V Kulkarni, Professor, BITS Pilani Goa Campus, Prof. A K Dimri Former Principal M S (PG) College Saharanpur (U. P.), Dr. Ravi S Bhattacharjee Former Professor SGTB Khalsa College University of Delhi, Dr. Sitikantha D Das IIT Kharagpur, Prof B P Tyagi Chief Coordinator (Examination) IAPT and Prof. Vijay Kumar HOD Physics Graphic Era Hill University Dehradun.

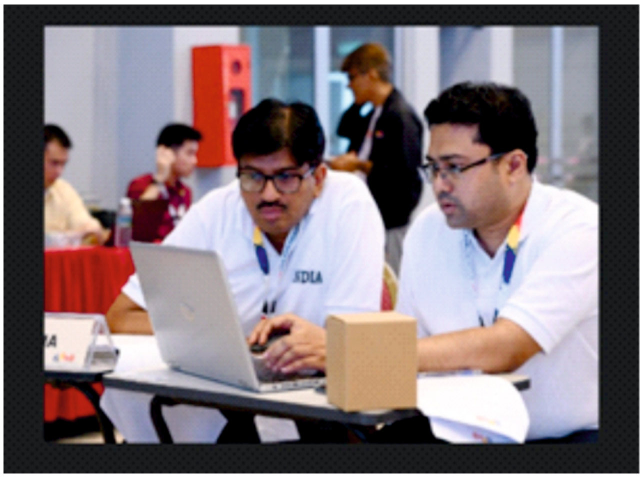
Apart from the scheduled training of the students during the camp, these six days were also utilized for other formalities just for as the international travel the purchase of the tickets, online-Visa, health insurance for international travelling and measurement and preparation of blazers etc.

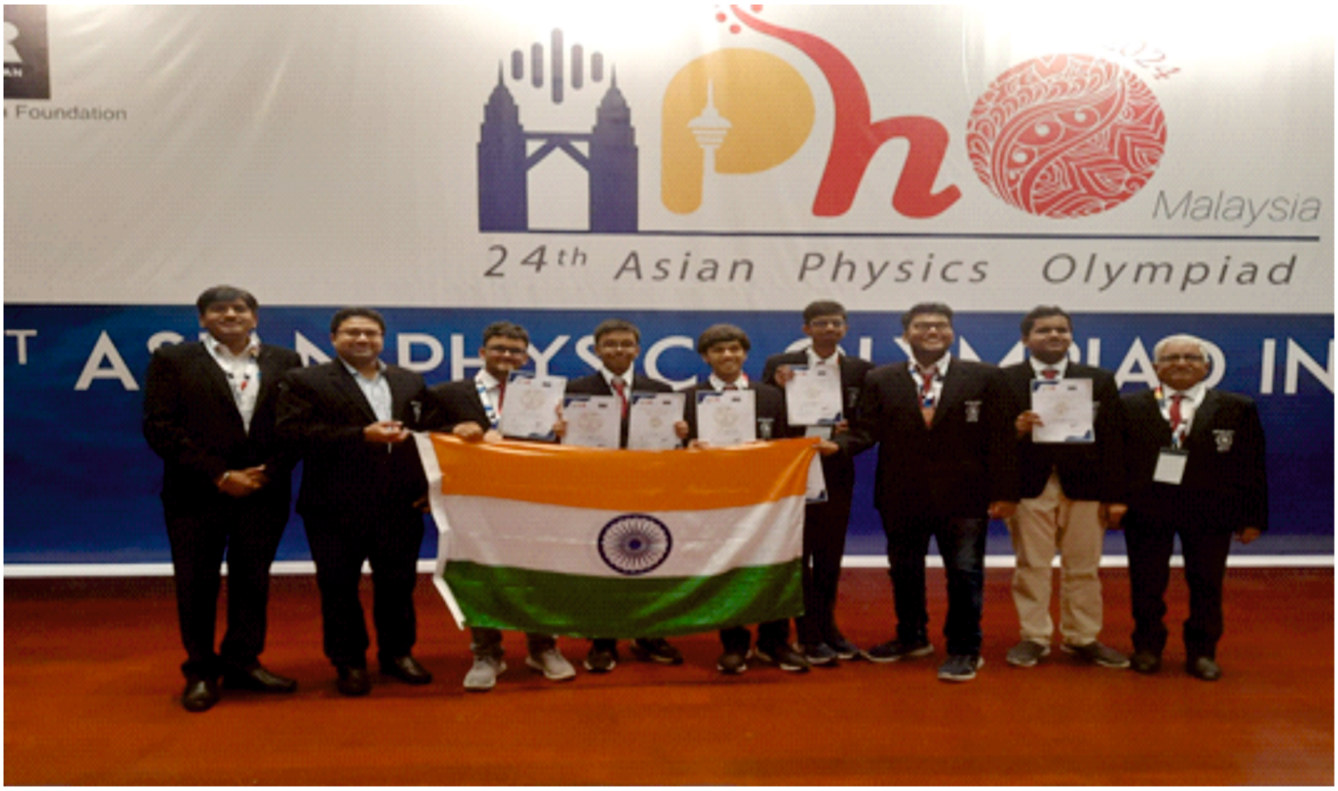
Armed with all necessary documents, the team left GEHU Dehradun on the afternoon of June 2, 2024. The team was flagged off by Prof Sanjay Jasola the Hon'ble Vice Chancellor, Graphic Era Hill University Dehradun for Airport. After all sorts of security checks at Delhi airport the team took its flight to Kualalumpur Malaysia at 11:00 pm on June 2, 2024. Taking up the long flight of nearly 5 and half hours, we reached Kualalumpur airport in Malaysia at 7.30 A.M. (Local time) on the June 3, 2024 . From Kualalumpur airport, the team was taken over to the Universiti Tunku Abdul Rahman (UTAR) Kampar, Malaysia by the organizers via a three hour long bus route.

The formal inauguration ceremony of 24th Asian Physics Olympiad was held from 10 am to 1pm on June 4, 2024, After the lunch the students and the teachers were taken to the separate destinations. The meeting of the leaders and observers for the setting of theory questions started at 2 pm in meeting hall of the University and lasted long till 3 am or so in the night of June 5, 2024 with long discussions and deliberations. This meeting continued for about 13 hours and at 3 am, all the leaders submitted the theory question papers to the organising members. The next morning the students had a long span of 5 hours of theory examination while the teachers were taken out for excursions to some historic places. The scanned copies of the students of their theory examination were provided to the respective leaders by 10 pm on 5.6.24 for the evaluation of theory questions which continued throughout the night. The process of evaluation was completed in whole night of June 5 2024. In the morning of June 6, the meeting of experimental problems started at 10 am where the experiments were performed by the leaders to ascertain all the observations and results. It continued till 1 pm at night of June 7, 2024. At 1 pm on June 7, the leaders submitted the problems of experiments to the organising team. The evaluation of answer scripts of experimental problems was started from morning June 8, 2024. The marks of theory and experimental problems were uploaded to the portal of 24th APhO in evening of June 8, 2024. In the morning (10 am to 1 pm) of June 9, the moderation and discussion on marks were carried out one by one. After lunch, the international board meeting of Asian Physics Olympiad started at 2 pm and lasted till 6 pm. The award ceremony and gala dinner were on the same day (9.6.24) from 7 pm to 10 pm.

The Indian team did a wonderful presentation at the 24th Asian Physics Olympiad in Malaysia. All the seven contestants of the Indian team won a total of seven medals. Mr. Rhythm Kedia won gold, Mr. Aditya, Mr Dakshesh Mishra and Mr Rajit Gupta won bronze medal while Mr. Kanishk Jain, Mr Bhavesh Ramakrishnan and Mr Eppa Laxmi won honorable mention.

As per the instruction of organising committee, on the morning of June10, the Indian team left the Hotel Grand Kampar at 8.30 am to the international Airport Kualalampur and passed almost the day there till we had a flight at 6.30 pm for Delhi. The team reached Delhi airport at 11 pm. Where the participating students were taken away by their guardians. Thus the team got dispersed from the Delhi airport on June 10, 2024.





Vijay Kumar, Sitikant D Das, Rajit Gupta, Kanishk Jain, Aditya, Bhavesh Ramakrishnan, Dakshesh Mishra, Eppa Laxmi, B P Tyagi

Vijay Kumar* and Sitikant D Das**
*Graphic Era Hill University Dehradun ** IIT Kharagpur

Anveshan – 2024

Teaching Competency Building Training Program ror Physics Teachers

Activity: Innovation Week 22-02-2024 to 28-02-2024.

Venue: Pithapur Rajah's Government College (A), Kakinada, Andhra Pradesh

Organised by: Centre for Innovation & Incubation & All Science Departments

In collaboration with: IAPT, RC-11 & Focus IAPT Anveshika, Andhra Pradesh

Topic: Innovative Pedagogy in Physics: Experiment Based Teaching - Learning Process

No. of Participants: 104, These included Physical Science Teachers from High Schools, 15 Degree-College Lecturers, nearly 200 Students from different Degree and Junior Colleges.

Resource Persons:

1. Dr. J.Chandrasekhar Rao, Lecturer in Physics, HOD, Govt. Degree College, Rajam
2. Sri. B. Venkata Rao, SA Physical Sciences, ZPHS, Mettavalasa, Laveru, Srikakulam

Programme Details: Under the leadership of Principal Dr. B V Tirupanyam, P R Government College (A), Kakinada, in collaboration with the RC-11, and FOCUS IAPT ANVESHIKA, organized a Teaching Competency Building Training program for Physics Teachers. This event, focusing on Innovative Pedagogy in Physics: Experiment-Based Teaching Learning Process, took place on February 26, 2024, as part of its Innovation Week Celebrations (February 22-28, 2024). With the steadfast support of the Department of Physics & Electronics, P R Government College (A), this initiative aimed to enhance teaching methods and foster an enriching educational experience for both educators and students.

During the inaugural session, alumni students of P R Govt. Degree College and the Principal illuminated the lamp and shared insights into the college's history, service motto, and its commitment to promoting students in their life pursuits. The principal emphasized the college's dedication to organizing such activities for the all-round development of students.

In the first session, we conducted the **Le**arning Physics Through **N**ature (**LEPTON**) program for students, under the observation of participant teachers. The teachers were expected to replicate the program in their respective schools/colleges. We showcased less than one-minute video clips depicting daily life events, crafted by our Anveshika team at Shiksha Sopan, Kanpur. These clips covered topics such as Mechanics, Fluid Mechanics, Measurements, Waves, Optics, Thermodynamics, and Electromagnetism. After each video, we posed multiple-choice questions, requiring students to provide answers on provided white paper sheets. Once all clips were shown, we collected the answer papers.

Meanwhile, our Anveshika team members began evaluating the papers in a separate room. Concurrently, an open discussion ensued, allowing for the clarification of questions and hands-on demonstrations of the video concepts. Both students and participant teachers actively engaged in learning the basic principles of physics.

This model program serves as the screening test for the National Anveshika Experimental Skill Test (**NAEST**), an annual event conducted under the guidance of H.C. Verma, Former Professor at IITK and National Coordinator of the National Anveshika Network of India (**NANI**). From this screening, we select 2% of students for the state-level preliminary test of NAEST. These selected students bypass the screening test and gain direct entry to the Preliminary Exam.

In the second session, covering Mechanics, Waves & Oscillations, and Electricity, we conducted various demonstrations:We illustrated wave motion, including crests, troughs, velocity, and characteristics like amplitude, frequency, and wavelength using straws.The concept of force was exemplified by showing how much one newton is using a weighing machine.Pressure and pressure differences were demonstrated using water bottles equipped with long and short straws, as well as a bottle with three holes.Atmospheric pressure was showcased using a transparent pipe.Lung efficiency and Bernoulli's theorem were explained through the use of long balloons.Newton's third law was demonstrated using flying magnets.Centripetal force was depicted using a rotating glass with a ball.Boyle's law was illustrated using a syringe with a small balloon.Aerodynamics concepts were explored using a small PVC pipe and a paper cone.Sound phenomena were demonstrated with straws.Static charge was exhibited using two straws and a bottle. The working principle of a simple generator was showcased, Faraday's laws of electromagnetic induction were explained using a *damroo*. These hands-on demonstrations provided a practical understanding of fundamental physics concepts to both students and participant teachers.

During the third session on Optics – Experimental Demonstration, we comprehensively covered the properties of light, including its rectilinear propagation, the Ray Optics approximation, reflection, the laws of reflection, refraction, rarer and denser mediums, focal lengths of concave and convex lenses, radius of curvature, and the relationship between focal length and radius of curvature, chromatic aberration, dispersion of light, refractive index of solid prism and glass slab, and total internal reflection. All these are demonstrated using our newly invented Parallel Rays Producer Device. Additionally, we delved into interference, diffraction, polarization, and the intensity variation of laser beams.

In the subsequent fourth session on Rocket Launching, we presented an experimental working model and elucidated the basics of rocket motion and rocket science. Throughout these sessions, the resource persons illustrated various teaching methods necessary for effective learning. The engagement of all participants was remarkable; they actively interacted and absorbed the material effectively.

During the closing ceremony, heartfelt accolades were extended to both resource persons for their tireless dedication in delivering enlightening experimental demonstrations.In his closing remarks, Tirupanyam emphasized that all school and college managements should adopt such innovative teaching methods utilizing low-cost, easily available materials in the region.He expressed gratitude to Principal Dr. P. Swapnahaindavee of Govt. Degree College, Rajam, and the Headmaster of ZPH School, Mettavalasa, for their invaluable support, alongside extending appreciation to the DEO of Kakinada.

J Chandrasekhar Rao

Orientation Cum Selection Camp for Junior Science Olympiad

The Indian Association of Physics Teachers (IAPT) conducted the Orientation Cum Selection Camp (OCSC) for the Junior Science Olympiad from May 7th to May 20th, 2024. Held at the Talent Development Centre (TDC) at the Indian Institute of Science (IISc), Challakere, Karnataka, the camp aimed to select six students from 36 participants to represent India at the International Junior Science Olympiad (IJSO) in Romania.

Participants were selected through a two-stage examination process: the National Standard Examination in Junior Science (NSEJS) and the Indian National Junior Science Olympiad (INJSO). This year, the OCSC was conducted outside the Homi Bhabha Centre for Science Education (HBCSE) for the first time, with significant support from HBCSE and contributions from teachers across India.

Pre-Camp Preparation

Two Resource Generation Camps (RGCs) were organized to prepare high-quality experimental tasks and theoretical questions:

1.First RGC (Experiments): Resource persons presented and shortlisted 6-8 experiments per subject, involving 24 participants.

2. Second RGC (Theoretical Papers): Resource persons presented theory and MCQ questions, with 20 participants involved.

An exposure camp in March further prepared participants. Coordinators arranged travel, accommodation, and logistics, with multiple visits to TDC and meetings with senior IAPT members.

OCSC Activities

The camp commenced on May 7th with student registration at Vidyavardhaka Sangha First Grade College. After arriving at TDC, IISc, the camp was inaugurated by Prof. Subba Reddy. The OCSC included:

1. Orientation, Training, and Practice Tests: Topics relevant to IJSO, but not covered in Indian high school curriculum, were taught by experts. Training included laboratory familiarization.

2. Theoretical and MCQ Tests: Based on questions prepared during RGCs, with solutions and feedback discussions.

3. Experimental Tests: Two individual and two group experiments in Physics, Chemistry, and Biology, with detailed grading discussions.

4. Grading and Arbitration: Involving two graders per paper and cross-verification by moderators. Arbitration sessions allowed students to review grades.

5. Enrichment Lectures and Activities: Included an ecology field trip and a quiz program.

Field Trip and Excursion

-Field Trip: Ecology field studies around TDC campus, guided by Dr. Chetan Nag from Jain University.

-Excursion: Visit to Chitradurga Fort, 30 km from TDC.

Valedictory Program

The valedictory program was held on May 20th, 2024, at Parthasarathi Hall, VVS College, Rajajinagar. Chief guests included former ISRO Chair Mr. Kiran Kumar and TDC Convenor Prof. Subba Reddy. All 36 students received gold medals, and the selected team for IJSO 2024 in Romania was announced.

Acknowledgments

We extend our gratitude to all resource persons, TDC staff, HBCSE, IAPT members, and everyone involved in organizing the camp. Congratulations to the selected students, leaders, and observers.

Enrichment Lecture

Speaker	Topic
Dr. Kiran Betadapura, Biocon	Science and Art of Drug Design
Prof. Madhusudhan, Jawaharlal Nehru Planetarium	Polarization in Nature
Prof. Ahluwalia, President, IAPT	Quantum Dots
Prof. Sudhir	How Biologists Think

Selected Students

Name	State
Pranit Mathur	Gujarat
Harshit Singla	Punjab
Manas Goel	Haryana
Jinansh Jignesh Shah	Maharashtra
Bhavyaa Gunwal	Punjab
Shwetank Agarwal	Haryana

Delegation Leaders and Scientific Observers

Name	Role	Subject
Dr. B.S. Achutha	Leader	Physics
Dr. Rekha S	Leader	Chemistry
Dr. Srinath T.L.	Leader	Biology
Prof. Rekha Ghorpade	Scientific Observer	

M K Ragavendra
Achutha B S
IAPT-JSO

IAPT National Annual Convention 2024
(Second Announcement)

The registration for the IAPT National Annual Convention 2024 is open. Last date for the registration of Annual convention is 31 July 2024.

Participants can join one of the following pre-convention workshops by paying extra Rs. 1000 along with the registration fees.

1 Research Based Pedagogical Tools : Dr. Vandna Luthra.

2 Innovative experiments using Exp EYES : Er. V. V. V. Sathyanarayana IUAC New Delhi.

3 Computer Simulations in Quantum Physics : Dr. Pawan Sharma and Dr. Sapna Verma.

4 Innovative Experiments and Demonstrations in Physics : Prof Y K Vijay.

5 XCOS : Dr. Anil Kachi and Mr Lalit Kumar

6 Video and Image Analysis using Tracker : Dr. Jyothi Bharadwaj and Dr Aditi Sharma.

7 Statistics Physics Simulations : Dr. Vandana Sharada and Ms Ayushi Awasthi.

8 Nuclear Shell model using Worksheet : Dr Swapna Gora and Ms Shikha Awasthi.

9 Telescope Making (Cost for this workshop is Rs 5000).

QR Codes to Participate in Four-part to Survey to Draft Vision IAPT@50

www.indapt.org.in **Perspective on future growth of IAPT** **first part of the four parts survey** **Vision IAPT@ 50 part I**	www.indapt.org.in **Identifying Strategic Focus Areas** **Second part of the four parts survey** **Vision IAPT@ 50 part II**
www.indapt.org.in **Member Engagement and support** **Third part of the four parts survey** **Vision IAPT@ 50 part III**	www.indapt.org.in **Evaluation of Progress and Impact** **Third part of the four parts survey** **Vision IAPT@ 50 part IV**

Trends and Themes in Physics Education Research (PER)

To Lecture or Not to Lecture ! Diverging Values and Expectations

Physics Education Research (PER) over the last few decades have generated valuable insights and materials to improve the teaching and learning of the subject. However, their acceptance and adoption by the physics teacher community have been patchy, at best. This is true even in countries like US where the discipline has gathered substantial momentum over the years. The paper below investigated some of the possible causes of resistance among teachers in adopting PER informed pedagogies and materials.

Henderson, C., & Dancy, M. H. (2008). Physics faculty and educational researchers: Divergent expectations as barriers to the diffusion of innovations. *American Journal of Physics*, *76*(1), 79-91.

The reported study was carried out in US, by interviewing teachers who were inclined to incorporate PER findings in their instruction. Discrepancy or divergence in expectations of teachers and physics education researchers, situational constraints etc. were identified as some of the key barriers to dissemination of education research findings.

Plausibly these issues are broadly true even in our contexts. Let us discuss a concrete case - perceptions on the efficacy of the lecture method as an illustrative example. We all know that lecture method is still the most prevalent mode of instruction in most Indian classrooms. Now comes the question of what does PER say in this regard and what do most of the physics teachers believe. More importantly, are there discrepancies between the two camps if so why. Many PER studies have been emphatically arguing that interactive methods have better learning gains compared to traditional lecture method (see Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, *66*(1), 64-74., as an example). Now the problems arise when one starts interpreting the studies such as the one by Hake, in an unnuanced manner. A PER zealot considering the study as a total dismissal of the lecture method will naturally be in conflict with a teacher who has been `successfully' lecturing throughout his career. The teacher based on his experiences may likely reciprocate the dismissiveness by questioning the validity of education research itself. If we look closely, both the above stances are undergirded by one's training, biases, convictions etc. and the truth lies somewhere in between. It is true that substantial empirical evidence (including studies showing similarities of brainwave activity pattern of students while they are sitting in lectures to when they are sleeping or watching TV) exists which points to the problems of lecture method. Nevertheless, these research may not suffice to convince our experienced lecturer as he likely would have many students who turned out well. His intuitions are in fact not fully wrong - lecturing do work when certain preconditions are met, as discussed by the below mentioned paper.

Schwartz, D. L., & Bransford, J. D. (1998). **A time for telling**. *Cognition and instruction*, *16*(4), 475-522.

If learners are sufficiently prepared - the soil adequately tilled - the seeds of lectures are likely to take root. In a class of many there may be a few whose knowledge state are ready for `telling' or lectures, who are likely the data points underlying the conviction of our experienced lecturer.

What I am trying to throw light on are possible sources of divergences of values between teachers and PER folks and how they can impede dissemination of research driven reforms. The interesting point to note is that there are no fundamental inconsistencies between the arguments of any of the three papers cited above. Lectures do have problems, and when PER emphasizes interactive engagements the essential call is to raise most of the students (not just the a few!) to a level of preparedness so that teaching and learning is effective. Concluding, the productive way to go forward would be to accept that there are going to be divergence in expectations. However, letting them devolve into mutual dismissiveness would be naive and not in the interest of physics education. Our efforts should be to promote more nuanced discussions of the methodology and findings of PER, and cultivate research that take into account our socio-cultural and economic realities.

K K Mashood
HBCSE - TIFR, Mumbai

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