

# Indian Journal of Science Communication

*Communicating Science of Science Communication*

**Celebrating 200 years of science journalism in India  
(1818-2018)**

**Impact of health gallery in understanding science  
among rural students**

**Round Table Meet on Mass Communication**



# Indian Journal of Science Communication

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# Celebrating 200 years of science journalism in India (1818-2018)



Science communication to the masses is all about dejargonization of complexities of science in a language that is comprehensible to the common man. Accordingly, science communication needs to follow the "language of communication" irrespective of any language whatsoever is applied as a vehicle to convey the messages of science, technology and innovation to different stakeholders. It becomes more challenging when it comes to communicating science in regional languages, as most of the technical and scientific terms are created mainly in English and they hardly have a substitute or an alternate in the given regional language. Similarly, the terms available in Indian languages cannot be equated with their possible counterparts in English as well.

The Commission for Scientific & Technical Terminology (CSTT) established under the Chairmanship of a famous Physicist Dr. D.S. Kothari, who gave a doctrine for science communication: i) Science communication for experts; and ii) Science communication for commoners. Dr. Kothari had suggested two sets of scientific and technical terminologies for science communication. He was of the opinion that the general public should not be over-burdened with the complexities of scientific jargon and be informed in laymen language. However, for the purpose of scientific precision and accuracy, the experts need to be communicated with proper complexities of science and technology by using appropriate scientific and technical terms.

Science journalism in India dates back to April 1818, when a general interest monthly magazine *Digdarshan* started its publication from Shrirampore, West Bengal. *Digdarshan* was a monthly magazine published in three languages simultaneously, i.e., Hindi, Bengali and English. *Digdarshan* carried a number of scientific articles of common interest. The first issue of *Digdarshan* published an article 'The native plants that cannot be grown in the UK'. The second issue of *Digdarshan* published an article "A journey by steamboat". Although, *Digdarshan* was not a full fledged science magazine, but it carried couple of articles and other materials dedicated to science of common interest. Mostly, it used to carry educational news and articles, etc. Since textbooks and other reading materials were not available those days, especially in regional languages, the Calcutta School Book Society used to purchase the copies of *Digdarshan* and distribute to schools for the benefit of teachers and students. The title page of English edition of *Digdarshan* stated 'Magazine for Indian Youth'. *Digdarshan* can be called a periodical for the youth and science. It contained articles on geography, agriculture, zoology, physics, history, geographical discoveries like that of Columbus, and stories relating to India and Bengal. It was not illustrated, though, *Digdarshan* used remarkably simple language. February 1821 issue contained a 10 page dictionary in which the words used in different articles were explained. It certainly set a standard for the future science magazines in India.

Thereafter, the journey of science communication and journalism continued with institutional as well as individual efforts and finally the first full fledged monthly popular science magazine *Vigyan* was started in 1915 in Hindi from *Vigyan Parishad Prayag*, which is still continuing. *Vigyan* celebrated 100 years of its glorious existence in 2015 where India's beloved scientist turned President Dr. A.P.J. Abdul Kalam graced the occasion with his benign presence and views. In the series of popular science magazines, a few efforts are noteworthy: CSIR has started publication of '*Vigyan Pragati*' popular science monthly in 1952, and *Science Reporter* in 1964, which are the largest circulated popular science magazines in India. Other magazines joined in the series are: *Awishkar*, *Invention Intelligence*, *Vigyan Bharti*, *Vigyan Doot*, *Vigyan Puri*, *Vigyan Jagat*, *Vaigyanik*, *Chakmuk*, *Parasmani*, *Science India*, and *Vigyan Pravah*, etc.

From the evolutionary perspective of science communication and popularization in India, the publication of *Digdarshan* holds an important position. The assessment and analyses indicates that the journey of science journalism is full of vivid examples and gives a thorough understanding as how science communication in the country has been able to make inroads despite several impediments and has progressed to cater to the larger audience to promote science awareness and scientific culture in the society. Hindi, being one of the major Indian languages, spoken and used for public communication of science, has been at the forefront of science communication as well.

The year 2018 also marks 200 years of science fiction in the world when *Frankenstein; The Modern Prometheus*, a novel written by English author Mary Shelley was first published on 1 January 1818, narrating the story of Victor Frankenstein, a young scientist who invents a hideous sapient creature during a scientific experiment. Even the genre 'science fiction' was coined later, *Frankenstein* was credited as the first science fiction of the world. 1818 is also the 400<sup>th</sup> death anniversary of Sant Kabir Das (1440-1518), a holy poet who composed a number of couplets based on rationality, the basics of scientific temper, and enlightened the people through his preaching against so-called superstitions in the society.

The 18th Indian Science Communication Congress (ISCC-2018) is being organized in December 2018 in New Delhi, with the focal theme "Celebrating 200 Years of Science Journalism in India" to mark the beginning of *Digdarshan* in 1818 and celebrate the progress of science journalism!

**Prof. Dr. Manoj Kumar Patairiya**

# Effect of locally customized vs. native speakers' phonics curriculum on young Iranian EFL learners' early literacy development

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*The purpose of this study was to investigate the effect of Magic Phonics (a locally customized phonics curriculum) versus Jolly Phonics (native speakers' phonics curriculum) on young Iranian EFL (English as Foreign Language) learners' early literacy development, known as the ability to read and write using grapho-phonetic cues. In order to find whether Magic Phonics had any significant effect on reading accuracy, reading fluency, letter formation and spelling accuracy of young Iranian EFL learners in comparison to Jolly Phonics instruction, two different samples were chosen: a sample of 150, 6-12 year old young Iranian EFL girls and boys, and a sample of 17 Iranian female EFL teachers, aged between 20-44, and with 2-11 years of teaching experience, using the two different phonics instructions. Through using the qualitative method of research (classroom observations and assessment of students' reading development and written portfolios) as well as the quantitative method in the form of an achievement test, students' reading and writing ability were assessed. Moreover, the selected teachers were interviewed twice during this study for a more in-depth investigation. The classroom observations, students' reading sessions and written portfolios as well as the interviews with the teachers were examined and the test results were analyzed through using SPSS (a statistical analysis software). The outcome of this study indicated that the students who used Magic Phonics instructions outperformed the ones who used Jolly Phonics instructions when it came to reading accuracy and spelling.*

**Keywords:** Phonics, Magic Phonics, Jolly Phonics, Literacy, Reading Ability, Writing Ability

## Introduction

In order to master a language, one should learn how to comprehend through listening, how to read, speak and write accurately and fluently using that language. These are known as the four main skills. When it comes to assessing young learners' literacy development, also known as reading and writing ability, different aspects have been defined. As mentioned by McKay (2006), the nature of reading ability for young language learners is based on graphophonic cues at the word level, known as the way a word is written and how it sounds. Also according to Alderson (2000), the process of reading for young language learners is to decipher the words that are written on the page, as well as the self-monitoring that might happen while a child is trying to read those words. Furthermore, the product of reading for young language learners in phonics-based languages has been defined as the ability to decode, identified as the ability to match sounds with letters and phonic blends, as well as the ability to sound out words and to use the graphophonic cues without overreliance on them (as cited in McKay, 2006).

On the other hand, the writing ability in young language learners has been defined as the ability to distinguish sounds and words in a stream of sounds, as well as the ability to write those words or characters down with the correct spelling or character formation on paper (McKay, 2006). Therefore in this article, whenever early literacy development of young language learners is mentioned, it refers to the reading accuracy and fluency, also known as native like pronunciation and the number of words read per unit of time, as well as writing accuracy known as correct letter formation, and spelling accuracy (Moloudi, 2012). Different methods have been introduced in order to teach reading and writing development to young language learners, and several studies have been conducted accordingly. Among these methods, the Whole-word method, known as "Look and Say" as an analytic method and Phonics as a synthetic method to teach reading and writing were the most popular ones. Several studies on the effect of each method on students' reading and writing ability have been conducted.

## Literature review and background

In general, Phonics method (phonetic method) is defined as "a method of teaching children to read. It is commonly used in teaching reading in the mother tongue. Children are taught to recognize the relationship between letters and sounds. They are taught the sounds which the letters of the alphabet represent, and then try to build up the sound of a new or unfamiliar word by saying it one sound at a time" (Richards and Schmidt, 2010). Phonics method is different from phonemic awareness instruction because phonics programs typically cover more than this and include instruction and practice in reading words in and out of text (Adams, 1990). According to Aukerman (1984) and Harris and Hodges (1995), different approaches have been used to teach phonics systematically. These approaches are synthetic phonics, analytic phonics, embedded phonics, analogy phonics, onset-rime phonics, and phonics through spelling. These approaches differ in some ways. For instance, analytic phonics uses a whole-to-part approach that prevents children from pronouncing sounds in isolation in order to figure out words. In this approach children are taught to analyze letter-sound relations once the word is identified. Synthetic phonics programs use a part-to-whole approach that teaches children to convert graphemes into phonemes (e.g., to pronounce each letter in *stop*, /s/-/t/-/ɑ:/-/p/) and then to blend the phonemes into a recognizable word. According to Cameron (2001), children have to make links from meaning to what they see (printed text), what they hear (the spoken language) and what they produce (written words) in order to learn reading and writing. Therefore, although the main approaches to phonics instruction are generally categorized into analytic and synthetic phonics, looking at phonics from some other aspect, multisensory phonics can also be a category for itself. In most cases, beginning readers will be taught different strategies using body movements, songs and rhymes in order to memorize the alphabet or learn phonics (Ureno, 2012). Using a multisensory teaching approach means helping a child to learn through more than one of the senses (Bradford, 2008). Teachers have always unknowingly used different methods to teach initial readers, through using different senses including sight, hearing, touch, taste and even smell (Greenwell & Zygoris-coe, 2012). Among these methods Jolly Phonics by Lloyd (1992) is an in-depth foundation for

reading and writing to young native speakers of English. It uses the synthetic phonics method for teaching the letter sounds in a fun and multisensory way. This method teaches children how to use the letter sounds to read and write words. According to Farokhbakht (2015), learning the letter sounds, learning letter formation, blending, Identifying sounds in words and spelling the irregular words are the five basic skills which are covered in Jolly Phonics. Numerous studies have investigated the effect of phonics versus non-phonics methods, as well as the effect of different phonics methods on teaching language skills in non-Iranian contexts. For instance, Sumbler and Willows (1996) ran a trial on Jolly Phonics with 281 kindergarten children from eight suburban Toronto primary schools. One hundred and fifty-one students were assigned into ten experimental (Jolly Phonics) groups and 131 pupils were assigned to ten control groups. The experimental and control groups respectively had 31% and 18% ESL participants. The post-test results near the end of senior kindergarten showed the Jolly Phonics pupils with a very substantial advantage on every measure. In another study, Morgan and Willows (1996) looked at the effects of Jolly Phonics on phonemic skills of 225 children in 6 primary schools in low-income areas within a high range of ESL students (mainly Punjabi). This technical study found that pupils in the ESL experimental group performed at least as well (and often much better) than the English-speaking controls on every measure except the auditory discrimination of phonemes. Since phonemes vary considerably from one language to another, this last result was not surprising. Freppon (1988) investigated students' reading in two different instructional settings. One group used skill-based instruction (phonics instruction) while the other group used literature-based instruction (whole language instruction). Results showed that although the literature group attempted to sound out words less often than the skill group, they achieved a greater success rate. This research implied that the whole language instruction produces greater phonics knowledge than explicit phonics instruction. In another study, Kwan and Willows (1998) explored the impact of early phonics instruction on children learning English as a second language. This study of ESL pupils found that those children who received Jolly Phonics training in both junior and kindergar-

ten showed outstanding achievements on measures of phonological processing. This finding argued against the accepted Canadian practice of avoiding the ESL problem by fostering cognitive growth through instruction in the pupil's native language. Stuart (1999) conducted a study with 112 five-year-old children, 96 of whom were English second language learners. The participants were enrolled into either the experimental program (Jolly Phonics intervention) or the control program which took a whole-language approach based on Holdaway's (1979) use of big books. Children were pretested on measures of spoken and written language, phonological awareness and alphabet knowledge, prior to a 12-week intervention using either the experimental or control program. They were post tested on all measures immediately after intervention, and again one year later. The results were in favor of Jolly Phonics. The experimental program accelerated children's acquisition of phoneme awareness and of phonics knowledge, and their ability to apply these in reading and writing. In the year following intervention both groups made comparable progress in most areas; however, at the end of this year the experimental group were still significantly ahead in phoneme awareness and phonics knowledge, and on standardized and experimental tests of reading and spelling. Dahl and Schrarer (2000) conducted a mixed method study, screening various whole language schools and selected eight first grade classrooms that embodied whole language programs. These programs had an emphasis on literature, composition, inquiry, and process-centered instruction. They believed that their study dispelled the theory that whole language teachers do not effectively teach phonics. Children from whole language classrooms seemed to develop greater ability to use phonics knowledge effectively than children in more traditional classrooms where skills were practiced in isolation. Joseph (2000) compared the effectiveness of two contemporary phonics approaches (Word Box instruction and Word Sort instruction) on children's phonemic awareness, word identification, and spelling performance. Forty-two randomly selected first-grade native English speakers received Word Box instruction, Word Sort instruction, and traditional instruction for three months daily. The results indicated that no significant differences existed between the two experimental conditions on

any measure. In 2001, Connelly, Johnston and Thompson conducted a research on the effect of phonics instruction on the reading comprehension of beginning readers and compared the level of reading comprehension and word recognition of beginning readers, using phonics and a non-phonics approach. The results revealed that the group using non-phonics approach was faster in identifying familiar words. Whereas the group using phonics instruction was slower in identifying words. The second group also showed higher reading comprehension and made more attempts to read known, as well as unfamiliar words. The results showed no significant differences between the two approaches in word recognition. Stahl and Willows (2001) conducted a quantitative meta-analysis to evaluate the effects of systematic phonics instruction compared to unsystematic or non-phonics instruction on learning to read in young learners. The results indicated that Phonics instructions in general improved decoding, word reading, text comprehension, and spelling in many readers. Also synthetic phonics and larger-unit systematic phonics programs had the same positive effect on reading ability. At the end, researchers found systematic phonics instruction to be effective and suggested its implementation in literacy programs for beginning reading. Similarly, Hitotuzi (2004) examined two different approaches for teaching pronunciation on two groups of beginning EFL learners in UK. One approach was based on learning pronunciation through mimicry and being exposed to the speech of native-speakers through listening to audiotapes, and another was based on raising learners' awareness towards phonemic symbols and intonation patterns. The results indicate that the use of either approach can result in the same level of accuracy in language production. Johnston and Watson (2005) conducted a longitudinal research study on the effects of synthetic phonics instruction on reading and spelling attainment of primary school children over 7 years in Clackmannanshire, Scotland. Around 300 children in primary 1 were divided into 3 groups. One group was taught through the synthetic phonics (Jolly Phonics programme), one by the analytic phonics method, and one by an analytic phonics programme plus rhyme and phonemic awareness training. In order to make sure that the gains in children's literacy attainment were maintained, the progress of all these children was fol-

lowed, assessing their performance in word reading, spelling and reading comprehension from primary 1 to primary 7. It was found that at the end of primary 7, the JP group was 3 years 6 months ahead of their chronological age in word reading, 1 year 8 months ahead in spelling and 3.5 months ahead in reading comprehension. Jackson (2006) compared two systematic approaches to phonics instruction (implicit or whole-language instructions and explicit or systematic phonetic instruction) for teaching reading with first grade students. The results revealed significant differences between these two instructions and favored explicit, systematic phonics instruction, known as the process of introducing phonetic elements, as well as sound-letter relationship, in development of young learners' reading. Brooks, Hall and Torgerson, (2006) conducted a systematic review of the research literature on the use of phonics in the teaching of reading and spelling. The result of their review showed that despite all the advantages of using a phonetic system for teaching reading to young native learners, it was not clear whether the systematic phonetic system was practical and effective for all children including EFL young learners. Also the degree of effectiveness and amount of sufficient exposure to systematic phonics system was unclear. The presented research results were insufficient for drawing conclusion about whether phonics should be used to teach spelling as well as reading. Joseph and Shmidgall (2007) were other researchers who compared the effectiveness and efficiency of phonics analysis and the whole- word read and cumulative reading rate on six English native first graders. Three different- treatment design was used to conduct the study, a phonic analysis method consisting of Word Boxes (WB), traditional drill and practice procedure on word-reading performance, as well as a phonics analysis condition. The results showed that four out of six learners had greater performance under the phonics analysis conditions, yet the rate of reading words was greater applying traditional drill and practice condition. At the end, there were no significant differences on maintaining and generalizing words. In 2011, Dixon, Schhagen and Seedhouse studied the impact of Jolly Phonics intervention on children's English literacy skills in low-income schools in India. This study used a quasi-experimental design in which over 500 students in 20 schools participated in the 6-month program-



mer. While the control group continued with their normal English lessons, the experimental group which consisted of over half of the participants experienced lessons organized around the JP materials. The findings showed that there were statistically significant differences between the intervention and control groups in the improvements of children in their test scores in reading and spelling. Eshiet (2012) inquired into the possible effects of Jolly Phonics on improving the reading skills of Nigerian children. She adopted Jolly Phonics as the intervention in a case study design. The mixed method approach involved collecting quantitative data through standardized reading and spelling tests while the focus group discussion of teachers provided qualitative data. The findings demonstrated that the JP method led to the improving of pupils' reading achievement and an increase in teachers' interest in teaching English. Ruiz (2014) conducted a research to analyze the effect of Jolly Phonics on teaching English to Spanish EFL learners in bilingual classrooms. The researcher observed teaching sessions, designed and used a questionnaire to find out about teachers' assumptions regarding this method, and also compared the effect of Jolly Phonics method with the whole-word approach in teaching literacy to children. The results indicated that although Jolly Phonics was considered an improvement in the field of teaching reading comprehension and autonomy to young native English speakers, it had limitations when it came down to considering non-native students' needs, different learning styles, and paying attention to the ultimate goal of learning a language known as communication. Finally, Tisma (2015) conducted a research to investigate different techniques in two different teaching approaches, known as Communicative Language Learning and Kagan's version of Cooperative Language Learning, to improve young Serbian EFL learners' pronunciation of problematic sounds such as inter-dental fricatives /ð/, /θ/ and approximants /r/ and /w/. For the purpose of this study twelve nine-year-old young learners who had been learning English for three years, were selected and received private English classes for three months. The results were in favor of Kagan's Structures, yet they indicated that in general the phonetic instruction was not sufficient in EFL settings.

As the result of the conducted studies show,

when it came down to young EFL learners, the results were in favor of phonics instructions. Whereas investigating the effect of different Phonics instructions including Jolly Phonics instructions on early literacy development of young EFL learners, the results indicated that although Jolly phonics was considered an improvement in the field of teaching reading comprehension and autonomy to young native English speakers, it had limitations when it came down to considering non-native students' needs, different learning styles, and paying attention to the ultimate goal of learning a language known as communication (Ruiz, 2014). Considering the previous conducted studies, the question is whether it is appropriate, effective and sufficient to use the same method and instruction for teaching reading and writing to native, as well as non-native young learners. In view of that, the current research was an attempt to study the effect of a locally customized phonics curriculum on early literacy development of young Iranian EFL learners. Since there has been no prior research trying to exclusively explore the effect of a locally customized Phonics curriculum on early literacy development of young Iranian EFL learners, the current study could be considered as novel research.

## **Methodology**

### ***Participants***

Considering the fact that the researcher aimed to conduct this research on two particular populations (Young Iranian EFL learners and the Iranian EFL teachers), two different samples were selected: A sample of 150, 6-12 year old Iranian EFL girls and boys from two different English language institutes in Tehran and one English language institute in Karaj. In order to select a homogenized sample, few issues were considered as key factors: only the young Iranian EFL learners who had started their literacy development as zero- beginners in the selected institutes were chosen. None of the learners were exposed to any other literacy development instructions except for Jolly Phonics or Magic Phonics. Each learner was only exposed to one Phonics instruction (either Jolly Phonics or Magic Phonics). In order to meet the mentioned factors and have a homogenized sample, more than 20 classes were analyzed and 150

students meeting the required profile were selected from them. Furthermore, these 150 Iranian EFL students were divided into two groups in which one group merely used Jolly Phonics instructions and the other merely used Magic Phonics instructions in order to develop their early reading and writing skills and each group was assessed in four different levels (level one, level four, undergraduate level, and newly graduated young Iranian EFL learners). The participants' distribution is presented in Table 1 and 2. In addition, a sample of 17 Iranian female EFL learners, aged between 20-4, with 2-11 years of experience in teaching literacy to young Iranian EFL learners, using Jolly Phonics and/or Magic Phonics was chosen from the same English institutes.

**Table 1: 75 participants merely using Magic Phonics instructions**

15	15	15	30
level one zero- beginner learners	level four learners	level eight learners	Magic Phonics graduates

**Table 2: 75 participants merely using Jolly Phonics instructions**

15	15	15	30
level one zero- beginner learners	level four learners	level seven learners	Jolly Phonics graduates

**Instruments**

In the present study, four tools were utilized to estimate participants' early literacy development. Regarding the reliability of the achievement test, the researcher measured Cronbach's Alpha for ensuring stronger reliability of the test. A panel of experts in TEFL confirmed the face and content validity of the test items, validated the check lists for assessing early reading and writing development of young Iranian EFL learners, as well as the pre and post observation questionnaires for interviewing the Iranian female EFL teachers of Magic Phonics and/or Jolly Phonics instructions. In addition, a colleague who also was a TEFL teacher and a researcher reviewed and examined the recorded videos of classroom observations, as well as the taken samples of written portfolios in order to have more reliable outcomes. These tools were put forth as follow:

**Early reading development observation checklist**

A reading development observation checklist with a numerical rating scale for the young Iranian EFL learners was designed by the researcher, reviewed and validated by a panel of experts and was used in certain intervals for participant structured classroom observations to assess young Iranian EFL learners' early reading development (reading accuracy and reading fluency) while using the two different Phonics instructions in three different levels (level one, level four and pre-graduate level).

**Written portfolio assessment checklist**

In order to assess the early writing development of young Iranian EFL learners (letter formation and spelling), a checklist with a numerical rating scale was designed focusing on the correct pencil hold, encoding sounds into graphemes, letter formation, correct word spelling of regular, irregular or functional words and correct use of capital and lower-case letters in a simple sentence (Farokhbakht, 2015; Lloyd, 2010; Moloudi, 2014). Subsequently the checklist was reviewed and validated by a panel of experts. The edited checklist was used for written portfolio assessment, as an alternative assessment to keep track of students' early writing development. As the learning sessions proceeded, students' workbooks, using two different Phonics instructions in different levels were collected chronologically, dated and assessed.

**Interview questionnaires for Iranian EFL teachers**

As Nishimuro and Borg (2013) acknowledged in their study, it is not possible to understand what teachers do in the classroom without also understanding their cognitions, known as what teachers know, believe and think about while teaching. Based on the given instruction by Dornyei (2007) to design a semi-structured interview, as well as the mentioned literature, the same arrangement and guidance was used by the researcher in order to design pre and post observation interview questionnaires as semi-structured interviews with the purpose of gathering information on teachers' opinion about the

effectiveness as well as the possible insufficiency of the selected Phonics instructions, in addition to their expectations and remedial suggestions for the selected phonics instructions' shortcomings.

### ***Early literacy achievement test***

The main focus of this study was on assessing young Iranian EFL learners' early literacy development using Phonics instructions, otherwise known as reading and writing at the level of sounds and simple words without any necessary comprehension and merely using graphophonic cues. In order to test these qualities, the researcher did not hit upon any internationally accepted standard tests without requiring some level of reading comprehension. Therefore the researcher was compelled to design a test for assessing the early reading and writing ability of the young Iranian EFL learners who had just graduated studying either Magic Phonics or Jolly Phonics. The words and sentences of the test were directly chosen from both Magic Phonics and Jolly Phonics books and no unknown or pseudo words were used. The test included a reading section comprised of 46 words, from which 20 of them were presented as isolated words to assess the decoding and blending process, as well as the correct pronunciation, whereas 26 of them were presented as six sentences to assess students ability to recognize capital and lower-case letters, as well as their reading fluency in addition to the ability to decode, blend and pronounce correctly. Furthermore, a writing section of 20 words were presented as four sentences to assess the early writing accuracy and letter formation of young Iranian EFL learners. The final test was presented as a 30 item test, then was validated by panel of experts and piloted in a language academy in Karaj before being used as the achievement test for young Iranian EFL Magic Phonics/Jolly Phonics graduates.

### ***Data collection and data analysis***

In the present study, in order to analyze the statistical data and investigate the research null hypotheses of the research, an independent samples t-test by the use of Statistical Package for Social Sciences (SPSS) software (version 21) was applied for inferential statistics. Also descriptive statistics were con-

ducted and demonstrated by tables and figures.

### ***Procedure***

This research was administered in 2016 by the researcher herself as the observer and the assessor during the experiment. In order to conduct the research study and to investigate the research hypotheses, a mixed method of qualitative-quantitative method was used. Considering the scope and within the research span of this two month study, the convenience or opportunity sampling type was used (Dornyei, 2007). A list of girl and boy English Institutes in Tehran and Karaj was prepared. The institutes were contacted and the study purpose and the procedures were explained. The final samples were selected from three different Language institutes that gave their full consent for cooperation, with parental approval from their students, and teachers whom were willing to participate in the study. In order to conduct the research study and to investigate the research hypotheses, the following steps were taken:

### ***Classroom observations for assessing early literacy development***

In order to investigate the early reading and writing development of young Iranian EFL learners while using the two different Phonics instructions, the researcher examined three different groups, each in 3 sessions with 2 weeks interval. For the first two 90 minute sessions the researcher observed the method in which a new letter-sound was introduced, the way students learnt about the letter formation, decoding graphemes into sounds and encoding sounds into graphemes, blending the sounds into words, the correct sound/word pronunciation, the correct sound/word spelling and the students' overall progress. She also monitored for the learners' recognition and correct spelling of functional or irregular words, reading fluency and recognition and correct use of capital and lower case letters in a sentence when it came to students in group two and group three. The learning and reading sessions were recorded in order to be studied and compared to each other by the researcher and her colleague. During session two and three, students' written portfolios were collected and copied, dated and finally at the third 90 minute session the reading and writing performances of

the students based on the learnt letter sounds were assessed, using the two checklists designed by the researcher herself. The results as well as the taken samples were shared and examined by a TESOL teacher and a fellow researcher in order to have a more reliable outcome.

***Administrating the achievement test***

At the end of the two-month study an achievement test was given to 60 newly graduated Jolly Phonics and Magic Phonics users. Since all students were zero- beginners no pre-test was used for this research. The main purpose of this study was to find out whether Magic Phonics, a locally customized Phonics curriculum, had any significant effects on reading accuracy, reading fluency, letter formation and spelling accuracy of young Iranian EFL learners in comparison to Jolly Phonics instruction known as the native speakers' Phonics curriculum for teaching early literacy to young native learners. The test was administrated in two different sessions. In the first session, students were asked to read the sentences and words one by one and all the reading sessions were recorded. Each participant took about 5 to 7 minutes to read and complete the reading part based on their reading abilities. In the second session, a five minute writing test was given to the participants and they were asked to write the four chosen sentences in their exam papers.

**Results**

In data analysis section of the present study, the researcher investigated significance of the achieved results by applying the suitable statistical test and analyses. In order to study the hypotheses of the present study a statistical test was used and the collected data was analyzed in two descriptive and inferential levels by using SPSS software. Finally the results of data analyses were presented using tables and figures. This study was conducted in order to find out the effect of a locally customized Phonics curriculum on early reading and writing development of young Iranian EFL learners. Accordingly, in order to achieve the purpose of the present study, the following research null hypotheses were addressed:

H01: In comparison to native speakers' Phonics curriculum, locally customized phonics curriculum has

no significant effect on young Iranian EFL Learners' reading literacy.

H02: In comparison to native speakers' Phonics curriculum, locally customized phonics curriculum has no significant effect on young Iranian EFL Learners' writing literacy.

H03: In teachers' opinions, using a locally customized phonics curriculum has no significant effect on young Iranian EFL Learners' reading literacy in comparison to using native speakers' phonics curriculum.

H04: In teachers' opinions, using a locally customized phonics curriculum has no significant effect on young Iranian EFL Learners' writing literacy in comparison to using a native speakers' phonics curriculum.

The participants' scores and results in terms of evaluated values have been presented in the following tables and figures.

***Reliability statistics***

The researcher piloted the test on 30 young newly graduated Iranian EFL Magic Phonics users (N=15) and Jolly Phonics instruction users (N=15) prior to the main study and measured the Cronbach's Alpha for ensuring stronger reliability of the Achievement test for measuring the early reading and writing ability of these young Iranian EFL learners. The results for Cronbach's Alpha reliability is presented in Table 3. In the current study, the Cronbach alpha coefficient was 0.87 and as a result, the test was considered reliable

**Table 3: Cronbach's Alpha reliability of the achievement test**

Cronbach's Alpha	N of items
0.875	30

***Assessment of early reading and writing development through classroom observations and checklists***

The researcher assessed the early reading and writing development of the students in three different levels of proficiency, using the designed checklists while observing and recording classroom sessions in certain intervals. The outcomes as well as the recorded sessions were then shared by a fellow TEFL researcher in order to have more reliable results, presented in the following figures (1, 2, 3, 4, 5, 6).

While observing the Level One zero-beginner Jolly Phonics and Magic Phonics users' reading performances, Jolly Phonics users showed stronger performances while decoding graphemes into sounds and recognizing the functional words. There were no differences between the two groups in blending sounds into words, pronunciation, or recognizing capital-lower case letters. Since the zero-beginners'

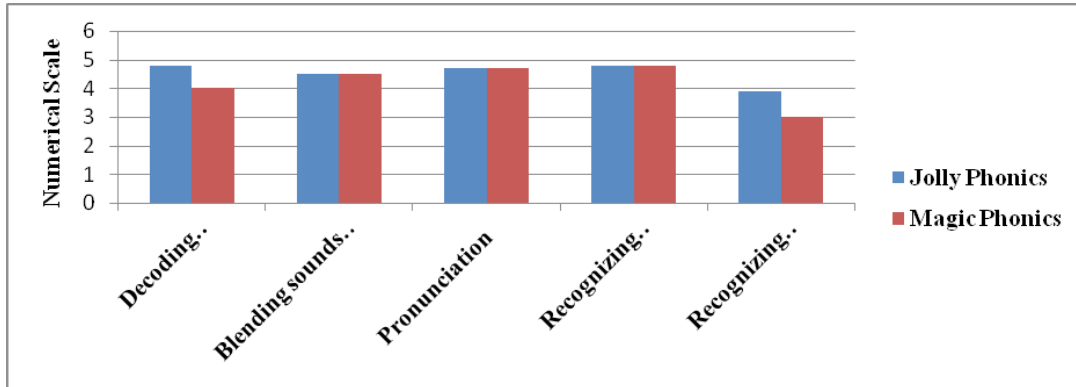


Figure 1: Reading development chart (level one)

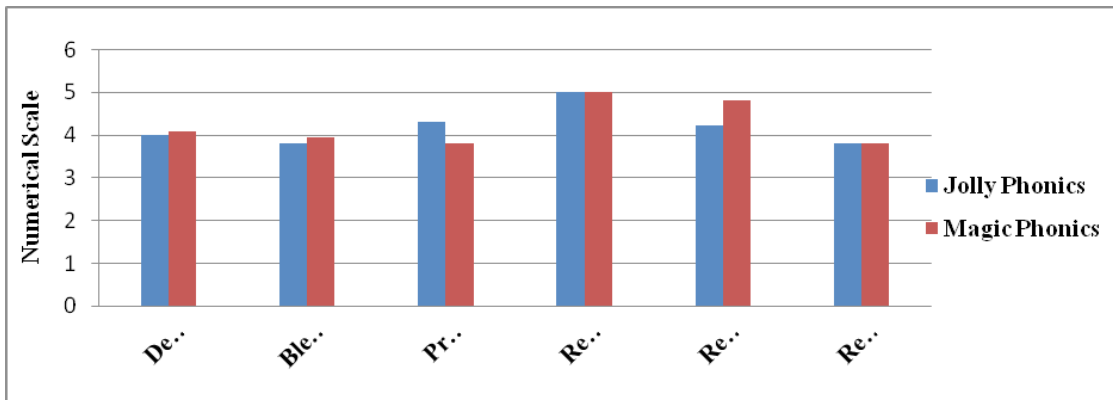


Figure 2: Reading development chart (level four)

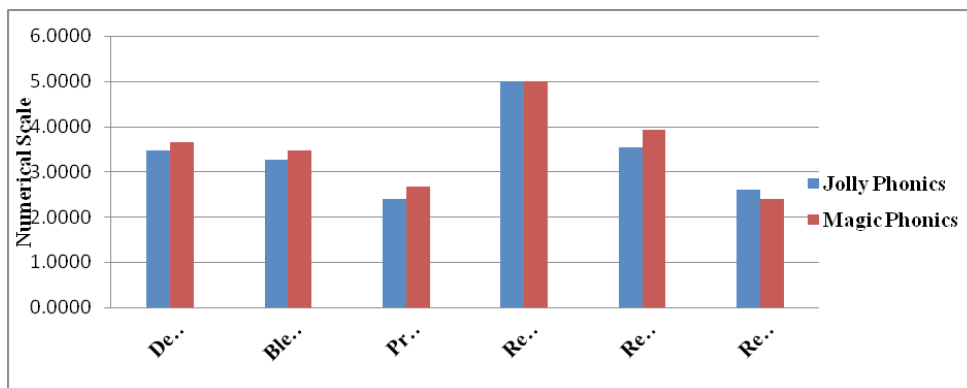


Figure 3: Reading development chart (level seven of Jolly Phonics/level eight of Magic Phonics)

reading ability was in the word-level, the reading fluency was not assessed in this level. The results uttered in Level Four of Jolly Phonics and Magic Phonics. Jolly Phonics users showed stronger performances while pronouncing the sounds, whereas Magic Phonics users had a better recognition of the functional words, as well as slightly better blending techniques. There were no differences between the two groups in reading fluency or recognition of capital-lower case letters. In comparison to the

previous levels, a noticeable decline was detected in both groups' pronunciation and reading fluency due to the difficulty level of the instructions in Level Seven of Jolly Phonics and level eight of Magic Phonics. Jolly Phonics users had a slightly better reading fluency, whereas Magic Phonics users were faintly better at Decoding, blending, pronunciation and recognition of the functional words. There were no differences between the two groups in recognizing the capital-lower case letters.

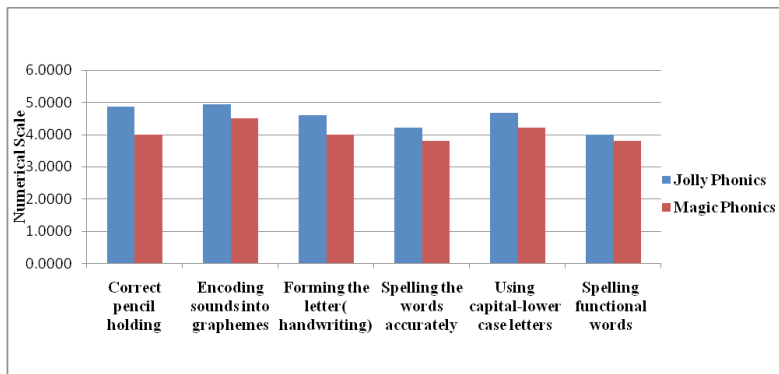


Figure 4: Writing development chart (level one)

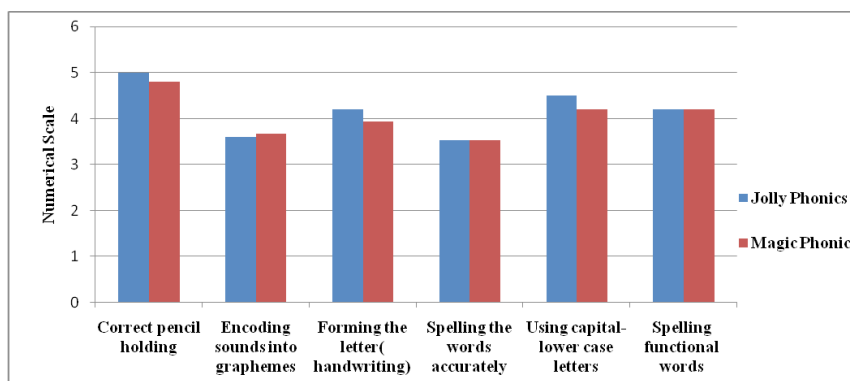


Figure 5: Writing development chart (level four)

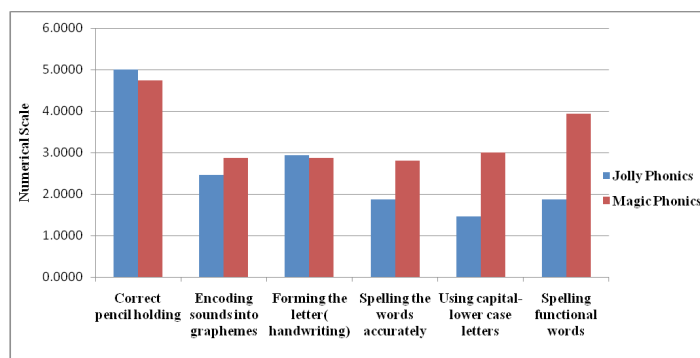


Figure 6: Writing development chart (level seven of Jolly Phonics/Level eight of Magic Phonics)

While assessing the Level One zero-beginner Jolly Phonics and Magic Phonics users writing portfolios, Jolly Phonics users showed stronger performances in all and every aspect. This could be explained by the age difference between the Jolly Phonics and Magic Phonics zero-beginners. Since the former group was older in age (9 to 10 years old) in comparison to the Magic Phonics zero-beginners (6 to 7 years old), they had a better understanding and more control over different aspects of writing techniques. In Level Four of Jolly Phonics and Magic Phonics, Jolly Phonics users still showed slightly stronger performances when it came to correct pencil holding, letter formation and using capital-lowercase letters in a sentence, whereas Magic Phonics users showed faintly better encoding techniques. There were no differences between the two groups in spelling. In the final phase, the results changed drastically in comparison to the previous ones. The Magic Phonics users showed a noticeable progress. They outperformed the Jolly Phonics users in encoding, spelling and correct use of capital-lowercase letters in sentences. Jolly Phonics users were still slightly better at correct pencil holding and letter formation.

In order to have a more conclusive result, the researcher used a quantitative method to assess the early literacy development of the learners through administrating an achievement test to the newly Jolly Phonics/Magic Phonics graduates. For this purpose data normality of the scores were checked and an independent sample t-Test was applied.

**Data normality**

Data normality is an assumption which indicates that the data or scores on each variable should be normally distributed. In order to apply the appropriate statistical methods, it should be determined that the collected data has a normal or non-normal distribution. Based on the results of Table 4 and 5, the significance level (sig) of the early achievement test of Jolly Phonics graduates ( 0.366) and Magic Phonics graduates (0.841) were greater than the error value 0.05 ( $p > 0.05$ ). Therefore, it is concluded that variables had a normal distribution and a parametric test should be used in order to analyze the data.

**Table 4: Normality test for Jolly Phonics graduates**

One-Sample Kolmogorov-Smirnov Test		
		Jolly Phonics Graduates
N		30
Normal Parameters <sup>a,b</sup>	Mean	14.7000
	Std. Deviation	3.85200
Most Extreme Differences	Absolute	.168
	Positive	.168
	Negative	-.104
Kolmogorov-Smirnov Z		.919
Asymp. Sig. (2-tailed)		.366

**Table 5: Normality test for Magic Phonics graduates**

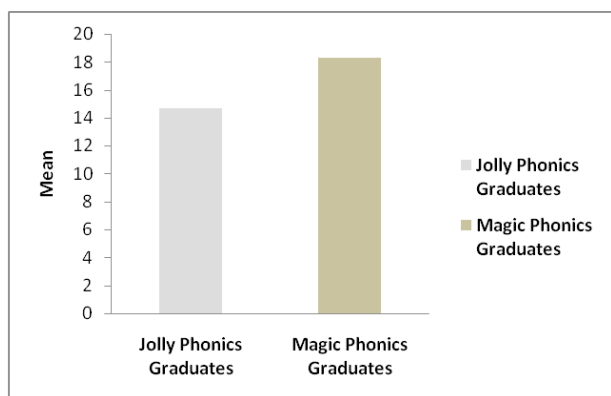
One-sample Kolmogorov-Smirnov test		
		Magic Phonics Graduates
N		30
Normal Parameters <sup>a,b</sup>	Mean	18.3000
	Std. Deviation	3.47553
Most Extreme Differences	Absolute	.113
	Positive	.113
	Negative	-.088
Kolmogorov-Smirnov Z		.617
Asymp. Sig. (2-tailed)		.841

**Descriptive statistics of Jolly Phonics and Magic Phonics users graduates, given achievement test**

As mentioned by Dornyei (2012), descriptive statistics is a set of statistical procedures used to help summarizing the research data, through describing and organizing the characteristics of sample data in a clear and understandable way, both numerically and graphically. In this section, the participants' scores in terms of evaluated values have been presented in the following table.

**Table 6: Descriptive statistics of the groups given achievement test**

Group Statistics					
		N	Mean	Std. Deviation	Std. Error Mean
Scores	Jolly Phonics Graduates	30	14.7000	3.85200	.70328
	Magic Phonics Graduates	30	18.3000	3.47553	.63454



**Figure 7: Mean of the groups given achievement test**

Based on the results of Table 6 and Figure 7, it was revealed that the mean score of the Magic Phonics graduates was greater than the mean score of the Jolly Phonics graduates. It can be concluded that the Magic Phonics instructions had a better effect on young Iranian EFL learner's early literacy development.

**Independent sample t-test**

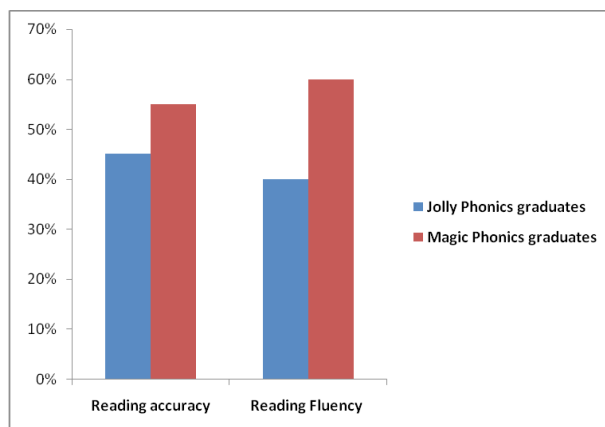
An independent-sample t-test was conducted to compare the effect of a standard Phonics curriculum vs. a locally customized Phonics curriculum on literacy development of young Iranian EFL learners. There was a significant difference in scores for native speakers' Phonics curriculum (Jolly Phonics) users (M= 14.70, SD= 3.85) and the locally customized Phonics curriculum (Magic Phonics) users (M= 18.30, SD= 3.47). Based on the results of Levene's

Test for Equality of Variances in Table 7, there was a significant difference between Magic Phonics graduates scores and Jolly Phonics graduates scores  $0.00 < 0.05$  (observed  $t = 3.80$ ,  $P < 0.00$ ).

**Table 7: Independent samples t-test**

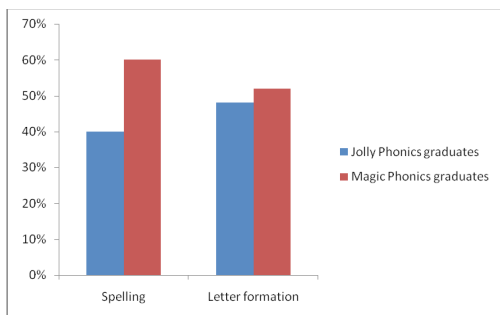
Independent samples test										
Scores	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Equal variances assumed	.000	.991	-3.801	58	.000	-3.60000	.94723	-5.49608	-1.70392	
Equal variances not assumed			-3.801	57.397	.000	-3.60000	.94723	-5.49651	-1.70349	

In addition to the mentioned procedures and in order to have more in depth and discriminating results, each and every answer sheet and recording session was studied and the following outcomes presented in Figures 8 and 9 were concluded.



**Figure 8: Early reading ability of Jolly Phonics/Magic Phonics graduates based on achievement test**





**Figure 9: Early writing ability of Jolly Phonics/Magic Phonics graduates based on achievement test**

As the figures demonstrated, Magic Phonics graduates outperformed Jolly Phonics graduates in reading and writing (20 % better at reading accuracy, 10 % better at reading fluency, 4 % better at letter formation and 10 % better at spelling).

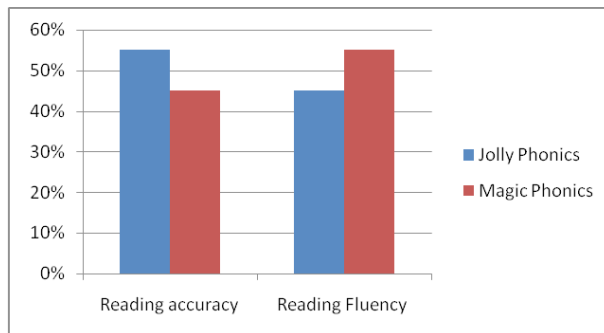
**Teachers’ opinions regarding efficiency of the two different phonics instructions**

For the purpose of investigating the third and fourth null hypotheses, first the researcher conducted pre-classroom observation interviews with teachers using the two different Phonics instructions. Subsequently the teaching sessions were observed and post- observation interviews were carried out immediately after the observation sessions. Amongst these teachers, three were using Jolly Phonics, seven were using Magic Phonics and seven teachers had used or were still using both Phonics instructions. While comparing the outcome of Jolly Phonics and Magic Phonics the following points were mentioned by the teachers that have taught both levels.

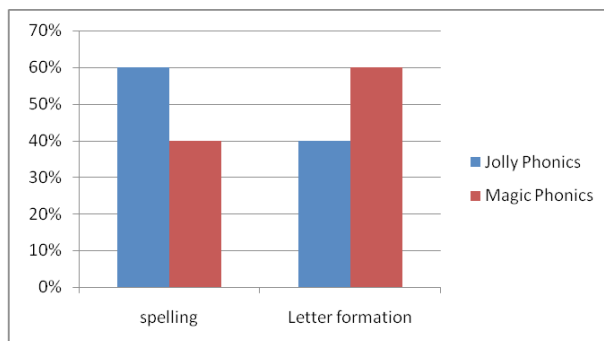
**Table 8: Teachers comparison of Magic Phonics instruction with Jolly Phonics instruction**

<b>Magic Phonics</b>	- More suitable for younger EFL learners. - More attractive illustrations. - More suitable for teaching reading fluency.
<b>Jolly Phonics</b>	- More suitable for older EFL learners. - More attractive songs, stories and actions for each letter sound. - More suitable for teaching reading accuracy/native-like pronunciation.
<b>Magic Phonics and Jolly Phonics</b>	- Both are suitable for teaching letter recognition, letter formation and letter direction. - Neither are sufficient for practicing spelling and writing

As the result, teachers believed that in comparison to Jolly Phonics, Magic Phonics instructions had no significant effect on Young Iranian EFL learners’ native like pronunciation, whereas its effect was significant in regard to reading fluency and letter formation. In teachers’ opinion no significant difference was detected between the two different Phonics instructions when it came down to letter recognition, letter direction or spelling. The results have been demonstrated in the following figures (10, 11).



**Figure 10: Teachers opinion regarding effect of Jolly Phonics/Magic Phonics on early reading development**



**Figure 11: Teachers opinion regarding effect of Jolly Phonics/Magic Phonics on early writing development**

**Discussion**

This study investigated the effect of a locally customized phonics curriculum vs. native speakers’ Phonics curriculum on early literacy development of young Iranian EFL learners. The research questions inquired whether the locally customized phonics curriculum (Magic Phonics) had any significant effect on early literacy (reading and writing ability) development of young Iranian EFL learners. Two groups of young Iranian EFL students were un-

der the investigation: A group merely using native speakers' phonics curriculum (Jolly Phonics) and a group merely using a locally customized phonics curriculum (Magic Phonics). For the purpose of this descriptive causal-comparative study, a type of mixed method of research was used. This can be defined as using a concurrent combination of qualitative and quantitative methods in order to describe a phenomena, find the relationship among the variables and determine the reason for the phenomena under investigation (Farhady, 1995), intended for achieving a fuller understanding of literacy development in young Iranian EFL learners, verifying the effectiveness of one Phonetics instruction over the other, and strengthening the results by using more than one approach (Dornyei, 2012). In this study the expansion function of mixed method was applied in which the qualitative method (in the form of classroom observations, assessment of written portfolios and teacher interviews) investigated the process of learning in young Iranian EFL learners, while using the localized as well as native speakers' phonics curriculum (Magic Phonics and Jolly Phonics), whereas the quantitative method (in the form of an achievement test), shed light on the effectiveness and outcome of the given instructions. Regarding the variables of this research, Magic Phonics and Jolly Phonics have been introduced as the independent variables and the literacy development as the dependant variable. The research questions inquired whether Magic Phonics had any significant effect on early literacy development (reading and writing development) of young Iranian EFL learners. The data analysis and the results of this research revealed that the answer to these questions were positive. Therefore, the related null hypotheses were rejected. The finding of this research could be a contribution to the educational system in Iran, and may assist the principals, supervisors, administrators; materials developers and authors of EFL materials to get new insights towards designing, selecting and implementing the appropriate teaching materials, and as the result have more practical and goal-oriented materials for EFL learners, considering their needs, objectives, strengths and weaknesses.

The results of this study are in line with Tisma (2015) who conducted a research to investigate different techniques in two different teaching approaches, known as Communicative Language

Learning and Kagan's version of Cooperative Language Learning, to improve young Serbian EFL learners' pronunciation of problematic sounds such as inter-dental fricatives /ð/, /θ/ and approximants /r/ and /w/. For the purpose of this study twelve nine-year-old who had been learning English for three years, were selected and received private English classes for three months. The results were in favor of Kagan's Structures, yet they indicated that in general the phonetic instruction was not sufficient in EFL settings.

In another research study Ruiz (2014) conducted a research to analyze the effect of Jolly phonics on teaching English to Spanish EFL learners in bilingual classrooms. The researcher observed teaching sessions, designed and used a questionnaire to find out about teachers' assumptions regarding this method, and also compared the effect of Jolly Phonics method with the whole-word approach in teaching literacy to children. The results indicated that although Jolly phonics was considered an improvement in the field of teaching reading comprehension and autonomy to young native English speakers, it had limitations when it came down to considering non-native students' needs, different learning styles, and paying attention to the ultimate goal of learning a language known as communication. These findings indicated that paying attention to non-native English learners' needs, different learning styles, strengths and weaknesses as well as their goals and objectives for learning the language are important factor in determining the effectiveness of the designed and implemented teaching method.

## Conclusion

The present study was designed to study the effect of a locally customized phonics curriculum versus the native speakers' phonics curriculum on early literacy (reading and writing ability) development of young Iranian EFL learners. In order to do the research, two different samples were selected :A sample of 150, 6-12 year old Iranian EFL girls and boys from two different English language institutes in Tehran and one English language institute in Karaj. In order to select a homogenized sample, few issues were considered as key factors: only the young Iranian EFL learners who had started their literacy development as zero- beginners in the selected in-

stitutes were chosen. None of the learners were exposed to any other literacy development instructions except for Jolly Phonics or Magic Phonics. Each learner was only exposed to one Phonics instruction (either Jolly Phonics or Magic Phonics). In order to meet the mentioned factors and have a homogenized sample, more than 20 classes were analyzed and 150 students meeting the required profile were selected from them. Furthermore, these 150 Iranian EFL students were divided into two groups in which one group merely used Jolly Phonics instruction and the other merely used Magic Phonics instruction in order to learn and develop their early reading and writing skills and each group was assessed in four different levels (level one, level four, undergraduate level, and newly graduated young Iranian EFL learners). During this two month study and in order to investigate the early reading and writing development of young Iranian EFL learners while using the two different Phonics instructions, the researcher examined three different groups, each in 3 sessions with 2 weeks interval. For the first two 90 minute sessions the researcher observed the method in which a new letter-sound was introduced, the way students learnt the letter formation, decoding grapheme into sounds and encoding sounds into graphemes, blending the sounds into words, the correct sound/word pronunciation, the correct sound/word spelling and the students' overall progress. She also monitored for the learners' recognition and correct spelling of functional or irregular words, reading fluency and recognition and correct use of capital and lower case letters in a sentence when it came to students in group two and group three. Finally at the third 90 minute session the reading and writing performances of the students based on the learnt letter sounds were assessed, using the two checklists designed by the researcher herself. The results as well as the taken samples were shared and examined by a TESOL teacher and a fellow researcher in order to have more reliable outcomes. After a period of 21 sessions and at the end of the 2 month study, an achievement test was given to 60 newly graduated Jolly Phonics and Magic Phonics users. Since all students were zero- beginners no pre-test was used for this research. The main purpose of this study was to find out whether Magic Phonics, a locally customized phonics curriculum, had any significant effects on reading accuracy, reading fluency, letter for-

mation and spelling accuracy of young Iranian EFL learners in comparison to Jolly Phonics instructions known as the native speakers' phonics curriculum for teaching early literacy to young native learners. The test included a reading section comprised of 46 words, from which 20 of them were presented as isolated words to assess the decoding and blending process, as well as the correct pronunciation, whereas 26 of them were presented as six sentences to assess students' ability to recognize capital and lower-case letters, as well as their reading fluency in addition to the ability to decode, blend and pronounce correctly. Furthermore, a writing section of 20 words were presented as four sentences to assess the early writing accuracy and letter formation of young Iranian EFL learners. The test was administered in two different sessions. In the first session, students were asked to read the sentences and words one by one and all the reading sessions were recorded. Each participant took about 5 to 7 minutes to read and complete the reading part based on their reading ability. In the second session, a five minute writing test was given to the participants and they were asked to write the four chosen sentences in their exam papers. In order to analyze the statistical data and investigate the null hypotheses of this research, an independent samples t-test was applied. The results of the independent sample t-test rejected the null hypotheses and revealed that Magic Phonics as a locally customized Phonics curriculum had positive effect on early literacy development of the young Iranian EFL learners.

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# Impact of health gallery in understanding science among rural students in Punjab

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*The present study is aimed at investigating the impact of visits to Pushpa Gujral Science City Health Gallery in building scientific temperament and learning experience amongst rural students of Punjab. A sample comprising 229 adolescent students including 108 boys and 121 girls were selected using random sampling. A questionnaire was developed, data collected and analyzed using t-test. The finding of the study has revealed that there was significant impact in terms of scientific knowledge gained by both the gender based group of rural students while using interactive exhibits as teaching aids. The study also indicates that rural adolescent girls performed better than rural adolescent boys in terms of scientific understanding and score.*

**Keywords:** Adolescent, Learning experience, Questionnaire, Rural students, Scientific temper

## Introduction

Learning experience or ability is commonly measured by examinations or continuous assessment but there is no general agreement on how it is best tested or which aspects are most important. Individual differences in learning experience have been linked to differences in intelligence and personality. Students with higher mental ability as demonstrated by IQ tests (quick learners) and those who are higher in conscientiousness tend to achieve highly in academic settings. The creativity and adjustment are essential factors in the progress of learning achievement of students. Therefore, proper stress may be given to develop the creative power among the students, so

that they can be balanced and ultimately secure better learning and academic achievement. The major contribution of science lies in the inculcation of scientific attitude among learners. Scientific temper is a way of life of an individual and social process of thinking and acting that includes questioning, observing physical reality, testing, hypothesizing, analyzing, and communicating. In order to inculcate scientific temper and spirit of learning amongst students and general public, the Pushpa Gujral Science City (PGSC), Kapurthala (Punjab) primarily aims at popularizing science through “edutainment” i.e. education through entertainment. Pushpa Gujral Science City now has a Health Gallery with a focus on interactive and hands on activities, func-

tional models and also especially designed exhibits that take the visitors beyond to be able to retain and stabilize the newly gained knowledge at the gallery. The present study was, therefore, undertaken with the following objectives: To investigate the impact of visits to health gallery at Science City in terms of gaining scientific knowledge and learning experience of adolescent rural students of Punjab using interactive exhibits; and to compare and statistically analyze and verify the significance of study on scientific perception of rural adolescent boys and girls.

**Methodology and discussion**

The study uses a quantitative research methodology. Approach based on Questionnaire 1 to review the scientific knowledge before and after the visit to the health gallery to achieve the desired objectives was employed. The statistics of activity was analyzed based on questionnaire data collected during 2016-17. The sample of this study comprised of adolescent students of Xth standard from rural area of Punjab. Stratified random sampling technique has been used to select the samples. A sample of 229 students, which included 108 boys and 121 girls was tested based on their scientific knowledge score before and after their visit. The sample students were drawn from 44 government schools which comprised 2200 students of which 1162 girls and 1038 boys who visited health gallery of Pushpa Gujral Science City, Kapurthala. The data was then analyzed by using mean, SD and t-test.

approach to learning experiences. The idea that the previous studies of Sivakumar, R.(2014) & Dierking and Falk (1994) that teaching science by using low cost teaching aids is more effective as well as interactivity improve visitor learning at museum exhibits (Frank Oppenheimer (1968) and (Dewey 1938/1997) also supports the findings of the research studies. The findings that significant improvement of marks after having visited health gallery is also attributed to fact that experimentation play a major role in the success of science and exhibits promotes pupils maximum participation in the learning process and ensures longer retention of the information gained. The findings of this study that girls exhibited better results before and after their visit to health gallery is supported by the study that girls are more interested in biological sciences. (Schibeci & Riley, 1986; Weinburgh, 1995) whereas boys show a more positive attitude toward physical sciences.

**Results and conclusion**

The results of the analysis from table 1 (for boys and girls) suggest that the mean scientific score of the girls was better than the boys as assessed based on the questionnaire. It was revealed that the calculated t-value is 2.61 in case of boys, and 5.09 for girls, which was higher than the table value (1.96) at 0.05 level of significance. Accordingly, the findings of this study are summarized here: There is a significant difference between the scientific perception and learning experience of adolescent rural boys and girls of Punjab; and girls exhibited significantly better score over boys before as well as after having visited health gallery.

The scientific knowledge can be developed given the opportunities to the students for independent extra reading, laboratory works and problem solving skills. The most powerful message that emerged from the studies is the emphasis needs to be given by the science teachers to make the learning interactive by developing low cost teaching aids using available resources. This will help to inculcate scientific temper, develop scientific knowledge as well as problem solving skills amongst the rural students of Punjab. Further, the students should be encouraged to take up studies based on their interest and taste for the subject.

**Table 1: t- values of boys and girls before and after visits of health gallery**

Variable	Gender	N	Marks obtained before gallery visit			Marks obtained after gallery visit			't' values	5% level of significance
			Mean	S.D.	S.E.M.	Mean	S.D.	S.E.M.		
Scientific understanding	Boys	108	3.49	1.82	0.17	9.0	2.39	0.23	2.61	Significant
	Girls	121	4.04	1.27	0.11	10.3	1.49	0.13		

The broad findings of this study showed that for getting less marks by both the groups before having visited the gallery is attributed to rural background, lower financial back up of the students, lack of facilities or resources provided to rural students. A significant difference of marks after having visited the gallery by both the group of students is attributed to the role of interactive exhibits as an innovative

**Pushpa Gujral Science City, Kapurthala, Punjab**  
**Questionnaire for Health Gallery**  
(Before & After Visit)

Name & Class  
School  
Urban/Rural  
Contact No.

Q 1. How many chambers a human heart has?

Q 2. A long tube that carries food from the mouth to the stomach.

- a. Urethra      b. Trachea      c. Esophagus      d. Large Intestine

Q 3. ECG Stands for?

Q 4. Name the largest, longest and strongest bone of the body?

- a. Tibia      b. Femur      c. Pelvis      d. Humerus      e. Radius

Q 5. Human body (Adult) has \_\_\_\_\_ bones.

Q 6. How many bones are in back bone or spinal column?

- a. 36      b. 28      c. 32      d. 26

Q 7. How many sense organs are in human body?

- a. 4      b. 6      c. 5      d. 7

Q 8. Human eye forms an image on

- a. Retina      b. Pupil      c. Lens      d. Cornea

Q 9. Left side of brain is responsible for controlling?

- a. Left side of body      b. Right side of body      c. Both sides of body      d. Front side of body

Q 10. Incisors are sharp teeth used for tearing food, how many incisors teeth do you have?

- a. 4      b. 6      c. 8      d. 12

Q 11. HIV Stands for

Q 12. AIDS stands for

Q 13. How many pairs of Chromosomes in Human?

- a. 22      b. 23      c. 24      d. 26

Q14. Genetically, who is responsible for the sex of the child?

- a. Father      b. Mother      c. Both      d. None

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# All e-users must be aware of e-waste management!

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## **Introduction**

Information Communication Technology (ICT) has at one hand revolutionized the world in terms of growing numbers and generations of e-users, whereas it leaves behind gargantuan amount of e-wastes on the other! E-waste is an offshoot of modern developments in Information and Communications Technologies (ICTs). However, majority of users of these services and products are unaware of presence of hazardous chemicals in ICT goods. The six hazardous chemicals are used in most brands of laptops and other electronic gadgets. It is necessary to estimate the amount of e-waste generated and understand the current trends in disposal and recycling of e-waste in Indian context, besides various hazards associated with recycling of e-waste and remedial measure for efficient collection and safe disposal of e-waste.

A plethora e-activities surround us today in our everyday life. We have e-mail, e-banking, e-business, e-books, e-medicine, tele-medicine, e-procurement, and so on. The e-products, like laptops and cellular phones have penetrated the society in a big way. ICT industry is growing at a very fast rate worldwide. Department of Communication & Information Technology, Government of India targets 75 internet subscribers per 1000 population. Moreover, consumers are enticed by planned obsolescence in ICT industry. They are brainwashed through aggressive advertisements to buy newer versions of

e-products by industry. There would always be problem of incompatibility between hardware and software with some scope of upgradation. All these arise because of the fact that companies are driven by profits only. Average useful life of computers has been reduced from 7 to 2-4 years. Cell phone has an average life of two years. Replacement rate of PCs in service sectors like BPO, KPO, ICT and advertising is high, they replace a quarter of PCs every year. E-waste is a generic term embracing various forms of electric and electronic equipments such as PCs, TV, cell phones, PDAs, MP3 players, computer games and peripherals, which are of no use to their users. Sometimes e-waste and WEEE (Waste Electrical and Electronic Equipments) are considered similar!

## **Quantum of waste**

Annually 20-50 million tonnes of e-waste is generated worldwide. In India, 0.4 million tonnes annual e-waste is generated. It constitutes 5% municipal solid waste. It is the fastest growing component of municipal solid waste. Apart from that, 50,000 tonne e-waste is imported annually in the form of secondhand gadgets or scrap in India.

## **What happens to electric and electronic gadgets after they become useless**

In developed countries e-waste is sent to landfill for

All e-users must be aware of e-waste management!

**Table 1: The recycling efficiency of various components of e-waste**

<i>Name</i>	<i>Content (weight %)</i>	<i>Weight (lbs.)</i>	<i>Recycling efficiency (%)</i>	<i>Use/location</i>
Tantalum	0.0157	<0.1	0	Capacitors/PWB, power supply
Indium	0.0016	<0.1	60	Transistor, rectifiers/PWB
Vanadium	0.0002	<0.1	0	Red phosphor emitter/CRT
Terbium	<0	<0	0	Green phosphor activator, dopant/CRT, PWB
Beryllium	0.0157	<0.1	0	Thermal conductivity/PWB, connectors
Gold	0.0016	<0.1	99	Connectivity, conductivity/PWB, connectors
Europium	0.0002	<0.1	0	Phosphor activator/PWB
Titanium	0.0157	<0.1	0	Pigment, alloying agent/(aluminium) housing
Ruthenium	0.0016	<0.1	80	Resistive circuit/PWB
Cobalt	0.0157	<0.1	85	Structural, magnetivity/(steel) housing, CRT, PWB
Palladium	0.0003	<0.1	95	Connectivity, conductivity/PWB, connectors
Manganese	0.0315	<0.1	0	Structural, magnetivity/(steel) housing, CRT, PWB
Silver	0.0189	<0.1	98	Conductivity/PWB, connectors

disposal and also sent to recycling units. A new economic sector is emerging around trading, repair, refurbishing and recovery of materials from waste devices. Recycling of e-waste is a market-driven and growing industry in India. About 40,000 people are involved with this sector in Delhi alone. Environmental impact of e-waste arises due to inappropriate handling. E-waste is toxic if treated improperly. It is a valuable source of secondary raw material if handled properly. The valuables in WEEE are about 60%, whereas pollutants are about 3% only. Electronic devices are a complex mixture of several hundred materials. Some of them are contained in bulk whereas others are found in traces. Substances which are found in bulk include epoxy resins, fibre glass, Poly-chlorinated bi-phenyls (PCBs), polyvinyl chloride (PVC) and thermo-setting plastics. The elements in bulk include lead, tin, copper, silicon, beryllium, carbon, iron and aluminum, gallium and

arsenic. The elements found in small amounts are boron, cadmium, mercury, phosphorous, thallium, tungsten and gold. The elements in trace amounts include americium, antimony, barium, bismuth, cobalt, europium, germanium, indium, lithium, manganese, nickel, niobium, palladium, platinum, rhodium, ruthenium, selenium, silver, tantalum, terbium, thorium, titanium, vanadium and yttrium.

### **Basics of recycling**

The various steps in recycling include dismantling, breaking, pulverization, hammering, shredding, acid processing, burning of organics, de-soldering and disposal of non recyclables. In India all these process are carried out informally in slum areas. The manual breaking of CRTs leads to inhalation of chemicals. Shredding exposes to metal dust. Acid processing in concentrated nitric acid exposes recy-

clers to toxic fumes. Open burning of PVC and various PCBs leads to emission of toxic, carcinogenic dioxins and furans. Ash contains high levels of Cd, Cu, Pb and Zn. The de-soldering is carried out on domestic cook-stoves and results in emissions of Pd, Sn and BFRs. In fact cables are used as fuel to cook food by recyclers.

The recycling operations necessitate the installations of an effluent treatment plant, air pollution control device and hazardous waste management. Hence authorized recycling plant require substantial investment. This is the reason that the cost of recycling is higher in authorized plants. Only a fraction of e-waste reaches formal recycling centres. Some corporates are selling e-waste to informal recyclers at higher prices. Informal recyclers pay more money for e-waste as the cost of recycling is cheap. Authorized recycling facilities are operating as logistics management companies as they send PCBs to Belgium to recover precious metals like gold.

In India most of recycling is done in unorganized sector. These are spread in all metros especially Bangalore and Delhi. Moradabad is also a recycling hub. The technology employed is rudimentary and dangerous. Workers are involved in various process without any safety gears like gloves, masks, goggles and boots. Mostly women and children are engaged in dismantling work. Recycling is highly inefficient. Percentage recovery of precious metals is very low. The wastes from recycling operations are directly dumped on nearby soils and water bodies.

### **Impact of e-waste**

There are hazardous chemicals present in e waste which have extremely high toxicity. There are substantial chemicals which are non biodegradable, persistent and bio-accumulative. It is much more hazardous than plastic packaging. All these lead to pollution of groundwater and acidification of soil. Heavy metals found in e-waste are hazardous. Lead is extremely harmful to the human body; damages both the central and peripheral nervous systems; can cause seizures, retardation, high blood pressure, damage to the kidneys and liver. It adversely affects child development. Long term exposure of Beryllium can be carcinogenic, especially for the lungs. Extreme exposure can lead to a potentially fatal condition known as Acute Beryllium Disease. Arsenic is

a notoriously potent poison; causes severe damage to the digestive tract. Mercury attacks the central nervous and endocrine systems; harmful to mouth, teeth and gums; poses risk in the neurological development of unborn fetuses. Antimony and Cadmium are potentially carcinogenic; repeated exposure can damage the lungs, kidneys and liver.

The Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment was adopted in 2003 by the European Union. The RoHS-directive, restricts the use of six hazardous materials (viz., lead, mercury, cadmium, chromium, PBB and PBDE) in the manufacture of various types of electronic and electrical equipment. PBB and PBDE are brominated flame retardants (BFR) used in several plastics. BFR release dioxins and furans which are neuro-toxins. A long term exposure of these substances may lead to damage of Nervous system, Kidney, Bones, Reproductive System and Endocrine system. The six restricted hazardous chemicals are used in most brands of laptops and other electronic goods. There are many reputed companies which repeatedly seek RoHS exemption. Instead of indulging in innovation and R & D to design out toxic chemicals the electronics companies are busy in selling their hazardous products through aggressive marketing. Consumers and Ministry of consumer's affairs seem woefully ignorant of these issues. There is no 'Jago grahak Jago' or any awareness campaign on RoHS directive or its exemption, except a few talks and articles in media!

### **Remedial measures**

Except a few items of WEEE included under the Hazardous Wastes Rules of India, there is no regulatory mechanism for the management of e-waste at present. A separate national legislation must be promulgated to deal with e-waste. The government's leverage may be used as one of the country's largest information technology buyers for design improvements, manufacturer's participation in reuse-cum-reprocessing and end of life product services. Setting up e-waste collection centres within state electricity distribution boards must be encouraged where consumers can deposit their end of life devices. This has been suggested in view of the fact that employees of state power distribution departments visit consumers at least twice a month to observe electricity

All e-users must be aware of e-waste management!

consumption readings from the meter and then to deliver the electricity bills. On these trips they may collect all e-waste from the household including used CFL lamps, cells and batteries. These items may be sent to proper recycling and disposal units. Producers must take full life cycle responsibility of their products. Corporate sector needs to bear cost of responsible recycling. For improving the efficiency of collection system, Corporate should start voluntary take back scheme of their end of life products. A Producer responsibility organization (PRO) is usually a not for profit organization established by a group of producers to exercise their responsibility. Government of India should create a special government fund for creation of PROs. Private sectors may be rewarded for programmes on environmentally friendly design for EEE. The Government should enact legislations so that manufacturers design clean products with longer life spans. Import of e-waste must be banned. Basel Convention for trans boundary trade of e-waste must be implemented. WEEE directives encourages design of EEE that facilitate dismantling. Hazardous chemicals should be substituted with safer alternatives. Formal recycling sector must be developed. Workers may be trained and be provided safety gears for performing operations like dismantling, shredding etc. Informal sector should be mainstreamed with formal sector. Wastes generated during recycling of WEEE shall be disposed of in engineered landfill sites.

The trend of going green and manufacturing

clean products free from hazardous chemicals is slowly picking up. In India WEEE task force was formed in 2004 with representatives from Ministry of Environment and Forests, Central Pollution Control Board, Ministry of Communication & Information Technology, State Pollution Control Boards, NGOs, stakeholders and producers. Consumers are becoming more informed and aware. They prefer green and clean products. Green labeling of e-products should be initiated for helping consumer in selection. Several companies are launching safer products, like PVC and BFR free cellphones, complying with RoHS directive which promotes phasing out of six deadly substances in e-products.

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# Role of civil society organizations in developing scientific temper

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## Introduction

*Science must be used for the development of all, not just a few. Two questions emanate from this: What is science? And what is development? Let's proceed to answer both the above questions. It incorporates both scientific perspective and spirit. The scientific perspective adopts an objective - impartial, impersonal, unbiased, unprejudiced - view of things. Scientific spirit drives a scientist to inculcate the scientific perspective. The objectives and work of some science movement organizations in the country, such as Jana Vignana Vedika (JVV), seek to inculcate among common populace scientific temper. It is not the intention here to come to a conclusive answer on the above two questions but provoke a few to think and debate, especially from civil society organizations' perspective.*

## What is science?

'Science' drawn from the Latin word 'scientia,' which stands for knowledge, has been interpreted differently. New Standard Encyclopaedia defines science as "the systematic and unbiased study of the world, including everything that can be seen or detected in nature, man and society and the knowledge that grows out of such study."<sup>1</sup> Encyclopaedia Britannica regards science as a mood in which the world is considered.<sup>2</sup> McGraw-Hill Encyclopaedia of Science and Technology characterizes science by "the possibility of making precise statements, which are susceptible of some sort of check or proof."<sup>3</sup> The common tenor in all these interpretations is that science is proved knowledge. Naturally, science incorporates everything that is discovered, invented

or interpreted, and it is for the humans to use it for harmful or harmless purposes.

A scientist is motivated by an urge or a passion to contribute. He may not be conscious of the ultimate purpose for which his knowledge may be used, but scientists are cautious of the purposes their contributions have been used for. Many have expressed regrets for their discoveries after having seen the destruction that they have caused. This is what we call 'latent dysfunction' in sociological parlance. That science and society are inter-related has also been stressed by many a scientists, political leaders and others. The scientist, as s/he is moulded by the society of her/ his 'academic socialization' has a responsibility and commitment to the good of the same because it is the society which provides with the right frame of mind, setting, finance and infrastructure to think originally, research, innovate and contribute.

## What is development?

This concept too has been defined and interpreted in diverse manner. But the development in the true earnest is that which is qualitatively and progressively higher and better than the earlier levels of development and the one, which is accessible to all sections of the population. Clarke stated twelve 'musts for development': Development must be total, original, self determined, self-generated, integrated, respect the integrity of environment, planned, directed towards a just and equitable social order, democratic, not insulate less-developed regions into 'reservations', innovative, based on a realistic definition of national needs.<sup>4</sup>

It is obvious that development has not affected

all sections of our society equally, nor even an 'urge' is created in them to aspire for it. Amartya Sen and Wolfensohn point to two debates on the reach of development: the hard-nosed approach which emphasizes sacrifices to be made for a better tomorrow and advocating macro-economic medicine considering social safety nets, social services and even human rights as folly, and the alternative outlook which sees development as an essentially friendly process with social protection systems, of freedoms, of laws and of judicial systems that can earn the confidence and respect of citizens.<sup>5</sup>

Coming back to the linkage between science and development, science has always been intended and is aimed at achieving growth and development but the way the development process has been taking place and affected different sections of the society differently has been determined more by the agents of development than the originator, namely, the scientist. If real development is not possible without the growth of science, access to development does not exist in an equal measure to all. If such people are endowed with scientific temper, they will be enlightened to take advantage of equal opportunity and access for development.

### **What is scientific temper?**

If science is a concise body of systematic knowledge acquired through the application of various scientific methods, then such knowledge is real, objective and the only one. If something else passes for knowledge that is only 'pseudo-knowledge.' The scientific knowledge itself may change from time to time taking into account new insights, analyses, perspectives, innovations and discoveries. In the various scientific methods mentioned above, a scientific perspective is discernible. The scientific perspective is an objective which means again to be impartial, impersonal, unbiased, unprejudiced, not subjective and so on. In other words, scientific perspective is an 'objective rationality.' When a scientist looks at an object critically, he has such an attitude without which he cannot be in a position to discover the 'reality.' It is this scientific perspective which enables the body of scientific knowledge to keep growing.

As scientific perspective stands for approach to comprehend knowledge, scientific spirit lies in the right attitude to absorb knowledge. The scientific

spirit drives the scientist and the scientific perspective enlightens him. Perhaps considering the essentiality of scientific temper encompassing both the scientific perspective and spirit, the Indian Parliament incorporated development of scientific temper as one of the fundamental duties under Article 51A(h). It should be a directive principle binding to spread scientific temper to save people from the evils of parochialism, regionalism, superstitions and other such vicious tendencies. Some scientists extended the scientific perspective and scientific spirit to spheres outside the pure science. Many organizations, forums or individuals were engaged in this kind of endeavour. Their conviction is that religion, politics, culture, economy, social issues and matters can be viewed from a scientific perspective. Their attempts have taken the shape of movements in some cases and All India People's Science Movement (AIPSM) emerged incorporating many of these organization under All India People's Science Network (AIPSN).

### **Civil society organizations propagate scientific outlook**

Kerala Sastra Sahitya Parishad (KSSP)<sup>6</sup> has been on the forefront of these organizations in India. Having started in 1962 with the main aim of 'mass propagation of science' by publishing and selling the science literature, it grew by mid-1970s to be a 'vehicle for social change' as it did not want to remain merely an 'information transfer coordinator.' KSSP's objectives are to: popularize science and scientific outlook among the people; to develop a sense of optimism in them, instill in them a sense of self-confidence that they can change the world and can build a better tomorrow; to oppose abuse of environment; to help implement alternative models for development, and others.<sup>7</sup> Its slogans like 'Science to remove poverty', 'science to change world', 'science to eradicate diseases' and others have become popular even amongst households. It took up diverse activities concerning health, education, planning, women, energy, environment and other areas as well. KSSP has won international accolades for its work including Right Livelihood Award (considered an alternative Nobel Prize) by the Right Livelihood Award Foundation, Stockholm, Sweden, in 1996. Such organizations function in other states too. Tamil Nadu Science Forum (TNSF), Jana Vig-

nana Vedika (JVV), Assam Science Society, Gujarat Gyan Vignan Samity, Bihar Vignan Manch, and Madhya Pradesh Vigyan Sabha, etc. The common aim is mainly to propagate scientific temper and enable the people to acquire a scientific perspective.

### **An illustrative example of Jana Vignana Vedika**

Jana Vignana Vedika (JVV) in Andhra Pradesh works with the objectives<sup>8</sup>: to propagate scientific knowledge among the populace and promote scientific perspective; dissuade people from superstitions and conservatism through scientific knowledge; promote scientific awareness on the basic nature of the problems faced by the people and search for solutions; endeavour to take advantage of the fruits of science; strive for truth, sovereignty, integrity, world peace, social progress and cultural development, and encourage scientific research in different fields keeping the people's welfare in view.

Launched on the National Science Day (February 28) in the year 1987 as a culmination of the efforts by science organizations and science activists, JVV has been focusing mainly on literacy, continuing education and post-literacy issues in the initial years, and such diverse issues, like women, health, thrift, watershed, and others later. JVV has a heterogeneous membership of nearly 50,000 in almost all the districts of the state and units are functioning down up to village/ ward-level. Members are from different socio-economic groups, professionals, like doctors, engineers, teachers, social activists, etc. JVV played a pro-active role in the National Literacy Mission in Andhra Pradesh in the year 1990. 'Hamara Desh' programme, launched in 1994, envisaged going to the villages, interacting people, understanding local problems from their perspective, motivating them to sink differences, get united and try to solve the problems by themselves<sup>9</sup>. Problems relating to health, sanitation, schools and '*panchayat*' and others were sought to be solved by local initiatives. The JVV volunteers were supposed to go to villages, do 'resource mapping' with the help of the local populace, understand their topographical sense with the aid of 'transect' walk, engage them in discussions and try to discern the perceived changes that they have noticed over the last fifty years in respect of agriculture, farming practices, food grains

produced, natural, physical and social resources and others to create a general awareness of their village, community, adopt a macro-outlook of the world and nation at large and put their own place in a contextual setting. Further, they were required to suggest solutions for the various problems of the community. This would help them to know where they stand, whether they are keeping pace with the changes around or were left behind. The ultimate aim was to spur the local people into a collective frame and achieve development. However, the programme was not a success due to a variety of factors – organizational, financial, lack of appreciation at the unit levels, apathy or ignorance of the people and so on.

There were incidences of distributing a '*fish medicine*' as a cure for *asthma* and other lung-related problems for the past many years. JVV had pointed out the absence of medicinal value of the same as also the other health hazards associated as the '*medicine*' was always administered by putting it in the mouth of a fish and forcing it down the throat of a patient with bare hands and claiming sole authority over the '*medicine*'. The matter was legally settled in 2006 with the court holding that it was a matter of conviction of the people although the medicinal value was not scientifically proved. Consequently, the number of people rushing for the '*fish medicine*' which ran into lakhs in the earlier years has fallen to only thousands in recent years.

Solar eclipse, partial or total, is a rare astronomical phenomenon and visibility of it in one's region on a clear day is much rare. JVV organized safe viewing of such a rare celestial event by public and people responded massively. JVV has also been practising 'catch them young' policy in real terms. In this direction, JVV has been organizing school-level activities in science promotion by conducting and organizing talent tests for the past many years from local-level to state-level, quizzes, science exhibitions, scientific talks. Government of India declared the year 2004 as a 'Year of Scientific Awareness.' JVV organized various activities in schools, urban colonies and villages and among public representatives and spread scientific awareness. JVV also organized several women-related programmes too under its wing called '*Samatha*.' Apart from these, awareness was also created among them about their own home, family, health of themselves and their children, environment and others to create confi-

## Role of civil society organizations in developing scientific temper

dence. It publishes books, booklets, pamphlets and other literature on scientific phenomena like solar system, solar eclipse, basic health education, etc., thus covering popular science and socio-scientific issues. Towards propagating scientific knowledge, promoting scientific temper and tackling developmental issues, it organized activities in diverse fields with social inclusion.

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17<sup>th</sup> Indian Science Communication Congress (ISCC-2017)

## Science Coverage in Mass Media is Proportionate to Science Awareness



*Inauguration by lighting the lamp*



*Prof. K.G. Suresh, DG IIMC addresses at inaugural session*

Chairing the inaugural session of the 17<sup>th</sup> Indian Science Communication Congress (ISCC-2017), noted particle physicist turned science communicator and UNESCO Kaling Prize Winner for Science Popularization Dr. Narender K Sehgal said that coverage of science in Indian media is dismal and has been declining over the years; though, science coverage in mass media is generally proportionate to science awareness and can be considered as an indicator to the scientific inclusion of the society, he said.

The 17<sup>th</sup> Indian Science Communication Congress was held on 21-22 December 2017 at New Delhi. CSIR-National Institute of Science Communication and Information Resources (CSIR-NISCAIR) and the Indian Institute of Mass Communication (IIMC) were the lead organizers of the well-attended two-day event. Scholarly societies and bodies involved in science communication including the Indian Science Writers' Association (ISWA), Society for Information Science (SIS), Indian Science Communication Society (ISCOS) and Vigyan Bharati (VIBHA) also partnered with CSIR-NISCAIR and IIMC in organising the 17<sup>th</sup> edition of the Indian Sci-

ence Communication Congress.

Some 200 delegates including science communicators, scientists, researchers, science fiction writers, science enthusiasts, science journalists and students participated in the Congress which had the theme 'Communicating India's Scientific Wisdom: Changing Paradigms'.

Prof. K. G. Suresh, Director-General, Indian Institute of Mass Communication delivered the keynote address. He said that to reach the masses, scientists have to be communicators as well. Welcoming the gathering Prof. Manoj Kumar Patariya, Director, CSIR-NISCAIR said that the Indian Science Communication Congress has over the years emerged as a platform for brainstorming and engaging in discussions on various facets of science communication with Pan India presence of the delegates. Dr. R.S. Sangwan, Director, Academy of Scientific and Innovative Research (AcSIR) who was the Chief Guest said that science communication should evoke a lot more scientific interest among the masses. Mr. Kamal Kishore, Member, National Disaster Management Authority who was the Guest of Honour said that the science of disaster should be communicated to the common man so that losses



***Prof. R.S. Sangwan, Director AcSIR and Dr. Narender K. Sehgal UNESCO Kalanga Awardee on dais***



***Release of a book on Disasters authored by Dr. R.K. Bhandari and published by National Book Trust***

owing to disasters can be reduced.

A popular science book “Disasters: Short Stories, Essays & Anecdotes” authored by Dr. R.K. Bhandari and published by the National Book Trust India was released at the inaugural function.

Spread across 10 parallel scientific sessions including a poster session, nearly 100 presentations and talks were given by the experts and delegates on the various facets of science communication focusing on India’s scientific wisdom.

### ***Panel discussion on Emerging Worldview on India’s Scientific Wisdom***

The panel discussion was chaired by Dr. Narender K Sehgal. During the course of the discussion, Prof. M. Sai Baba of National Institute of Advanced Studies, Bengaluru said that while coverage of science in traditional media is lower, there is an increased coverage of science in the social media. However, he added that with the prevalence of fake news on social media, one needs to be diligent when following science news on the social media. Dr. Dinesh Kumar, Former Director, Institute of S&T Communication, University of Lucknow said that language should not be a barrier to science communication and that science communication in vernacular languages should be promoted. Dr. G. P. Pandey of Assam Central University also emphasized that scientific research being carried out in India should find more visibility in regional language mass media. Dr. U.P. Pandey of Dainik Tribune called upon the science communicators to focus on regional languages. Mr.

V.P. Singh, President, Indian Science Communication Society shared his view that the rich scientific wisdom in Indian villages needs to be communicated widely. Mr. Nimish Kapoor of Vigyan Prasar stated that we need to brand our ancient science and popularize it better. He was also of the view that there is a need to translate ancient Indian scientific works in foreign languages. Dr. Daljeet Sachdeva of IGNOU highlighted the important role that community radio can play in popularising Indian science. That there is an urgent need to bridge the gap between journalists and scientists was articulated by Dr. Surabi Dahiya of Indian Institute of Mass Communication. The panel gave impetus on communication for shaping the emerging worldview on our ancient scientific wisdom and indigenous scientific knowledge.

### ***Mass Media & Science Communication***

Dr. Rajiv Sharma, Secretary, Science and Engineering Research Board who chaired a session and shared his concern that it has become difficult to differentiate between real and fake news. Dr. P. Iyamperumal, Executive Director of Tamil Nadu Science and Technology Centre detailed the science communication efforts of the Centre that included organizing science exhibitions that had virtual exhibits, creating innovation hubs, providing trainings in the area of robotics and special programmes for differently-abled children.

Speaking on the role of media in communicating S&T to the masses, Dr. M. A. Ansari, Professor (Communications), G B Pant University of Agricul-

ture and Technology said that media should set the agenda for public discourse, thereby shaping opinion for and against scientific issues that concern the masses. The talk by Dr. Ajitabh focused on the role of social media in science communication and how social media can be a game changer in communicating India's scientific knowledge.

Drawing on several initiatives taken by Central Building Research Institute's youth centric programmes, Dr. A. K. Agarwal of CBRI, Roorke underscored the need for building scientific temperament in young minds. Prof. H.P.S. Kalra, Professor, Punjabi University, Patiala shared science related aspects mentioned in the Punjabi language scripture, Sri Guru Granth Sahib.

A study about the role of social media in creating awareness about reproductive health among Indian women found that though most of the women in the study were using social media, a majority were not receiving reproductive health related information through social media.

Challenges in science communication in India, motivating school children to study science, communicating S&T policy issues, science communication through radio including internet radio were also

topics of discussion that gave emphasis on increasing the effectiveness of science communication through various ways and means.

Mr. V.P. Singh, President, Indian Science Communication Society in his lecture said that there is a great demand for science communicators in the country. He said that the many courses on science communication should strive to not only train but should also assist in placing such trained people in suitable jobs related to science communication and science journalism.

### ***Public Health Communication***

Promoting and enhancing awareness about public health was the focus of most presentations of a session on health communication. The role of Anna University in community radio as a medium of social responsibility by broadcasting information regarding women health was highlighted. An assessment of national dailies on reportage of health news showed that some newspapers focussed on visual depiction and some others on news story format. Another study showed that while the coverage of health news and reports in mass media are growing,



***Dr. Manoj Kumar Patariya, Director CSIR-NISCAIR addresses at inaugural session***



***Science Journalist Pallava Bagla and Science Magician Harish Yadav deliberate***



*Delegates in a scientific session*



*Scientainment: Science Puppet Show in the evening*

there is scope for further increasing the coverage of health news. Health awareness among Baiga tribal community in Madhya Pradesh was also discussed. Dr. Arvind Dubey, Paediatrician and Science Writer delved on the how to write a popular health science article.

### ***Facets of Agriculture Communication***

The media does not adequately cover agriculture, noted Mr. Pallava Bagla, Science Editor, NDTV who was a lead speaker of the session on agriculture communication. Through a few recorded videos of agriculture related news stories, Mr. Bagla highlighted the role that the audio-visual media can play in reporting important news. Dr. Anubhuti Yadav of IIMC said that the farmers need to be made digitally literate and that more science content is required in regional languages. The role of community radio in agriculture communication was highlighted in this session.

Ms. Aupa Lakhar, Assistant Professor from Gauhati University reported that while the reach of television continues to be limited, the radio has better reach and interactive two-way communication programming is a must in today's scenario. Use of ICT for agriculture information sharing by the government through its many programmes was chronicled and discussed. The increasing use of social media for agriculture communication and many potential uses of social media was presented by Dr. M. A. Ansari, Professor of Communication of GB Pant University of Agriculture and Technology. Social media platforms can be used to enable farmers

and agribusinesses to meet and network with other farmers, agribusinesses and consumers domestically and globally. An AgriChat model along the lines used in other developed countries can be introduced in India too.

Agriculture extension services have been pivotal in transferring new skills and knowledge to farmers and have been carried out by public funded institutions. A G B Pant Agricultural University Study reported that agriculture extension is evolving into advisory services with fulfilling client oriented and demand led needs and involvement of NGOs, farmer organizations and private sector for helping farmers

### ***Trends in Environment and Risk Communication***

That science tourism can be an effective communication tool for promoting scientific heritage was put forward by Dr. Lalit Kumar Sharma of Vigyan Setu Foundation. Many archaeological sites, science museums, science cities, science parks, observatories, R&D institutions and universities can be potential science tourism sites. Based on a study on the coverage of climate change in major English dailies of India, Ms. Nisa Askari of Aligarh Muslim University reported that the political take on climate change issues were predominantly covered in the dailies followed by reportage on disaster and risk, awareness and climate change developmental issues.

Vigyan Prasar recently made 13 episode video programmes on the science and technology behind Indian architectural sites. Mr. Navneet Kumar Gup-

ta of Vigyan Prasar briefly gave a narrative about some of them such as evolution and advantages of constructing buildings with bricks, ancient water conservation and water harvesting technologies and so on.

The sessions discussed on the emerging worldview on India's scientific wisdom, science communication, health communication, agriculture communication, and environment and risk communication. Various speakers noted that India's scientific wisdom; particularly the ancient scientific wisdom is not being effectively communicated, especially in foreign languages.

### ***Round table on India's scientific wisdom: communication strategies***

A round table discussion on 'India's scientific wisdom: communication strategies' had many experts including Prof. K.G. Suresh, Prof. Manoj Kumar Patairiya, Prof. Krishan Lal, Dr. C.M. Nautiyal and many other noted science communicators brainstorming on various communication strategies for spreading India's scientific wisdom. Prof. V.K. Malhotra, Member-Secretary, Indian Council of Social Science Research was the chief guest. Mr. Declan Kirrane, Managing Director, ISC Intelligence in Science who joined the panel discussion over Skype from Brussels, Belgium said that there is a unique need to communicating science with policymakers as well as international collaborations.

### ***Highlights***

Science based entertainment or Scientainment was

a unique highlight of ISCC-2017. The programme that included magic and puppet shows in the evening on both the days saw the delegates and the general audience enjoying and understanding many scientific concepts.

Summing-up the event during its conclusion, Prof. Manoj Kumar Patairiya, Director, CSIR-NISCAIR highlighted various recommendations emerged during the deliberations such as promoting science communication research and academics including training and cross cultural studies on said that many interesting papers were read at the science communication congress, notable among them being the study by Dr. Manoj Mishra and his team under the guidance of Prof. Raja Ram Yadav, Vice Chancellor of VBS Purvanchal University on how science communication has played an important role in lowering the instances of casualties caused by snake-bites in the region. Prof. V.K. Malhotra, Member Secretary, Indian Council of Social Science Research was the Chief Guest at the valedictory session who emphasized on value and respect for interdisciplinarity while dealing with subjects like science communication. Co-Chair of IAP for Science and Former President INSA Prof. Krishan Lal highlighted the significance of academies in promoting science communication and said the institutions like NISCAIR and IIMC are well placed to play major role in professional enrichment with global competitiveness in science communication while chairing the session. The 17<sup>th</sup> ISCC-2017 concluded with expectation and promise by one and all that everyone would contribute towards promoting scientific awareness and inculcating scientific temper among masses. ■

## **Commissioned Studies/ Papers**

Indian Journal of Science Communication encourages potential scholars to undertake short term studies/ research/ surveys on specific area/ topic/ sector concerning S&T communication. It is expected that such studies will also lead to writing of a paper/ article and can subsequently be published in IJSC, if found suitable. A committee of experts will evaluate and recommend carrying out of such studies. A nominal amount towards honorarium may be granted for undertaking such studies. Proposals, including information pertaining to title of the study, scope and objectives, methodology, expected outcome, budget estimates and time schedule, etc., may be sent to the Editor, IJSC.

3<sup>rd</sup> India International Science Festival 2017

## Round Table Meet on Mass Communication



**Dignitaries releasing the theme book of the Round Table Meet on Mass Communication. From left: Dr. Manoj Kumar Patairiya, Director, CSIR-NISCAIR; Prof Shambhu Nath Singh, Director, School of Journalism and New Media studies, IGNOU, New Delhi; Dr. Narender K. Sehgal, UNESCO, Kalinga Prize Winner; Prof. Kamal Kant Dwivedi, Vice Chancellor, ITM University, Gwalior; Dr. Satheesh Shenoy, Director, National Institute of Ocean Technology (NIOT); Shri A. Jayakumar, Secretary General, ViBHA and Dr. Dhilsha Rajappan, Chief Scientist, National Institute of Ocean Technology (NIOT)**

The “Round Table Meet on Mass Communication” was organised on 13-14 October 2017 at National Institute of Ocean Technology (NIOT), Chennai, Tamil Nadu as part of the 3<sup>rd</sup> India International Science Festival 2017 (IISF 2017), which was held during 13-16 October 2017 in Chennai. The “Round Table Meet on Mass Communication”, which was organised for the first time as part of the IISF 2017, saw enthusiastic participation from many regions of the country including the Northeast and even Andaman & Nicobar islands. The participants included students, researchers, science policymakers, science communicators, and journalists.

Inaugurating the Round Table Meet, Dr. Narender K. Sehgal, Former Adviser, Govt. of India and winner of the prestigious UNESCO Kalinga Prize said, “*A scientifically literate person should internalize the method of science, know a minimum of science and technology, and be ready to learn a new thing every day. These are the three components of scientific literacy*”. In his inaugural address, Dr. Se-

hgal further emphasized integration of all media for effective communication by qualified science communicators. Chairing the inaugural session, Prof. Kamal Kant Dwivedi, Vice Chancellor, ITM University, Gwalior, said, “*Often good research does not find its way to people, rather bad science frequently gets shared*”. That is the challenge we face in science communication, he said. Prof. Dwivedi further went on to give a few tips for effective science communication, which included communicating global concepts with reference to Indian contexts, using modern tools for communication, and also exploring and involving the most potential groups of communicators. The guests of honour of the session included Dr. Satheesh C. Shenoi, Director, National Institute of Ocean Technology, Chennai, Prof. Shambhu Nath Singh, Director, School of Journalism and New Media Studies, IGNOU, New Delhi, and Shri A. Jayakumar, Secretary General, Vijnana Bharati, New Delhi. Echoing similar sentiments, Shri A. Jayakumar, General Secretary of Vignana Bharati, said

that to emerge as a world leader we have to inculcate a basic level of scientific literacy among fellow citizens. Science and science communication should be able to prevent people from dying of diseases. In the welcome address, Dr. Manoj Kumar Patairiya, Director, CSIR-NISCAIR, said that for effective science communication there were four prerequisites – content, medium, audience, and format. He said a wide range of media could be utilized for communicating scientific developments especially in a country as diverse as India. This included means such as traditional folk media to the most recent social media. Dr. Patairiya also said that the content needs to be moulded according to the levels of scientific literacy prevailing in the target groups which included school students on the one hand and farmers and people from non-scientific backgrounds at the other. Dr. Satheesh C. Sheno, said that scientists should reach out to the public and schools, and other academic institutions. He suggested translation of scientific knowledge in all regional languages for effective communication to all levels – even fisherman. He said that INCOIS has already initiated communication of information in regional languages through mobiles.



***Dr. V.K. Saraswat, Member, NITI Aayog felicitating Dr. Pradip Srivastava, former scientist from the CSIR-Central Drug Research Institute, Lucknow***

There were four components to the “Round Table Meet on Mass Communication” – Panel Discussion on Why science coverage in mass media is abysmally low?, two parallel Scientific Sessions on the topic “Trends in Science Communication”, a special session for Ph.D. scholars on the nuances of transform-

ing technical and specialized scientific contents of their research papers into popular news and features, and a final Round Table Meet and summing up.

The Panel Discussion, Why science coverage in mass media is abysmally low, was chaired by Dr. Narender K Sehgal, and included experts such as Shri Pallava Bagla, Science Editor, *NDTV*, New Delhi, Dr. N. Murugan, Former Director, All India Radio, Chennai, Dr. A.R.S. Menon, Central Institute of Fisheries Technology, Kochi, Dr. V.K. Srivastava, President, Indian Science Writers’ Association (ISWA), New Delhi, Dr. Upendra Nath Pandey, *Dainik Tribune*, Chandigarh, and Shri Nimish Kapoor, Vigyan Prasar, Noida. Shri Pallava Bagla, said that in keeping with the Prime Minister’s repeated emphasis on instant and regular communication, scientists and science policymakers need to take to social media in a big way. He also said that journalists and scientists need to come together for effective communication of science and technology to the public. There are no rules, he said, that prevent a scientist working in the laboratory to talk about his work to a journalist. Talking about the need for scientists also to become good science communicators, Dr. Upendra Nath Pandey, said this could especially be a boon for farmers who need to be conveyed scientific knowledge in a jargon-free language. Giving a counter view, however, Shri Nimish Kapoor expressed that scientists could not be expected to become good science communicators because of their research-focused training.



***Renowned science film maker Mr. Nandan Kudhiyadi at the summing-up session***

In the two parallel Scientific Sessions on “Trends in Science Communication”, chaired by Dr. Manoj

Kumar Patariya, Director, CSIR-National Institute of Science Communication and Information Resources (CSIR-NISCAIR), New Delhi; and Dr. Dhilsha, National Institute of Ocean Technology, Chennai, papers were presented on varied topics such as weather and climate communication, science communication in Indian languages, filling the gap between theory and practice, training and employment in science communication, gate keeping eco-media, S&T information for newspapers, blogging as an interactive experience, use of social media for addressing social issues and the caution that needs to be exercised while dealing with social media.



***Dr. Manoj Kumar Patariya, Director, CSIR-NISCAIR summing up the proceedings of the Round Table Meet on Mass Communication***

Next session was on the topic “Social Media Chaupal (Science Communication Through Social Media)”, which was chaired by Dr. P. Iyamperumal, Executive Director, Tamil Nadu Science and Technology Centre, Chennai, wherein Dr. Arvind Mishra, Secretary, Indian Science Fiction Writers’ Association, Shri Rajkumar Bhardwaj, Director, Educational Multimedia Research Centre (UGC), Indian Institute of Technology (IIT), Roorkee, Dr. I. Arul Aram, Anna University, Chennai, Dr. P.K.

Ingle, CSIR-National Chemical Laboratory, Pune, and Dr. Anil Saumitra, Atal Bihari Vajpayee Hindi Vishwavidyalaya, Bhopal, participated as experts.

In a special session on “Science Writing Workshop for Ph.D. scholars” chaired by Dr. Sai Baba of the National Institute of Advanced Studies, Bengaluru, science communicators like Dr. C.M. Nautiyal, former scientist from the Birbal Sahni Institute of Palaeo-sciences, Prof. Muthuswamy Balasubramanyam, Dean of Research Studies, Madras Diabetes Research Foundation, Chennai and Mr. Hasan Jawaid Khan, Editor, Science Reporter, CSIR-NISCAIR, gave an insight into the techniques and nuances of transforming research papers into popular science articles.

The concluding session Round Table Meet & Summing Up deliberated on the topic “Science Communication – The Way Forward” chaired by Dr. V.K. Saraswat, Member, NITI Aayog, New Delhi and co-chaired by Shri Jayant Rao Sahasrabudde, Organising Secretary, Vijnana Bharati, New Delhi. Dr. P. Iyamperumal, Executive Director, Tamil Nadu Science and Technology Centre, Chennai, Dr. Kamal K. Kapoor, University of Jammu, J&K, Dr. P.K. Srivastava, Scientist and Science Communicator, Lucknow, Shri V.P. Singh, Secretary, Indian Science Writers’ Association, New Delhi, Shri Nandan Kudhyadi, Producer-Director, Nandan Kudhyadi Productions, Pune, Shri Abhay S. Rajput, Indian Institute of Tropical Meteorology, Pune, and Shri Praveen B. Gawali, Indian Institute of Geomagnetism, Mumbai, participated as experts. Dr. P.K. Srivastava gave an interesting and exciting presentation on the use of cartoons to convey messages pertaining to complex scientific topics and issues. Earlier, Dr. Manoj Kumar Patariya, Director, CSIR-NISCAIR while summing up the deliberations during the two days of the “Round Table Meet on Mass Communication” said that media-savvy scientists and science savvy journalists need to be brought together on a common platform for effective science communication. He said that there was a need for government science institutions to employ trained science communication professionals. He also said that there was a need to promote research and scholarship in science communication. While chairing the final summing-up session of the “Round Table Meet on Mass Communication, Dr. V.K. Saraswat said that he was optimistic about new technologies like





Augmented Reality, Animation and Gaming that were emerging to take forward science communication and assumed that these technologies would also make the work of taking science to the people much easier.

With Dr. V.K. Saraswat in chair, the Round Table Meet on Mass Communication at Rajendra Hall of National Institute of Ocean Technology, Chennai saw the experts shedding light on the present state and future course of science communication in the country. Dr.P.K. Srivastava a former drug scientist, highlighted the role of ‘scientoon’, a hybrid of science and cartoon, in conveying environmental and other science- messages to the masses in the palatable form. Sh. V.P. Singh of Indian Science Communication Society deliberated on the S&T communication education in the country. Well known science film producer Nandan Kudiyadhi talked of need for more science films. Abhay S Rajput from Indian In-

stitute of Tropical Meteorology, Pune put value on the documentation of science in action, training for science communication and necessity of public relation work in research establishments. Tribune journalist Dr. Upendra Pandey shared his experiences of science coverage in newspapers. Dr. Manoj K. Patairiya presented a bird’s eye view of the scenario, emphasising on harmony between science and media for better results. Sh. Dattatreya emphasised on learning science in the mother tongue citing the example of how the meaning of word vein and artery have to be crammed, while the Sanskrit words Neela and Lohita are self explanatory as they refer to the passage of impure blue coloured blood and pure red coloured blood. Shri Jayant Rao Sahastrabudhe and Dr. Shankar Rao Tatwawadi of Vijanan Bharati also graced the occasion. Dr. Shiksha Rajapan proposed a vote of thanks.

■

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