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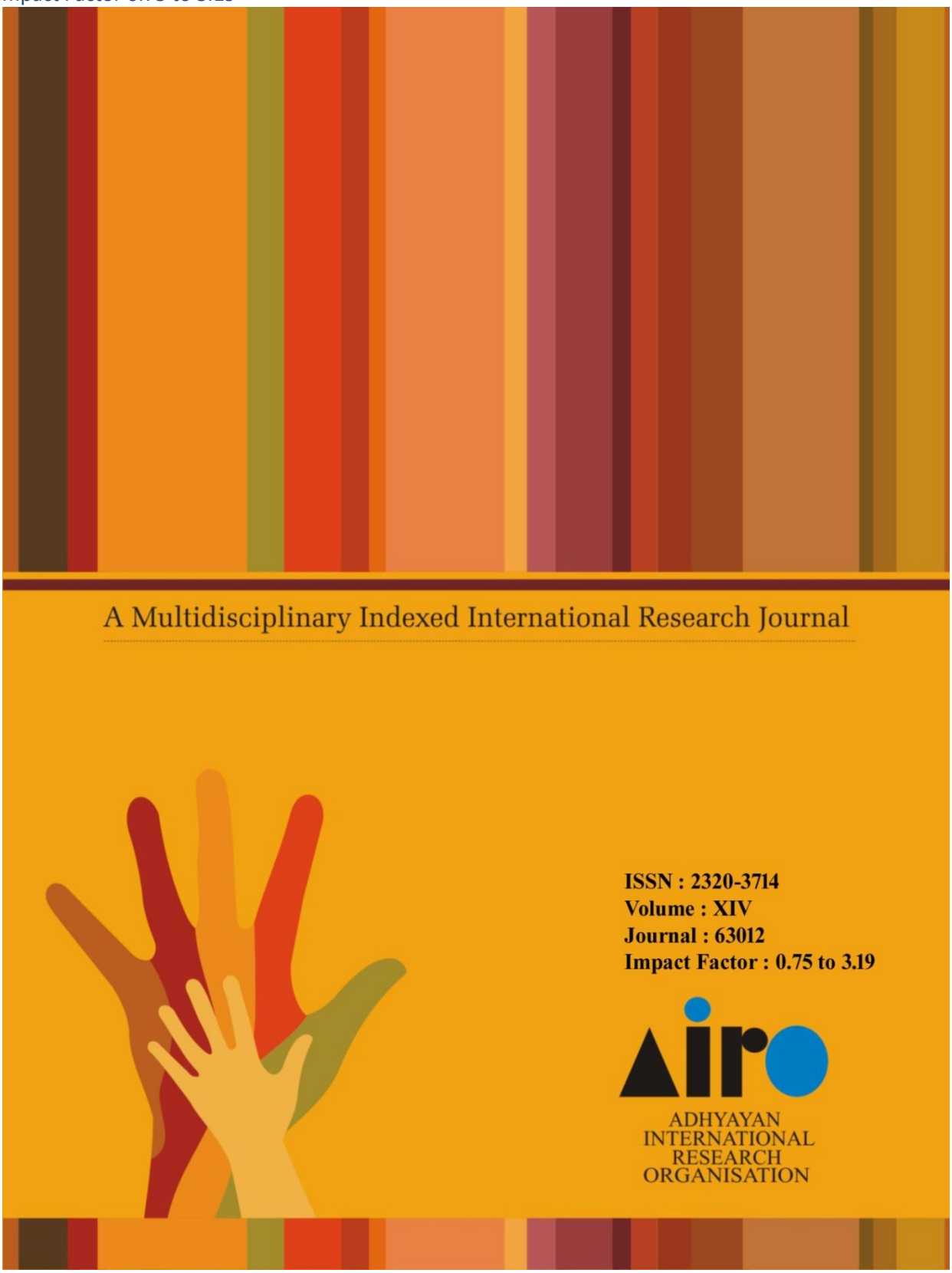

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A REVIEW OF DEVELOPING MOVEMENTS IN SCIENCE EDUCATION IN POST-INDEPENDENT IN INDIA

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ABSTRACT

Science is the constitutive element of the learning society. It has changed the way we comprehend the social and regular world around us. Aside from mitigating us from the traps of numbness, lack of education and penury, it tested the centrality and predominance of supernatural convictions in the public arena. The properties of science like discerning, inventive, and basic reasoning and logical perspectives are the all-inclusive qualities. These qualities are fundamental for the development of a person and additionally society in general. In post independent India, our constitution embraced the objectives of setting up society in light of the logical temper, humanism and soul of request. It is additionally cherished in the principal obligations of the constitution that expresses that it is the obligation of the each national of the nation to instill, proliferate and additionally spread logical temper in the public arena. This underlines science education has unmistakable duties to scatter logical temper in the public arena. Presenting the possibility of science as a procedure/hone at educational programs level, presenting understudies to nature of science, and conveying the setting of logical ideas and teaching science through creative records like learning by doing and disclosures in the classroom are a portion of the critical segments of instructive substance information that can be utilized in the science educationprogram to make science education charming, bearable and characteristic for learning process. It will likewise bring the issues and setting of educational praxis at the focal point of teaching andlearning scienceeducation practices.

KEYWORDS: *Developing Movements, Science Education, social and natural world, society, classroom, important components, teaching and learning.*

1. INTRODUCTION

Globalisationand liberalization has not just changed the monetary structure of the entire world as new financial request yet in addition the human asset improvement and

education pattern. Globalization came about a blast in more qualified labor in administrative and specialized expertise and science training specifically has seen basic changes, which is reflected as S&T workers. Humanresource potential all in all and S&T staff specifically is a measure of a nation's aggressiveness in the rising knowledge society. Science andengineering degree holders might be perceived as an imperative pointer of a country's S&T exertion. Past pattern in science education might be utilized to increase some knowledge and, additionally, to extend the future request and supply of human resources. Each year thousands of thousands of post-graduates and Ph.D. holders are turning out from our scholastic establishments and contributing in the development and formative exercises on the national and in addition universal level. Reasonable sending of this work power can get changes in all kinds of different backgrounds. The viability lies in arranging the labor prerequisite in the coveted regions to make a base for logical and mechanical research. The advance in logical and mechanical research in the past has been great and right now is an ideal opportunity to glance around and survey the general prospects toward this path. It is basic for approach detailing and program improvement.

As a human enterprise, science goes for gaining target learning of the world. Present day science emerged out recently nineteenth century Enlightenment when society was going through what Karl Polanyi has called "the time of extraordinary change." It was the time words like science, logical reasoning, and logical perspective came in the public eye alongside the thoughts of the freedom, equity, fairness that expanded writhings. The properties of science like sound, innovative, and basic reasoning and logical perspectives are widespread qualities. These qualities are fundamental for the development of a person and in addition society in general. Zilsel in an article, the sociological underlying foundations of science followed the starting point of researcher and characterized science as exercises, what researchers do? Be that as it may, what researchers do changes over the timeframe. To summarize what he said what we today call researcher was fairly generally top notch craftsman, handyman and so forth that with course of time extemporized their business. This underlines methodologically science is in excess of an authoritative opinion and substance driven subject that is pre-predominantly instructed in classrooms. It is a procedure, a strategy, and a theory installed in the social milieu of the general public. At the core of science lies the request framework. On the off chance that substance of the science is one side of the coin, another side of the coin is the logical request.

Human resourcepotential is a measure of a nation's intensity in the rising learning society. Science and designing degree holders might be perceived as a critical marker of a country's S&T exertion. Such markers are valuable in approach definitions and improvement of plans for what's to come. A pattern gauge in science instruction will be useful in basic leadership. Pattern

investigation of the outturn of profoundly qualified S&T labor in India is introduced alongside future projections. The branches of knowledge incorporate Natural Sciences, Engineering and Technology, Medical Sciences, Agricultural Sciences, and Veterinary Sciences. As respects essential sciences, a pattern investigation of Ph. Ds. granted in Physics, Mathematics and Chemistry is exhibited here. An essential part of this investigation being that the exceedingly qualified labor at the appropriate time of time can turn into an intense instrument of the country and along these lines can make a viable impact at the national and global level for progression of learning.

Science education situated in the more extensive setting of information generation and legislative issues of society has the unmistakable character in the public eye and is not the same as different subjects. It has an uncommon interest and conjures depends on universalism, objectivity and logic. Since the point of science training isn't simply to make students mindful of the logical realities and ideas yet to make individuals mindful of the advantages of utilizing logical reasoning in individual and open life, dispersal of logical qualities is a basic piece of the instructive procedure of learning science. In such manner Chunawala and Natarajan propose that it is fundamental to have the logical temper of brain as it helps in taking part and law based basic leadership in both individual and open life. In the context of Indian education system, it is essential, they suggest, developing innovative approach of teaching science to promotes understanding of science as a process that help learners to deal the significant problems of their life.

2. EDUCATIONAL QUALITY MANAGEMENT

Quality plays crucial role today than ever before due to the impact of globalization on the higher education field. The central tenet of strategic implementation and planning of educational reforms in India has recognized the significance of quality teaching and learning. As an outcome of the national policy, the University Grants Commission has established the country's first autonomous agency for quality assessment (Antony, 2004). The National Assessment and Accreditation Council (NAAC), based on the careful evaluation report assess the universities and colleges and award accreditation status. The NAAC has evolved a three pronged strategy for quality assessment for awarding accreditation to institutions.

3. CURRICULUM WITH INTERACTIVE TEACHING COMPONENT

Creative ideas for reforming education may come from many sources, but only teachers can provide insights that emerge from direct experience in the classroom itself. Science instructors must focus more on what students learn and how well they can use their knowledge about a subject than on "covering" a pre-designed syllabus. Problem based and case based approaches are the two

instructional approaches which create opportunities for applying the knowledge (Fabrizio 2005). The existing science courses must be improved by incorporating an active component of student engagement in the learning process. Choosing a subject of study is a very important matter in the life of an individual. The school education system must also be necessarily revamped to nurture the budding talents in science. It is necessary to decide what knowledge is to be managed by the teacher and administered to the students. Teachers should train students the way to handle the information flooded around them (Cameron, 2004). Most teachers who are reputed in their research are unaware of the effectiveness of teaching methods (Robert, 2005). Lack of trained teachers in rural areas may be a reason for the preference for other subjects. Teacher must be motivated to spend time and effort for developing new teaching methods or redesigning learner centered courses. The assessing mode existing in the universities needs immediate attention. Properly tested and effective evaluation instruments must be used for assessment purpose. Competency of the students should be measured at a collective level throughout the entire course duration. Research must be made inevitable part of teaching in universities and colleges. Teaching work and research work must be separately counted. Research productivity of the faculty member must be rewarded with incentives and career advancements.

4. SCIENCE EDUCATION IN POST-INDEPENDENT INDIA

In the post independent India, our constitution adopted the goals of establishing the society based on the scientific temper, humanism and spirit of inquiry. It enshrines in Article 51 A(h) of the constitution that it is the fundamental duty of the every citizen of the country to inculcate, propagate and further disseminate the scientific temper in society. In fact, India is the only country in the world that has adopted such obligation in the written constitution. Science education policy in India is based on the recognition that scientific thinking is the cherished values of human efforts, yearning, and struggles against the culture of fear and limitations. It is as precious as society itself for the advancement of society towards social progressivism to achieve the goals of social, moral and spiritual values and material wellbeing. However, in the recent decades, it has been seen that there is a retreat of public reasoning in the public sphere that has helped in the culmination of and rise of anti-science attitude and religious revivalism in public life (Raina, 2016). This poses a great challenge to the society. In 1981 “A Statement on Scientific Temper,” 4 was endorsed by Nehru Center assuming that scientific inquiry helps people to form and develop their idea and argument based on proof and evidence rather than mundane reasons that would finally negate the prevailing obscurantism and superstitions in the society. National Council Education Research & Training (NCERT) Position

Paper on science5 has recognized that our science textbooks are overloaded with scientific facts. It also mentions that science teaching in India suffers from the problems like- (a). It is lagging behind in achieving enshrined values like humanism, scientific temper and social justice in our constitution. (b) Science education, even at its best, does not encourage inventiveness and creativity. (c) Overpowering examination system is the fundamental problems of science education. Similar conclusions have been also drawn by Aikenhead6 . According to Aikenhead, students are increasingly disenchanted with the content of school science. School science is full of content which is socially sterile, intellectually boring, and dismissive of student's life. It's no wonder that most students don't able to make meanings out of classroom teaching of science and not able to correlate with what is being taught in the classroom with their personal life. This has proved fatal for the development popularity of science as a subject among students and promoted the myth of science as a brainy and difficult subject. In the similar vein Sarangapani laments the pathetic condition of the way in which science is being taught in the classrooms. According to her as a country we may take pride in the success of science graduate student abroad but we have failed to take the question of the seriousness of science teaching and learning in the classrooms. Among other problems, she counts is the authoritarian approach of teaching science in India that hardly allows autonomy to learners and teachers. It adheres to absolute and strict interpretation of textbooks in the classrooms. Kumar called it preponderance of the Textbook Culture. Sarangapani7 traced out the roots of such outdated monolithic culture of learning in the colonial origin of the education system. According to Mukherjee9 in spite of the tremendous socio-political odds, the success of Raman, Saha, and Bose has triggered a sense of pride and jubilance among the Indian people. In 1961, a committee namely Indian parliamentary and scientific committee was formed under the leadership of Late Shri Lal Bahadur Shastri to find out the problems facing science school in Indian school system. The other problems which were taken for serious consideration were finding out the relationship between central and state government policies regarding science education policies and exploring the courses offered in the different schools under different state educational system. In 1964, Indian Education Commission under the chair of Dr. Kothari pointed out that the state of science in India is in pathetic condition and system has failed to reckon with the explosion of knowledge in science. In order to meet this immediate challenge, it was recommended that projects should be conducted to upgrade school curriculum and textbooks. In 1968, a national policy of education (NPE)10 was launched with the aim to connect the development of the nation, citizenship education, and science education. It laid stress on social reconstruction and also on mitigating regional imbalances in the development of educational system. In 1986, NPE11 prioritized the agendas of inclusive education, vocational training, technical and

professional education and laid stress on reducing female illiteracy in the country. In this way, educational policy was linked to the spread of scientific literacy and scientific awareness in the society that acted to stimulate the different education subsystem to produce skilled workforce needed the economy. But in this process of production of scientific workforce for the industrial purposes encompasses the darker side. It came as a heavy burden to students at large. Textbooks were overloaded with more and more factual information. Reforms were often done on episodic basis to add more information citing the reason like information explosion. This phenomenon and ideology has been analyzed by famous Canadian science educator Aikenhead6 who has called it the pipeline production.

In 1975, NCERT in the framework of the curricular objectives has laid down the objectives of education. NCERT defined curriculum as the sum total of all the deliberately planned set of educational experiences provided to the child by the school. Kala & Ramadas13 reviewed these trends in science curriculum reforms research that have occurred worldwide. According to them, Piaget's influences in the domain of science education reforms led to a shift from behaviorism to constructivism and by the 1970s, the major trends in science education research shifted from constructivism to philosophy of science. Philosophy of science, specifically the work of Popper, Kuhn, and Lakatos started to find currency in the domain of science education worldwide. Ideas such as theory-laden observations, nature of scientific inquiry started to impinge in the school curriculum theories and texts. They explained that justification for applying ideas from the philosophy of science to science education can be found in the child as scientist metaphor, which had been subtly present since Piaget. Since child could be considered as a novice scientist, researchers in science education thought that philosophy of science, which attempted to lay down the foundations for science, could similarly be used to interpret children's conceptions of science and provide guidelines for interpreting children's conceptions of science. Confrey14 pointed out that philosophy of science allows researchers to critique the underlying inductive conception of science which has permeated science textbooks in the form of the scientific method. However, Kala & Ramadas13 contend that unfortunately in the practices of science education research and curriculum making these developments in domain independent science education research like epistemology studies, cognitive psychology is still to be seen in India.

5. NEW SCIENCE EDUCATION AND CURRICULUM

With the upcoming of 21st century the world has witnessed unprecedented socio-economic changes due to explosion in information technology and the process of socio-political and economic integration that necessitated the agendas of reforming the curriculum. The aims of science curriculum reforms across the cultures have been to

help students to develop informed and enriching understanding of science and promote science learning as joyous experience that promote critical and creative thinking through various innovative methods like learning by doing, learning by inquiry method, and discovery method. This is the departure from the old ways of knowing science in schools that only inscribes science teaching by giving instructions that students in the classrooms and school followed to mime and mimic the scientific process. The recognition of the fact that scientific knowledge does not only entail knowledge of products of science but science learning is all about learning processes, cultures and practices of science is important from the educational praxis point of view that emphasizes the bridging the gap between theory and practice. Science learning does include knowing methods, scientific practices of scientists and nature of science. In other words how does scientific knowledge emerge is important to know for student's comprehensive and deeper understanding of scientific knowledge? These episteme values also include questions like what demarcates science from other way of knowing like religion and philosophy. Allchin's 12 has called it knowing the whole conceptualization of science rather than processed image of science that is currently filters in textbooks. It adopts and hence prescribes the image of science that is reductionist. Adopting the whole conceptualization of science in accordance with the nature of science can be a good starting point to renew the energy that is needed to review of science education curriculum to get benefit from the pedagogical analysis of teaching science. More particularly the idea of teaching of science and about science extracting from philosophy and methodology of science and science studies may work wonder to kill the symptomatic culture of monolithic way of teaching content of science and extrinsic learning of students which is present in today's day education system.

6. CONCLUSION

National Curriculum Framework Policy (NCF)15 2005 of India recommends teaching science as a process/inquiry and value system. It talks about maintaining the cognitive validity, process validity, historical validity, environmental validity, and ethical validity in science textbooks. But unfortunately, today's science textbook hardly takes cognizance of such issues. It projects the image of science that is empty of the epistemic, cognitive and social values of science. Consequently, as it is the case the overwhelming majority of students ascribe the naive conception of science and teachers continue to structure their science argument in a way that is incommensurate with how scientist proceed to scientific activities, scientific deliberations, and unpack their inquiries into natural phenomena in real life situation. The understanding of science as a dynamic enterprise human activities consisting of socio-psycho values that mediates within scientific communities helps learner to situate the scientific knowledge in the real context of social world. The need to apply scientific

knowledge in the real life examples like socio-scientific complexities of personal and public issues in society has gained ground. There is increasing importance of pedagogical innovation of teaching science in the classroom that requires (a). Teaching nature of science along with the content of science (b) the knowledge of how science is manufactured including the contribution of affective side of human like role socio-psycho effects like creativity and errors. Such a system of pedagogical analysis of teaching science has been enriched by disciplines like History, Philosophy and Sociology of Science (HPSS) that makes complimentary conversation with science education and presents the Nature of Science in brief form to adopt it in science curriculum16 .Reforms in science curriculum are also necessitated to disseminate scientific temper as the dominant mode of thinking in a society that helps people to base their reasoning on the cause-effect relationship. In fact, scientific thinking that favors the value-system supported by egalitarian, secular, and rational values and promotes the development of the collective conscience of the society based on the spirit of inquiry is accepted on the basis of the right to question and be questioned. It involves knowing the grammar of science so that people can apply it to many aspects of life ranging from ethics to politics to economics.

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