IDENTIFICATION OF SCIENTIFICALLY CREATIVE YOUNGSTERS ISSUES AND IMPLICATIONS

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Creativity has been interpreted differently by different researchers. It is a complex concept encompassing a wide spectrum of activities. Now by putting prefix "Scientific" to an already complex concept, a new dimension is added to it. Hence, the problem arises: what is meant by 'scientific creativity'? Has scientific creativity some specialities of its own which are different from other types of creativity? This problem can be best attacked by looking into the very nature of science and to choose what special factors or components characterise the scientific creativity.

Among all the national resources, the creative potential of its human resources play the motive force for the exploitation of other resources. If this potential is utilised properly, other resources get exploited easily and quickly. Thus, the consequent need for ever wider use of human ingenuity is being felt very much by every nation. But unless its identification and proper development is ensured, the very expectation of its maximum utilisation will prove deceptive and imaginary. As such, the research on identification of creativity, especially 'scientific creativity', has been drawing more and more attention in this age of science and technology. Now the problem that arises is: Can we identify the scientifically creative youngsters?

What is Creativity?

The usual method for estimating the intellectual potential of a person is the calculation of his I.Q. But the notion that the traditional kinds of intelligence tests measure all that is worth-knowing about a person's intellectual functioning has been challenged by many researchers. It has been pointed out that the kinds of intelligence-tests commonly in use these days concentrate on convergent thinking and ignore divergent thinking which is considered to be of great importance for creativity. Thus, there is an increasing realisation of the shortcomings of intelligence-tests in the sense that they sample only a narrow band of the total range of intellectual abilities. Hence, the need for a special kind of tool capable of measuring the most important aspect of intellect called 'creativity' is now being felt much. Such a tool must encompass the aspects of divergent thinking. According to Guilford (1956), "Divergent thinking is a kind of mental operation in which thinking proceeds in different directions, sometimes searching, sometimes seeking variety and is opposite to convergent production where the information leads to one right answer or to a recognised best or conventional answer" (p. 269). The unique feature of divergent production is that it produces a number of answers. Here, the

examinee produces a variety of responses, rather than selects the appropriate one from among a set of choices presented to him. In doing so, he may produce a novel response. It is the relative variety and novelty of the products found in divergent production that links this category of ability basically with creativity.

According to Torrance, E.P. (1962), "Creativity is the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, forming ideas or hypothesis and communicating the result, possibly modifying and retesting the hypothesis".

Stein, M.I. (1963) says, "Creativity is a process of hypothesis formation, hypothesis testing, and the communication of results". He further says that for empirical research, the definition of creativity is "that process which results in a novel work that is accepted as tenable, useful of satisfying by a group at a point of time" (p. 218).

Mednick, B.A. (1962) is of the opinion that "creative thinking process may be defined as the forming of associative elements into new combinations which either meet specified requirements or are in same way more useful. The more mutually remote the elements of the new combinations, the more creative is the process" (p. 220).

Wallach and Kogan (1965) in an experimental approach to be nature of creativity, conceive of it in terms of the number of associational responses and the uniqueness of these responses.

Bybee, Rodger W. (1972) is, too, of the view that "creativity is the ability to view the familiar in an uncommon way to make changes or modifications, to see numerous possibilities in a single object and to synthesise isolated schemes is a unique and novel way. The process or product is useful to either self or society" (p. 22).

What is Special about Scientific Creativity?

Thus, it is evident that creativity has been interpreted differently by different researchers. It is a complex concept encompassing a wide spectrum of activities. Now by putting prefix "Scientific" to an already complex concept, a new dimension is added to it. Hence, the problem arises: What is meant by 'Scientific creativity'? Has scientific creativity some specialities of its own which are different from other types of creativity? This problem can be best attacked by looking into the very nature of science and to choose what special factors or components characterise the scientific creativity.

We know science as a system of knowledge, the structural elements of which are the informational facts gathered by observation and experiments. The form of science is established by the organisation of these facts into systems, generalisations and theories. Probably, the first step in the organisation of knowledge beyond simple observation is the process of classification. It is also known as analysing. Although, there are limits on the usefulness of classification, the sorting of observation into categories is necessary and even very effective first step in establishing the patterns and systems of knowledge that lead to understanding.

The next step in system formation is a search for an 'explanation' of the classified information. This is an intellectual non-experimental function. Here,

we advance a postulate which most often takes the form of a model. This is termed as hypothesising. It is also known as synthesising or generalising. And if we are scientific about this stage, we maintain an attitude of acepticism and a feeling of tentativeness about the postulate. The important point is that all postulates (hypothesis) of science are constantly evolving suffering modifications, additions, and deletions and sometimes total destruction. The moving force of this change is the constant test of experiment. Thus the steps involved in scientific method seem to be the following: (1) statement of the problem, (2) collection of data by observation or experimentation, (3) analysing the data; (4) hypothesising, (5) testing the hypothesis, and (6) drawing conclusion.

Hadamard (1945) has suggested that the scientific process consists of the construction of ideas followed by the combing and examination of a few useful combinations consciously produced. The distinguishing characteristic of science is, therefore, to relate the facts of the investigation and to weave them into a comprehensible whole. The construction of this web out of facts and ideas, either remotely associated or immediately related, is the most productive area for creative endeavour in science.

As regards process aspect Singh, C. (1976) is of the opinion that scientific creativity appears to be very much different from creativity in other areas. As an example for a person to be creative, he must be highly imaginative. The abundance of fantasy is the prime requisite for him. So is the case with an artist. On the contrary, more imagination and fantasy alone will not be of much help to a creative scientist. Though speculation and bold guess are sometimes needed by a creative scientist to solve his problem, but this alone will leave him in complete wilderness leading nowhere near his goal. To achieve something novel, creative out of his speculation, he must be capable of observing minutely, analysing, elaborating and hypothesising.

What Scientific Creativity Test Should Search for?

A good tool for measuring potential in scientific creativity should therefore, search for novelty in all these abilities required by a scientist. It is also to be noted here that novelty is facilitated by the production of a large number of ideas especially of different kinds. Thus, the consideration of fluency and flexibility as criteria for evaluating creative potential in the areas of science also, seems to be justified. However, to my mind, all the three criteria: novelty, flexibility and fluency are not equally important. Here, they stand in their respective position in decreasing order of importance and therefore, some relative weightage to each of them appears to be rational.

In view of the above discussion, properly loaded factors of novelty, flexibility and fluency applied to different processes involved in scientific method of problem-solving should be a good measure of scientific creativity.

Further, the evaluation of potential for scientific creativity particularly in youngsters is faced with additional problems: Identification of these abilities associated with scientific method of

problem-solving which are easily exhibitable by youngsters as well as adequately measurable. Thus, while developing a tool capable of effectively measuring potential for scientific creativity among youngsters, one must keep in mind all the implications mentioned above.

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