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GENDER DIFFERENCES IN LEARNING PHYSICS CONCEPT

Pardeep Kumar
Research Scholar
Dakshina Bharat Hindi Prachar Sabha, Chennai

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1.0 Introduction:

Physics is a great human enterprise, not only endless and faceless, but also stable and fluid. It is a self-accumulating, self-growing, self-accelerating, self-pervading and self-corrective enterprise, which originated in the collective curiosity of man since time immemorial. It is a body of knowledge that allows us to comprehend laws that govern everything in nature, from the galaxies to the atoms, from the non-living to the living. Physics is an esoteric activity as it requires a high level of specialization and creativity and involves complex concepts (Bhargava and Charkrabarti, 2006).

A concept refers to a symbolic representation of some common or shared characteristics of events or objects. A concepts is a category used to group similar events, ideas, object or people. Concepts are abstractions. They do not exist in the real world, only individual examples of concepts exist. Concepts help us organize vast amount of information into manageable units. In physics they play an important role in the accumulation, understanding and application of the knowledge. They are very vital in understanding the language that the scientists speak. For the present study the concepts taken are from the syllabus pertaining to class IX by NCERT.

'Sex' refers to biologically based differences and 'gender' to socially influenced characteristics. Sex refers to comparisons between males and females that do not involve any casual inference. In contrast, gender is used when judgements are being made about, either, biological or environmental causes. The world gender usually refers to traits and behaviours that a particular culture judges to be appropriate for men and that woman (Brannon, 2002).

Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve, problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings-"catching on", "making sense" of things, or "figuring out" what to do (Arvey, 2004).

Personality is a board and comprehensive concept covering the organization of an individual's predisposition to behaviour and his unique adjustment to environment. It is the dynamic organization within the individual of those psychophysical systems that determine his characteristics, behaviour and though. What we are and what we hope or aspire to become is our personality.

Eysenck and Eysenck (1985) proposed the PEN model, and experimental approach to the study of personality. In the model, personality comprises of three major dimensions: psychoticism, neuroticism and extraversion. These three super factors or dimensions of personality are orthogonal to each other, which means that they do not correlate with each other (Eysenck and Eysenck, 1985). Eysenck strongly advocates that there are only three major dimensions or super factors in the description of personality: psychoticism versus impulse control, stability versus instability or neuroticism and extraversion versus introversion.

Home environment is considered as a system where the behaviour and relationship among all family members is interdependent. A stimulating physical environment, encouragement of achievement and affection are repeatedly linked to better performance of children every individual bears an impact of the environment in which he

is brought up. Home is almost the exclusive environmental factor, which influences the first few primitive years of life.

2.0 Statement of Problem

GENDER DIFFERENCES IN LEARNING PHYSICS CONCEPTS AMONG SECONDARY SCHOOL STUDENTS OF HARYANA IN RELATION TO INTELLIGENCE

3.0 Objectives of the study

1. To find out gender difference among secondary school students in learning physics concepts.
2. To analyse gender differences among secondary school students in learning physics concepts in relation to intelligence.
3. To find out gender differences among secondary school students in learning physics concepts in relation to personality.
4. To analyse gender differences among secondary school students in learning physics concepts in relation to home environment.
5. To find out interaction effect of intelligence and personality on gender difference in learning physics concepts among secondary school students.
6. To analyse interaction effect of intelligence and home environment on gender difference in learning physics concepts among secondary school students.
7. To explore interaction effect of personality and home environment on gender difference in learning physics concepts among secondary school students.

4.0 Hypotheses

1. There will be no significant difference between secondary school boys and girls in learning Physics concepts.
2. There will be non-significant gender difference among secondary school students in learning physics concepts, both, at high and low levels of intelligence.
3. There will be non-significant gender difference among secondary school students in learning physics concepts, irrespective of being high and low on the personality dimensions of psychoticism, neuroticism and extraversion.
4. There will be non-significant gender difference among secondary school students in learning physics concepts, irrespective of better or poor perception about each of the ten dimensions of home environment.
5. There will be no significant interaction effect of intelligence and personality on gender difference in learning physics concepts among secondary school students.
6. There will be no significant interaction effect of intelligence and home environment on gender difference in learning physics concepts among secondary school students.
7. There will be no significant interaction effect of personality and home environment on gender difference in learning physics concepts among secondary school students.

5.0 DELIMITATIONS OF THE STUDY

1. The study was delimited to class IX of secondary schools, affiliated to CBSE.
2. The four districts, chosen for the study, were Fatehabad, Jind, Hisar, Sirsa
3. 3-way analysis of variance was applied to study the main effects of gender, intelligence, personality and home environment on learning physics concepts alongwith their interactions effects.
4. The distribution of physics achievement scores was not tested for the assumption of normaley and the assumptions underlying analysis of variance were not tested keeping in view the observations of Norton (quoted in Guilford, 1960: 300-301) that F is rather insensitive to variations in the slope of population distribution. Moreover, the assumption of randomness was applied for selection of sample and also while selecting equal number of cases in different cells of factorial designs.

6.0 Operational definition of terms:

1. Physics concepts in the study are related to the topics found in the NCERT syllabus of class IX and operationalized by the instrument developed by the investigator.

2. Gender-Generally there is a misconception of the concept "gender" and "sex". Technically , sex refers to differentiation of boys and girls from biological point of view. On the other hand, gender refers to differentiation of boys and girls from sociological point of view. That is, gender refers sociologically to daily roles in a society assigned to boys only and those assigned to girls only.
3. Intelligence-Intelligence connotes the intellectual ability of students to adapt themselves to their total environment, to learn and to carry out abstract thinking, which is to be measured by General Mental Ability Test by Jalota (1992), measuring intelligence in terms of vocabulary similar and opposites; number series; classification; best answers; inferences and analogies.
4. Personality _ It refers to the organization of an individual's predisposition to behaviour and his unique adjustment to environment, to be measured in terms of Psychoticism (which describes personality as solitary, troublesome, cruel, lacking in feeling, hostile to other, senPATion seeking and liking odd and unusual things); Neuroticism (which refers to the general emotional liability of a person, his emotional over responsiveness and his liability to neurotic break down under stress) and Extraversion (which refers to the outgoing, uninhibited, sociable proclivities of a person) as measured by Eysenck's Personality Questionnaire-R (1975).
5. Home Environment-Home is the social-biological unit that exerts the greatest influence on the development and perpetuation of the development and perpetuation of the individual's behaviour. The variable will be measured by Home Environment Inventory by Misra (1989). Which is designed to measure the psycho-social support that has been available to the child within the home?

7.0 Method and Procedure

8.0 Design of the study

The research design used in this study was a survey research method, specifically an ex-post facto research method.

9.0 Tools and their description

In order to collect the data for the present investigation following tools were employed by the investigator:

- Physics Achievement Test (PAT) constructed by the investigator.
- The Group Test of General Mental Ability by S. Jalota (1992).
- Eysenck's Personality Questionnaire –R (1982)
- Home Environment Inventory (HEI) by K.S. Mishra (1989)

10.0 Physics achievement Test (PAT)

The tool was constructed by the investigator it involved various operations as cited below:-

- Content selection.
- Framing of the items.
- Experimental try out.
- Final selection of items.
- Determination of reliability and validity

The reliability of the tool was found out to be 0.867 and validity coefficient was 0.931. The percentile norms of PAT have also been formed.

11.0 The Group Test of General Mental Ability

Intelligence connotes the intellectual ability of students to adapt themselves to their total environment, to learn and to carry out abstract thinking, which was measured by the General Mental Ability Test by Jalota, measuring intelligence in terms of vocabulary similar and opposites; number series; classification; best answer; inferences and analogies. The tool consists 100 questions.

12.0 Eysenck's Personality Questionnaire

The Eysenck Personality Questionnaire was designed in given measure to the three important personality dimensions: Psychoticism, Neuroticism and Extraversion. These three traits were measured by means of 90 questions, carefully selected after lengthy item analysis and factor analysis.

13.0 Home Environment Inventory (HEI)

The present home environment inventory (HEI) is an instrument designed to measure the psycho-social climate of home as perceived by children. It provides a measure of the quality and quantity of the cognitive, emotional and social support that has been available to the child within the home. HEI has 100 items belonging to ten dimensions of home environment.

14.0 Sample

The Universe of the study was Haryana out of which 4 district, namely, Fatehabad, Sirsa, Hissar, Jind were taken randomly. The total sample comprised of approximately 1000 students, taken randomly from secondary schools of these four districts. The schools, taken, were affiliated to CBSE. Out of the total sample 500 boys and 500 girls from class IX were taken.

15.0 Analysis of data

- 3-way analysis of variance with two levels each of gender and home environment across two levels each of intelligence and personality were taken along with interaction effects. Teh factorial designs (2x2x2 factors) used in the present study were:
- Gender x intelligence x Personality (separately for psychoticism, neuroticism, extraversion).
- Gender x Intelligence x Home environment (separately for control, protectiveness, punishment, conformity, social isolation, reward, deprivation of privileges, nurturance, rejection, permissiveness)
- Gender x Personality (Psychoticism) x Home Environment (separately for control, protectiveness, punishment, conformity, social isolation, reward, deprivation of privileges, nurturance, rejection, permissiveness).
- Gender x Personality (Neuroticism) x Home Environment (separately for control, protectiveness, punishment, conformity, social isolation, reward, deprivation of privileges, nurturance, rejection, permissiveness).
- Gender x Personality (Extraversion) x Home Environment (separately for control, protectiveness, punishment, conformity social isolation, reward deprivation of privileges, nurturance, rejection, permissiveness).

16.0 Findings of the study

- On the basis of the findings of the present study the investigator drew the following conclusions regarding gender differences in learning physics concepts among secondary school students.
- There were no significant gender differences found in learning physics concepts, except in the case of neuroticism x rejection dimension of home environment design in which the result favoured girls.
- As far as the main effect of intelligence is concerned, it was found out that high intelligence students were significantly better than low intelligence students in learning physics concepts.
- The two dimensions of personality namely, psychoticism and neuroticism, at both the levels, did not relate significantly with learning physics concepts, but the main effect of extraversion was found out to be significant, including that extraverts have significantly better performance in learning physics concepts as compared to introverts.
- The dimensions of home environment namely, conformity, reward, social isolation and rejection were significantly related to learning physics concepts, but in different ways. The students who perceived home environment to be high on significantly higher mean scores on learning physics concepts than those perceiving home environment to be low on these two dimension. On the other hand, it was found that students who perceived home environment to be low on dimensions of social isolation and rejection, had better mean scores on learning physics concepts than those perceiving home environment to be high on these dimensions.
- The significant main effect of conformity dimension of home environment was found to depend on gender. High conformity group of girls students showed significantly better performance on learning physics

concepts as compared to those perceiving conformity dimension to be low, whereas in case of boys such differences were non-existent.

- The interaction effect of gender and intelligence was found in two cases. In both the cases the same trend was observed, that is, high intelligence group of students was significantly better than low intelligence group, in case of boys as well as girls. However, it was observed that the mean difference in high and low intelligence group was markedly more significant in case of boys than girls.
- The non-significant main effect of neuroticism and nurturance dimension of home environment was found to be dependent on each other in a peculiar manner. The normal students having better perception of nurturance dimension of home environment had comparatively better performance in learning science concept than those perceiving it poor, whereas neurotic group of students perceiving nurturance dimension of home environment as poor had better performance in learning science concepts than those perceiving it better.
- There was no significant interactive effect of gender, intelligence, personality (psychoticism, neuroticism and extraversion) and home environment t (all ten dimensions), thereby indicating that the non-significant gender difference in learning science concepts remains true at high and low levels of intelligence, personality and home environment.

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