

ROLE OF DEPARTMENT OF MATHEMATICS, PHYSICAL SCIENCES AND BIOLOGICAL SCIENCES IN STRENGTHENING ELEMENTARY TEACHER EDUCATION: A STUDY OF DIETs

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Abstract:

This paper examines the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education through the functioning of District Institutes of Education and Training (DIETs) in Karnataka. The study is descriptive in nature and follows the normative survey method. A total of 21 faculty members working in this department across DIETs representing the Bangalore, Mysore, Belgaum and Gulbarga educational divisions were selected by purposive sampling for the study. Data were analyzed using the independent 't'-test with respect to sex, educational qualification, locality of the institute, and teaching-cum-research experience of the faculty. The results indicate that the role of the department did not differ significantly by sex or educational qualification, but differed significantly with respect to locality and experience, with faculty from rural DIETs and faculty with more teaching-cum-research experience reporting more favorable perceptions of the department's functioning. Implications for equitable resource distribution and experience-linked mentoring in DIET science departments are discussed.

Key Words: Elementary Teacher Education, DIET, Department of Mathematics, Physical Sciences and Biological Sciences, DIET Functioning

I. INTRODUCTION:

In the system of education, elementary education occupies the most important place, as it is meant to serve the first-level educational needs of the young population of the country. Teachers serving at this stage often receive comparatively low-quality training and feel isolated from professional support structures, a situation that tends to be more acute in rural areas (Azim Premji Foundation, 2010).

The National Policy on Education (NPE, 1986) and the accompanying Programme of Action (1986) proposed the establishment of District Institutes of Education and Training (DIETs) to provide for the pre-service and in-service training needs of elementary school teachers and other functionaries at the district level, and to decentralize educational planning and supervision to the district level (DIET Guidelines, 1989). Each DIET functions through several academic departments, one of which is the Department of Mathematics, Physical Sciences and Biological Sciences. This department is entrusted with strengthening the science- and mathematics-teaching competencies of elementary school teachers through training programmes, material development, and academic resource support.

Studies of DIET functioning have repeatedly flagged infrastructural and resource constraints as a central concern. Sunil Kumar (2017), in a study of in-service training programmes organized by DIETs in Himachal Pradesh, reported that teacher educators frequently faced shortages of resource persons, laboratory facilities, and physical space during training programmes - constraints that would be expected to weigh particularly heavily on a science and mathematics department, given its dependence on laboratory and demonstration infrastructure. Gogoi and Khanikar (2016), examining educational facilities available in a District Institute of

Education and Training in Assam, likewise found considerable variation in the availability of laboratory and instructional resources across institutes. Tharmakumar (2016), studying teacher-educator effectiveness across DIETs and teacher-training institutes in southern Tamil Nadu, found that effectiveness levels themselves varied across institutions, pointing to the value of examining departmental functioning at a disaggregated, department-specific level rather than treating DIET functioning as a single, undifferentiated construct.

Given the persistent national concern over weak foundational competence in mathematics and science among elementary learners, the effective functioning of this department within a DIET carries considerable significance for the quality of elementary teacher preparation. The present study investigates how DIET faculty perceive the functioning of this department, and whether that perception varies with faculty characteristics such as sex, qualification, locality, or experience.

1.1 Statement of the Problem:

The topic selected for the present investigation is **“Role of Department of Mathematics, Physical Sciences and Biological Sciences in Strengthening Elementary Teacher Education: A Study of DIETs.”**

1.2 Objectives of the Study:

1. To find out the significant differences in the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education with respect to sex, educational qualification, locality, and teaching-cum-research experience of DIET faculty.
2. To offer suggestions for the more effective functioning of the Department of Mathematics, Physical Sciences and Biological Sciences in DIETs based on the perceptions of faculty working in the department.

1.3 Hypotheses of the Study:

1. There is no significant difference in the Role of Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by male and female faculties working in DIETs.
2. There is no significant difference in the Role of Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by faculties working in DIETs having prescribed and over prescribed qualification.
3. There is no significant difference in the Role of Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by faculties working in urban and rural DIETs.
4. There is no significant difference in the Role of Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by faculties working in DIETs having less and more experience on research work.

II. METHODOLOGY:

2.1 Research Method:

The investigator employed the **survey method**, a method of collecting and analyzing data obtained from a representative sample of respondents through a structured and detailed questionnaire.

2.2 Population and Sample:

Three DIETs from each of the four educational divisions of Karnataka - Bangalore, Mysore, Belgaum and Gulbarga - were selected by **purposive sampling for the present study**. From these DIETs, a total of 21 faculty members working in the Department of Mathematics, Physical Sciences and Biological Sciences were drawn as the sample, comprising 5 males and 16 female faculties.

2.3 Tool Used for Data Collection:

The DIET Functioning Description Tool, developed by the researcher, was used to measure the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education. The tool was constructed as per the DIET Guidelines (1989) and covers the important functional aspects of the department. Responses were obtained on a four-point scale (Poor, Satisfactory, Good, Excellent), with a higher score indicating more satisfactory functioning. The content and concurrent validity of the tool were established through expert judgement, including review by officials of the Department of State Educational Research and Training (DSERT), Karnataka.

2.4 Statistical Techniques:

The collected data were analyzed using the **independent 't'-test**. The level of significance was fixed at the 0.05 and 0.01 levels of confidence.

III. ANALYSIS AND INTERPRETATION OF DATA:

The data are analyzed by computing the mean, standard deviation, and 't'-test for each variable, presented below along with graphical representation.

Table-1: 't' test results - Role of Department of Mathematics, Physical Sciences and Biological Sciences by Sex

Variable	Groups	N	Mean	SD	't' value
Sex	Male	5	68.923	3.402	0.71NS
	Female	16	67.875	2.997	

Table-1 shows the number, mean, standard deviation and 't' value of the role of the Department of Mathematics, Physical Sciences and Biological Sciences perceived by male and female faculties working in DIETs. The obtained 't' value of 0.71 is less than the table value of 2.09 at the 0.05 level of significance. Therefore, it is not significant. Hence, the stated null hypothesis is accepted: there is no significant difference in the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by male and female faculties working in DIETs.

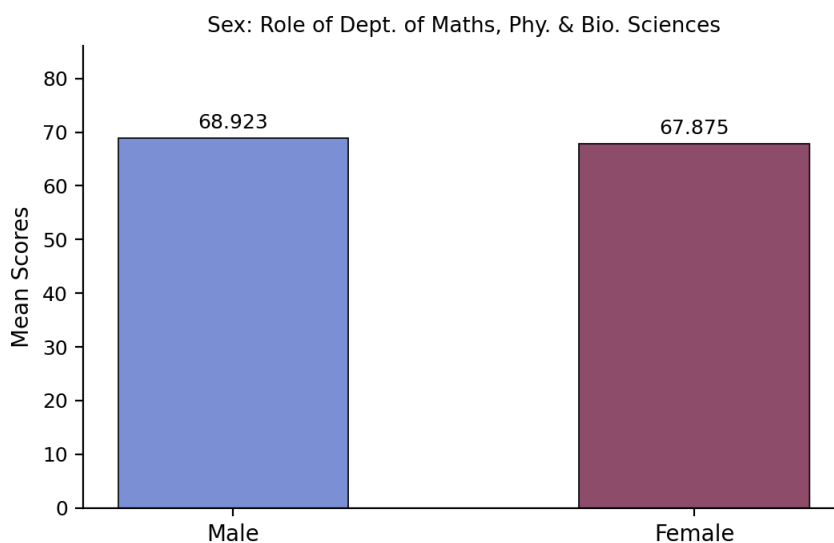


Fig.1: Bar graph showing comparison of mean scores of role of Department of Mathematics, Physical Sciences and Biological Sciences perceived by male and female faculties working in DIETs.

Table-2: 't' test results - Role of Department of Mathematics, Physical Sciences and Biological Sciences by Educational Qualification

Variable	Groups	N	Mean	SD	't' value
Educational Qualification	Prescribed	13	67.384	3.014	1.54NS
	Over Prescribed	8	69.375	2.774	

Table-2 reflects the number, mean, standard deviation and 't' value of the role of the Department of Mathematics, Physical Sciences and Biological Sciences perceived by faculties having prescribed and over prescribed qualification. The obtained 't' value of 1.54 is less than the table value of 2.09 at the 0.05 level of significance. Therefore, it is not significant. Hence, the stated null hypothesis is accepted: there is no significant difference in the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by faculties having prescribed and over prescribed qualification.

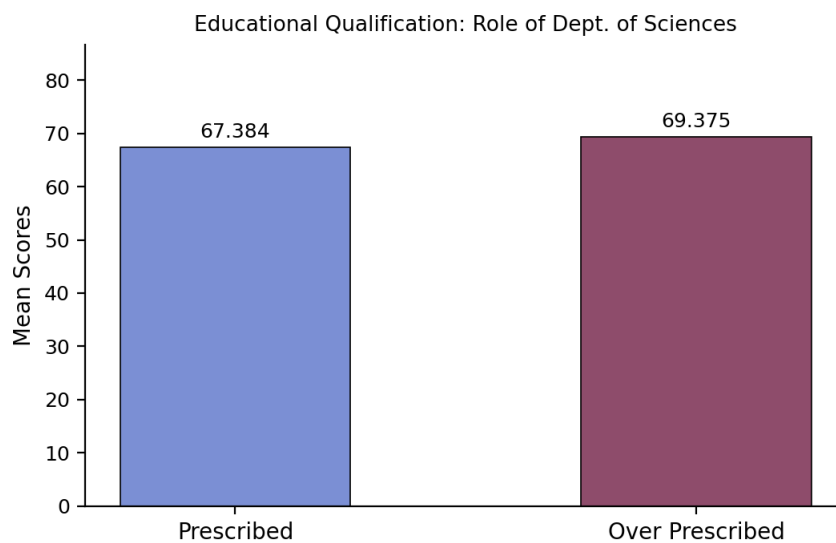


Fig.2: Bar graph showing comparison of mean scores of role of Department of Mathematics, Physical Sciences and Biological Sciences perceived by faculties having prescribed and over prescribed qualification.

Table-3: 't' test results - Role of Department of Mathematics, Physical Sciences and Biological Sciences by Locality

Variable	Groups	N	Mean	SD	't' value
Locality	Urban	17	68.352	3.334	2.29*
	Rural	4	72.250	2.986	

Table-3 opines the number, mean, standard deviation and 't' value of the role of the Department of Mathematics, Physical Sciences and Biological Sciences perceived by faculties working in urban and rural DIETs. The obtained 't' value of 2.29 is greater than the table value of 2.09 at the 0.05 level of significance. Therefore, it is significant. Hence, the stated null hypothesis is rejected and an alternative hypothesis is accepted: there is a significant difference in the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by faculties working in urban and rural DIETs. The mean scores of faculties in rural DIETs are higher than their counterpart.

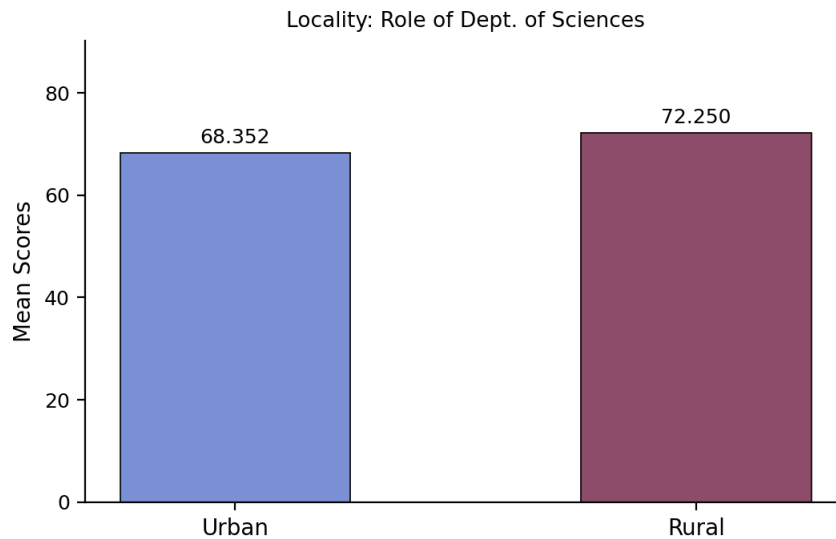


Fig.3: Bar graph showing comparison of mean scores of role of Department of Mathematics, Physical Sciences and Biological Sciences perceived by faculties working in urban and rural DIETs.

Table-4: 't' test results - Role of Department of Mathematics, Physical Sciences and Biological Sciences by Experience

Variable	Groups	N	Mean	SD	't' value
Experience	Less experience	15	68.533	3.248	3.03**
	More experience	6	73.500	3.449	

Table-4 illustrates the number, mean, standard deviation and 't' value of the role of the Department of Mathematics, Physical Sciences and Biological Sciences perceived by faculties having less and more experience on research work. The obtained 't' value of 3.03 is greater than the table value of 2.86 at the 0.01 level of significance. Therefore, it is significant. Hence, the stated null hypothesis is rejected and an alternative hypothesis is accepted: there is a significant difference in the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education perceived by faculties having less and more experience on research work. The mean scores of faculties with more teaching-cum-research experience are higher than their counterpart.

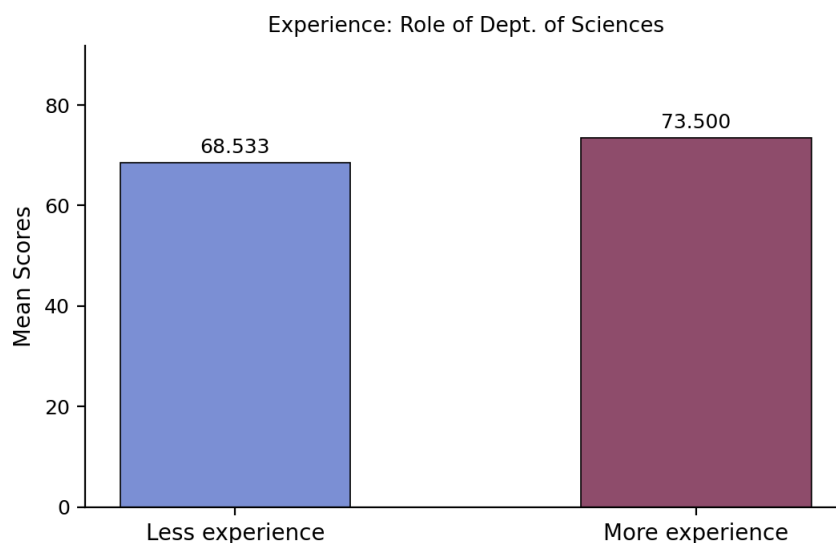


Fig.4: Bar graph showing comparison of mean scores of role of Department of Mathematics, Physical Sciences and Biological Sciences perceived by faculties having less and more experience on research work.

IV. DISCUSSION:

Unlike the Department of Languages, where qualification was the decisive factor, the Department of Mathematics, Physical Sciences and Biological Sciences shows a different pattern: locality and experience are the significant differentiators, while sex and qualification are not. The significantly higher mean scores reported by faculty in rural DIETs is a notable and somewhat counter-intuitive finding, given that resource and infrastructural shortages have generally been reported as more acute in rural and remote institutes (Azim Premji Foundation, 2010; Gogoi and Khanikor, 2016). One plausible explanation is that smaller rural DIETs may allow for more focused, hands-on engagement between science faculty and a smaller cohort of trainees, partially offsetting infrastructural limitations - though this interpretation warrants further investigation.

The significant difference by experience, with more experienced faculty reporting higher scores, is broadly consistent with Tharmakumar (2016), who found that teacher-educator effectiveness in the region varied appreciably across individuals and institutions rather than following a uniform pattern. It suggests that familiarity with the department's systems, training cycles, and resource networks builds over time. This finding, together with Sunil Kumar's (2017) observation that inadequate resource persons and laboratory facilities are a recurring complaint among DIET faculty, points to the value of structured mentoring or induction support for less experienced science faculty to help narrow this experience-based gap.

V. CONCLUSION:

The 't' test revealed that there is no significant difference in the role of the Department of Mathematics, Physical Sciences and Biological Sciences in strengthening elementary teacher education between male and female faculties, or between faculties having prescribed and over prescribed qualification. However, the 't' test revealed a significant difference between faculties working in urban and rural DIETs, and between faculties having less and more experience, with rural faculty and more experienced faculty reporting more favorable perceptions in each case respectively.

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