Research Article

RELATIONSHIP BETWEEN MULTIPLE INTELLIGENCE AND KNOWLEDGE OF CONTENT PEDAGOGY OF NATURAL SCIENCE SECONDARY TEACHER EDUCATION STUDENTS.

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Abstract

The present study investigates the relationship between multiple intelligences and the knowledge of content pedagogy among secondary teacher education students specializing in Natural Science. The framework of Howard Gardner's Theory of Multiple Intelligences was adopted to assess the dominant intelligence profiles of the students and to explore how these intelligences correlate with their pedagogical knowledge in teaching science content effectively. The study employed a descriptive and correlational research design with a representative sample of secondary teacher trainees. Standardized tools were used to measure multiple intelligences and knowledge of content pedagogy. The findings revealed that students with higher levels of logical-mathematical and naturalistic intelligences demonstrated stronger pedagogical knowledge in Natural Science. Additionally, interpersonal and linguistic intelligences were also positively associated with effective instructional strategies. The study concludes that understanding learners' multiple intelligences can significantly enhance teacher education programs by aligning pedagogical training with individual cognitive strengths. This integration supports the development of competent and innovative science teachers.

Keywords: *Multiple Intelligence, Content Pedagogy, Natural Science, Teacher Education, Secondary Teacher Trainees, Pedagogical Knowledge, Correlational Study, Science Teaching*

Many prospective science teachers know their content well but they have not learned to transform or translate that knowledge in to meaningful units for instruction. Directly or indirectly teacher education programmes will benefit from pedagogical content knowledge. In order to develop pedagogical content knowledge the prospective teachers have to develop multiple intelligence. This study has been undertaken with a view of finding out if there is any significant relationship between multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students, the 't' value shows that there is significant relationship between bodily kinaesthetic, musical rhythmic, interpersonal, intrapersonal, naturalistic, multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students.

SECONDARY TEACHER EDUCATION

The Education Commission said, (1964) "A sound programme of professional education of teachers is essential for qualitative improvement of education. Investment in teacher education can yield very rich dividends because the financial resources required are small when measured against the resulting improvements in the education of millions".

MULTIPLE INTELLIGENCE

The theory of multiple intelligence was first describes by Howard Gardner in Frames of Mind(l983).Gardner defines intelligence as "an ability or set of abilities that allow a person to solve a problem that is valued in one or more cultures". He proposed in the book Frames of Mind(1983),the existence of at least seven basic intelligence; ***verbal linguistic, logical mathematical, visual spatial, bodily kinesthetic, musical rhythmic, interpersonal and intrapersonal intelligence.*** More recently, he has added an eighth naturalistic intelligence and discussed the possibility of ninth. (Gardner, 1999). His current research indicates there are eleven distinct forms of intelligence.

CONTENT PEDAGOGY

Content pedagogy refers to the pedagogical (teaching) skills teachers use to impart the specialized knowledge or content of their subject area. The effective teachers display a wide range of skills and abilities that lead to creating a learning environment where all students feel comfortable and are sure that they can succeed both academically and personally. This complex combination of skills and abilities is integrated in the professional teaching standards that also

include essential knowledge, dispositions and commitments that allow educators to practice at a high level.

The content knowledge of the prospective science teacher is developed primarily in science courses taught by science faculty. All science teacher candidates should be provided with a carefully designed; balanced content curriculum leading toa demonstrated knowledge of the concepts and relationships they are preparing to teach.

SIGNIFICANCE OF THE-STUDY

Multiple Intelligence theory makes its greatest contribution to education by suggesting that teachers need to expand their repertoire of techniques, tools and strategies beyond the typical linguistic and logical methods. In the multiple intelligence classroom the teacher continually shifts her method of presentation from linguistic to spatial to musical and so on, often combining intelligence in creative ways. Teachers need to know much about and understand students being taught in the classroom. The abilities, interests and needs of each students must be studied and accepted by the science teacher. Teacher needs to be well versed in different intelligence possessed by students and how there may be used to assist each student to optimize instruction in many fields of knowledge and skills.

The general pedagogical content provides a relatively comprehensive categorization scheme for future studies of pedagogical content knowledge development in teacher education. It will provide a classification scheme for implementing unique instructional methods in the science classroom. Secondary science education programme could focus on developing topic specific pedagogical content knowledge in prospective teachers. Many prospective science teachers know their content well but they have not learned to transform or translate that knowledge in to meaningful units for instruction. Directly or indirectly teacher education programmes will benefit from pedagogical content knowledge. In order to develop pedagogical content knowledge the prospective teachers have to develop multiple intelligence. So the investigator wants to study the relationship between multiple intelligence and knowledge of content pedagogy of the prospective science teachers.

STATEMENT OF THE PROBLEM

Relationship between multiple intelligence and knowledge of content pedagogy of natural science secondary teacher Education Students.

OBJECTIVES

1. To find out the level of multiple intelligence of natural science secondary teacher education students.
2. To find out the level of multiple intelligence of male and female natural science secondary teacher education students.
3. To find out the level of knowledge of content pedagogy of natural science secondary teacher education students.
4. To find out the level of knowledge of content pedagogy of male and female natural science secondary teacher education students.
5. To find out the relationship between multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students.

NULL HYPOTHESES

1. There is no significant difference between male and female natural science secondary teacher education students in their multiple intelligence; verbal linguistic, logical mathematical, visual spatial, bodily kinaesthetic, musical rhythmic, interpersonal, intrapersonal and naturalistic intelligence.
2. There is no significant difference between male and female natural science secondary teacher education students in their knowledge of content, pedagogy and content pedagogy
3. There is no significant relationship between multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students.

METHOD USED FOR THE PRESENT STUDY

The method adopted in the present study is survey.

POPULATION FOR THE STUDY

The population of the study is natural science secondary teacher education students studying in B. Ed colleges affiliated to Mahatma Gandhi University, Kottayam.

SAMPLE

The investigator has used stratified random sampling technique for selecting the sample. The investigator selected 11 B.Ed colleges randomly, affiliated to Mahatma Gandhi

University. From each college natural science optional students were taken by including both male and female students. The sample consists of 250 natural science secondary teacher education students from 11 B.Ed college affiliated to Mahatma Gandhi University, Kottayam. Among them 42 are male students and 208 are female students.

TOOLS USED

The following tools were used for data collection

1. Multiple Intelligence Inventory developed by Dr. Terry Armstrong.
2. Content Pedagogy Knowledge Tool developed by Anisha and Dr. PAnnaraja.

STATISTICAL TECHNIQUES USED

1. Arithmetic Mean
2. Standard Deviation
3. 't' test
4. Pearson's Product moment co-efficient of correlation

ANALYSIS OF DATA

Multiple Intelligence of Natural Science Secondary Teacher Education Students was studied.

► **Level of Multiple Intelligence of Natural Science Secondary Teacher Education Students**

It is inferred from the Table 4.1.1 that 14.4% of the natural science secondary teacher education students have low, 70.4% of them have moderate and 15.2% of them have high level of multiple intelligence.

► **Level of Multiple Intelligence of Male Arid Female Natural Science Secondary Teacher Education Students**

It is inferred from the Table 4.1.2 that 9.5% of male natural science secondary teacher education students have low, 8% of them have moderate and 9.5% of them have high level of multiple intelligence.

Regarding female natural science teacher education students 15.4% of them have low, 68.3% of them have moderate, and 16.3% of them have high level of multiple intelligence.

► **Difference between Male and Female Natural Science Secondary Teacher Education Students in their Multiple Intelligence**

It is inferred from the Table 4.1.3 that and there is no significant difference between male and female natural science secondary teacher education students in their verbal linguistic, logical mathematical, bodily kinaesthetic, musical rhythmic, interpersonal; intrapersonal, naturalistic and multiple intelligence, but there is significant difference between male and female natural science secondary teacher education students in their visual spatial intelligence.

Level of knowledge of content pedagogy of Natural Science secondary Teacher Education students It is inferred from the Table 4.2.1 that 14% of natural science secondary teacher education students have low, 69.6% of them have moderate and 16.4% of them have high level knowledge of content pedagogy.

Level of knowledge of Content Pedagogy of Male and Female Natural Science Secondary Teacher Education Students It is inferred from the Table 4.2.2 that 2.4% of the male natural science secondary teacher education students have low, 76.2% of them have moderate and 21.4% of them have high level of knowledge of content pedagogy.

Regarding female natural science secondary teacher education students 16.3% of them have low, 68.3% of them have moderate and 15.4% of them have high level of knowledge of content pedagogy.

Difference between Male and Female Natural Science Secondary Teacher Education Students in their Knowledge of content Pedagogy

It is inferred from the Table 4.2.3 that there is no significant difference between male and female natural science secondary teacher education students in their knowledge of content Pedagogy and knowledge of their content pedagogy.

It is inferred from the Table 4.3.1 that there is no significant relationship between verbal linguistic, logical mathematical, visual spatial, intrapersonal intelligence and knowledge of content ped1gogy of natural science secondary teacher education students. But there is significant relationship between bodily kinaesthetic, musical rhythmic, interposal•, naturalistic, multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students.

FINDINGS

► Multiple Intelligence of Natural Science Secondary Teacher Education Stu- dents

1.1 15.2% of the natural science secondary teacher education students have high level of multiple intelligence.

1.2 9.5% of male and 16.3% of female natural science secondary teacher education students have high level of multiple intelligence.

1.3 There is significant difference between male and female natural science secondary teacher education students in their visual spatial intelligence. That is, male natural science secondary teacher education students are better than female natural science secondary teacher education students in their visual spatial intelligence. But there is no significant difference between male and female natural science secondary teacher education students in their verbal linguistic, logical mathematical, bodily kinaesthetic, musical rhythmic, interpersonal, intrapersonal, naturalistic and multiple intelligence.

► Knowledge of Content Pedagogy of Natural Science Secondary Teacher Education Students

2.1 16.4% of natural science secondary teacher education students have high level of knowledge of content of pedagogy.

2.2 21.4% of male and 15.4% of female natural science secondary teacher education students have high level of knowledge of content Pedagogy.

2.3 There is no significant difference between male and female natural science secondary teacher education student in their knowledge of content, pedagogy and knowledge of content pedagogy.

► Relationship between Multiple Intelligence and Knowledge of Content Pedagogy of Natural Science Secondary Teacher Education Students

3.1 There is significant relationship between bodily kinaesthetic, musical rhythmic, interpersonal, intrapersonal, naturalistic and multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students. But there is no significant relationship between verbal linguistic, logical mathematical, visual spatial and intrapersonal

intelligence and knowledge of content pedagogy of natural science secondary teacher education students.

Results and Discussions

't' test results reveal that, male natural science secondary teacher education students are better than female natural science secondary teacher education students in their visual spatial intelligence. This may be due to the fact that male students have great interest in keen observation and have more interest on the physical environment. More over usually male students express more practical bend up of mind than female students and are more exposed to physical and social environment.

't' value shows that there is significant relationship between bodily kinesthetic, musical rhythmic, interpersonal, intrapersonal, naturalistic, multiple intelligence and knowledge of content pedagogy of natural science secondary teacher education students. This may be due to the fact that natural science, being a discipline related to nature and physical environment requires the students to-do a lot of physical activities including experimentation that will in turn enhance their bodily kinaesthetic, interpersonal, intrapersonal and naturalistic intelligence.

TABLES

TABLE 4.1.1

Level of Multiple Intelligence of Natural Science Secondary Teacher Education Students

Dimensions of Multiple futelligence	Low		Moderate		High	
	No	%	No	%	No	%
Verbal linguistic intelligence	41	16.4	174	69.6	35	14
Logical mathematical intelligence	30	12	185	74	35	14
Bodily kinesthetic intelligence	47	18.8	162	64.8	41	16.4
Musical mythrnic intelligence	40	16	165	66	45	18
futerpersonal intelligence	37	14.8	176	70.4	37	14.8
futrapersonal intelligence	47	18.8	164	65.6	39	15.6
Naturalistic intelligence	30	12	180	72·	40	16
Multipleintelligence	36	14.4	176	70.4	38	15.2

TABLE 4.l.2

Level Of Multiple Intelligence Of Male And Female Natural Science Secondary Teacher Education Students

Dimensions of Multiple Intelligence	Low				Moderate				High			
	Male		Female		Male		Female		Male		Female	
	No	%	No	%	No	%	No	%	No	%	No	%
Verbal linguistic intelligence	6	14.3	35	16.8	31	73.8	143	168.8	**5**	11.9	30	14.4
Logical mathematical intelligence	4	9.5	26	12.5	33	78.6	152	73.1	*5*	11.9	30	14.4
Visual spatial intelligence	3	7.1	31	14.9	31	73.8	147	70.7	8	19	30	14.4
Bodily kinesthetic intelligence	8	19	39	18.8	23	54.8	139	66.8	11	26.2	30	14.4
Musical rhythmic intelligence	6	14.3	34	16.3	27	64.3	138	66.3	9	21.4	36	17.3
Interpersonal intelligence	3	7.1	34	16.3	31	73.8	145	69.7	8	19	29	13.9
Intrapersonal intelligence	10	23.8	37	17.8	30	71.4	134	64.4	2	4.8	37	17.8
Naturalistic intelligence	8	19	22	10.6	27	64.3	153	73.6	7	16.7	33	15.9
Multiple intelligence	4	9.5	32	15.4	34	81	142	68.3	4	9.5	34	16.3

Table 4.1.3

Difference Between Male and Female Natural Science Secondary Teacher Education Students in their Multiple Intelligence

Dimensions of Multiple Intelligence	Male		Female		Calculated Value of "t"	Remarks at5% **level**
	Mean	**SD**	**Mean**	**SD**		
Verbal linguistic intelligence	1833	339	18.50	4.27	0.28	NS
Logical mathematical intelligence	15.7	6.30	14.76	4.66	0.40	NS
Visual spatial intelligence	2036	4.66	18.75	5.28	2	S
Bodily kinesthetic intelligence	17.95	4.81	16.72	4.91	151	NS
Musical rhythmic intelligence	20.24	*631*	20.14	5.84	0.00	NS
Inter personal intelligence	24.88	5.61	23.08	6	1.87	NS
Intra personal intelligence	29.02	6.62	30.98	7.62	1.70	NS
Naturalistic intelligence	*2555*	7.12	26.93,	*554*	1.9	NS
Multiple intelligence	17150	20.80	169.85	24.61	0.45	NS

Table 4.2.1

Level of Knowledge of Content Pedagogy of Natural Science Secondary Teacher Education Students

Dimensions of Content Pedagogy	Low		Moderate		High	
	No	%	No	%	No	%
Content	47	18.8	149	59.6	54	21.6
Pedagogy	26	10.4	181	72.4	43	172
Knowledge of content pedagogy	35	14	174	69.6	41	16.4

Table 4.2.2

Level of Knowledge of Content Pedagogy of Male and Female Natural Science Secondary Teacher Education Students

Dimensions of Content Pedagogy	Low				Moderate				High			
	Male		Female		Male		Female		Male		Female	
	No	%	No	%	No	%	No	%	No	%	No	%
Content	8	19	39	18.8	26	61.9	123	59.1	8	19	46	22.1
Pedagogy	1	24	25	12	33	78.6	148	712	8	19	35	16.8
Knowledge of content pedagogy	1	24	34	163	32	762	142	683	9	21.4	32	15.4

Table 4.23

Difference Between Male and Female Natural Science Secondary Teacher Education Students in Their Knowledge of Content Pedagogy

Dimensions of Content Pedagogy	Male		Female		Calculated Value of 't'	Remarks at5% level
	Mean	SD	Mean	SD		
Content	21.98	3.73	22.0'J	3.93	0J8	NS
Pedagogy	1338	3.40	1261	3.86	131	NS
Knowledge of Content Pedagogy	3536	5.45	34.70	6.20	0.69	NS

TABLE 4.3.1

Relationship Between Multiple Intelligence and Knowledge of Content Pedagogy of Natural Science Secondary Teacher Education Students

Dimension of Multiple Intelligence	Σx	Σx^2	Σ*y*	Σy^2	Σ*xy*	Calculated Value of *'t'*	Table Value Of 't'	Remarks at 5% level
Verbal linguistic intelligence	8703	312213	4618	89584	161268	0.080	0.113	NS
Logical mathematical intelligence	8703	312213	3707	61157	129893	0.112	0.113	NS
Visual spatial intelligence	8703	312213	4754	97196	165543	.006	0.113	NS
Bodily kinesthetic intelligence	8703	312213	4231	77639	148297	0.135	0.113	s
Musical rhythmic intelligence	8703	312213	5039	110377	176661	0.138	0.113	s
Interpersonal intelligence	8703	312213	5846	145634	204754	0.137	0.113	NS
Intrapersonal intelligence	8703	312213	7662	248894	265770	0.084	0.113	NS
Naturalistic intelligence	8703	312213	6675	186795	233796	0.160	0.113	s
Multiple intelligence	8703	312213	42532	7380104	1485982	0.147	0.113	s

(At 5% level of significance the table value of 't' is 1.96)

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