

Effect of Experiential Learning Strategies on Attainment of Spatial Geometry Skills Among Primary School Students in Relation to Locus of Control

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ABSTRACT

Geometry had an origin in primitive ritualistic practice. Sulvasutras or 'rules of the cord' were applied. The knowledge was of a practical nature. Thales started probing theorems, Pythagoreans developed "Books of the Elements" and Archytas designated the four subjects of mathematics. These together with grammar, rhetoric and dialectics, constituted the seven liberal arts – and are responsible for western educational traditions. Geometry has been studied because it has been held to be the most exquisite, perfect, paradigmatic truth available to us outside divine revelation. Plato argued on two kinds of reality, one, the world we live in, and two, a higher other kind of reality, an ideal non-material forms. A triangle drawn on sand is not really a triangle but it is taken to be representative, a way of thinking about – what triangles are really like. Students shy away from the study of geometry. What causes, the negative attitude and poor performance? Howson (2000) observed that "Euclid-style' geometry is found to be extremely difficult and sometimes uninteresting, by most school students". This may be due to failure of the geometry to relate the child to immediate environment and the child fails to appreciate its role and importance of its application in his day to day living.

Introduction

The cumulative reviews of Jones and Rodd (2001) and Dreyfus (1999), suggests that students fail to feel a need for proof because all too often they are asked to prove things that are too obvious to them. As the ICMI study details, the main consequence of these problems has been that many countries have tried to bypass the obstacles by cutting down the amount of geometry taught or resorting to pedagogical approaches that rely heavily on memorization.

Royal Society and Joint Mathematical Council (2001) reports a further problem: "We believe that there are many teachers who have been taught geometry through styles of teaching which we would not advocate as appropriate". This means that existing teachers have little in the way of their own experience on which to base or develop their practice.

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Experiential Learning

Two movements, namely, “situated learning” and “constructivism”, have been gaining influence. Situated learning emphasizes that knowledge is maintained in the external, social world, whereas, the constructivism argues that knowledge resides in an individual’s internal state.

Undoubtedly, one overriding goal in education is for a learner to acquire concepts, ideas, attitudes, skills, or knowledge; to internalize and make their own meaning of it and then use it in some productive way in the world around them. Experiential approaches provide an integrated process by which these types of challenges could be addressed to. The process of learning that puts forward the mission of developing students to be critical, yet contributing members of society need to be investigated by examining the methods by which courses and experiences are designed to cause learners to find ways to apply their knowledge beyond schools.

The pragmatist philosophy, associated William James and John Dewey, taught that learning through direct experience highlighted practical value, which was a valid test of theoretical worth, and that knowledge must be tied to action and doing. (Dahlgren & Szczepanski, 1998; Priest & Gass, 2005).

Locus of Control

Any study of skill acquisition entails investigating factors leading to individual differences in learners (Ellis, 2008). Research has highlighted individual differences to be dependable predictors of skill acquisition (Dörnyei, 2005). Early studies tried to classify learners as good and bad, intelligent and dull, motivated and unmotivated (Horwitz, 2000). Recent research has focused on explaining why some learners are more successful than others. Robinson (2002) and Dörnyei (2005), in line with Skehan (1989) included motivation, personality, and anxiety as main factors. Oxford and Ehrman (1993) stressed the identification of individual differences and take them into consideration in order to create effective instructions. In general, major points regarding individual differences research can be summarized as:

1. Research in the individual differences area is based on a theory of learning which considers’ individuals’ behaviors as being affected by a set of traits or attributes which are fixed.
2. The practical value of the findings has been limited because they do not give us information on how teachers can help learners to become effective learners. (Williams & Burden, 1997: 95)

Therefore, Williams and Burden (1997) maintained a constructivist approach including the individuals’ main contributions to the learning situation. This approach is needed because:

1. Such a theory enables us to highlight the uniqueness of individuals and help teachers to see what they have in common.
2. It helps us to see how individuals change rather than how they stay the same.
3. It enables teachers how to help learners take control of their own learning.
4. It concerns individuals’ perceptions of themselves as learners.

In this approach, an individual’s understanding of the world is gradually reshaped as they

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adapt their knowledge to new information. The way in which individuals perceive the world and themselves plays an important role in their learning. Thus, rather than focusing on how learners are different from each other or measuring their differences, it would be really useful to concentrate on how learners perceive themselves as learners, what influences their personal views have on their learning processes, and how teachers can assist them in making sense of their learning that is personal to them. One important area which is related to the way in which learners perceive themselves is locus of control.

Statement of the Problem

Effect of experiential study learning strategies on attainment of spatial geometry skills among primary school students in relation to locus of control.

Objectives

- To develop experiential learning programmes for class IV students in spatial geometry studies.
- To compare the effectiveness of experiential learning strategy and traditional instruction on attainment of spatial geometry skills - knowledge, comprehensive and application category among students with internal and external locus of control.
- To compare the effectiveness of experiential learning strategy and traditional instruction on attainment of spatial geometry skills - analyses, synthesis and evaluation category among students with internal and external locus of control

Hypotheses

Hypotheses related to spatial geometry skills

- H₁ The two instructional treatments yield comparable mean gain scores on spatial geometry skills of the students.
- H₂ There is no significance difference in mean gain scores of spatial geometry skills of the students with internal and external locus of control.
- H₃ Comparable mean gain on spatial geometry skills scores are yielded by the students at knowledge, comprehension and application category and analyses, synthesis and evaluation category of spatial geometry skills.

Delimitations

1. The study was conducted on class IV students.
2. Students were taught topics of spatial geometry from their syllabus by some selected experiential learning strategies.
3. The experiment was limited to about 50 working days of the academic session.
4. The study was delimited to class IV students of two schools of Chandigarh.

Methodology

In the present investigation, experimental method was employed.

Sample

60 students with external LOC and 60 students with internal LOC were studied. These 120 students were further divided into two groups of 60 students each i.e. experimental group and control group randomly on the basis of their locus of control. Experimental group was consisted of 30 students with internal locus of control and 30 students with external locus of control. Similarly the control group was consisted of 30 students with internal locus of control and 30 students with external locus of control.

Tools

1. Instructional material for implementing experiential learning strategies was developed by the investigator.
2. Formative tests in the areas of geometry were developed by the investigator.
3. Spatial geometry skills tests were developed by the investigator.
4. Locus of control test (for primary children) internal and external scales constructed and standardized by Pal.R. (1982).

Procedure

Phase 1: Administration of the pre-test.

Phase 2: Conducting the instructional program.

Phase 3: Administration of the post-test.

Treatment was the independent variable, locus of control was the classification variable and spatial geometry skills was dependent variable. Category of skills was the repeated measure variable in analysis of spatial geometry skill:

- Knowledge, comprehensive and application category of skills. – S_1
- Analyses, synthesis and evaluation category of skills. – S_2

Analyses and Interpretations

In the light of the problem, objectives and hypotheses, the obtained data was subjected to descriptive as well as to suitable inferential statistics and was processed.

Table-1: Means and standard deviation of sub – samples of 2 x 2 x 2 design for mean gain scores on spatial geometry skills

L	S	T₁	T₂	Total
L ₁	S ₁	M = 48.2 SD = 4.3 n = 30	M = 30.9 SD = 6.6 n = 30	M = 39.6 SD = 6.3 n = 60
	S ₂	M = 60.4 SD = 7.0 n = 30	M = 24.6 SD = 3.3 n = 30	M = 42.5 SD = 8.7 n = 60
L ₂	S ₁	M = 41.2 SD = 5.1 n = 30	M = 26.2 SD = 6.1 n = 30	M = 33.7 SD = 9.4 n = 60
	S ₂	M = 53.0 SD = 6.6 n = 30	M = 17.8 SD = 3.0 n = 30	M = 35.4 SD = 6.4 n = 60

A 2 x 2 x 2 – Analysis of variance with one repeated measure in terms of categories of spatial geometry skills, was used for the total spatial geometry skills gain scores.

Main Effects

Table-2: 2 x 2 x 2 ANOVA for mean gain scores on spatial geometry skills

Source of variation	df	SS	MSS	F-ratio	Level of Significance
Treatment (T)	1	132007.9	132007.9	320.1	0.01
Locus of control (L)	1	13336.1	13336.1	32.3	0.01
T x L	1	40.98	40.98	0.10	N.Sig
Error between	116	47835.3	412.3	---	
Categories of Skills(S)	1	4170.1	4170.1	65.6	0.01
T x S	1	238.3	238.3	3.8	N.Sig
L x S	1	19.8	19.8	0.3	N.Sig
T x L x S	1	8.8	8.8	0.1	N.Sig
Error within	116	7370.3	63.5	--	

Treatments (T)

F-ratio for the two instructional treatments was found to be significant at 0.01 level of

confidence. So the two instructional treatments exhibited difference in the mean gains on spatial geometry skills. Thus, H_1 was rejected, as the students taught spatial geometry by experiential learning strategies exhibited better spatial geometry skills than taught by traditional learning method.

Locus of Control (L)

F-ratio for the difference between mean gain scores on spatial geometry skills obtained by students of internal and external locus of control was found to be significant at 0.01 level of confidence. Hence, H_2 was rejected as students with internal locus of control performed better than their counterparts with external locus of control.

Categories of Skills (S)

F-ratio for the difference in means of the two categories of skills was found to be significant at 0.01 level of confidence. Thus H_3 was rejected, as the students performed better at analyses, synthesis and evaluation category of skills than at knowledge, comprehension and application category of skills.

Conclusions

- Experiential learning strategies, exhibited better spatial geometry skills as compared to the students who learnt by traditional learning method.
- The students with internal locus of control exhibited better spatial geometry skills than the students with external locus of control.
- The students performed better at analyses, synthesis and evaluation category of spatial geometry skills than at knowledge, comprehension and application category of spatial geometry skills.

Educational Implications

- Educators should introduce experiential learning strategies, especially to the primary classes, as it is the age when they develop habits, values and attitudes.
- Experiential learning enjoys a vast scope in developing spatial geometry and addressing the much talked pedagogical problems of learning geometry.
- Experiential learning strategies should be fully exploited in our schools and should become an integral part of our teaching – learning programmes.
- Experiential learning, as in the present investigation, was found to be effective strategy irrespective of locus of control and therefore find useful with students belonging to various cultures in India and abroad.
- Nature itself is children's best teacher. So we need to allow children's exposure to the nature.
- Experience is the child of thought and thought is the child of action. So in order to result in desirable behaviour of the children, experiential learning strategies must be adopted.
- When the syllabus on mathematics for children at different stages of school education are finalized, different spots for the essential field visits as educational excursion can be identified and listed comprehensively.

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- Locus of control has major effect on action behaviour. So, in the primary stage, when the children are in the process of building their locus of control, they need to be exposed to experiences.
- As the child attains increasing personal mastery over the environment, internal belief usually grows. Mastery over the 3D can be generated out of the number of well – planned hands-on – activities and experiences.

Suggestions for Further Research

- Research may be conducted involving other important variables such as creativity, motivation, self-concept, and cognitive style and study habits too.
- Experiential learning strategies may be much fruitful for differently abled students with special needs. As it is the way to make them learn, it may further be explored.
- Student's interest to learn by experiences may be further probed and their effect on motivation may also be studied.
- Can experiential learning strategies help in the shift from external locus of control to internal locus of control of the students may be investigated.

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