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EFFECT OF VISUAL THINKING STRATEGIES ON OBSERVATION SKLILLS OF 4th GRADE STUDENTS IN RELATION TO THEIR LEARNING STYLES

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Abstract

The present study examined the effect of Visual Thinking Strategies (VTS) on observation skills in relation to their learning style. The sample of the study was consisting of randomly selected 200 students of 4th grade from 10 C.B.S.E. schools of Mohali City. Two groups were prepared- experimental group and control group, where experimental group was taught with the Visual Thinking Strategies and the control group was taught by the conventional method of teaching-learning. For the data collection, Observation Skills Scale was developed by investigator. Analysis by t-test revealed that the students with audio learning style and with visual learning style, taught through Visual Thinking Strategies which resulted in more problem solving skills and observation skills than the students taught through traditional strategies**.**

According to draft National Education Policy (2009), "the direction of the global education development agenda is reflected in the sustainable development goal 4 (SDG4) of the 2030 Agenda for Sustainable Development. SDG4 seeks to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" by 2030. Five of the seven targets of SDG4 focus on quality education and learning outcomes. SDG4 is, therefore, an all-encompassing goal, which is applicable to every nation attempting to bring quality of life to its citizens in a sustainable way, without degrading the environment. This is a huge challenge and the understanding of this should begin in the early part of education. Another dimension of the future of education is the need to deal with the connected dimensions of education. Knowledge will be transformative because of the manner in which it will be connected to all domains. An overarching aspect of SDG4 is

that of inclusion and fostering quality education, and in order to be a practitioner in the field of education, one needs to have some orientation to this mode of thinking."

Educational opportunity is created when students and teachers engage in purposeful learning experiences that help students develop in various ways. This requires clear goals, the skills to translate these goals into sound curriculum and pedagogy, and the leadership of teachers, and school and educational administrators to focus on supporting the creation of meaningful learning opportunities. In a nutshell, educational opportunity requires an effective system to support learning, including supportive organizations, resources, and sound policies. Such a lofty goal will require the entire education system to be reconfigured to support learning. Else none of the goals of the SDGs can be achieved. Pedagogical innovations alone will not succeed.

According to Kalam (2000),"The students should learn by asking questions in the classroom because it is one of the very important characteristics of a student." Dr. Abdul Kalam stresses on thinking by students. He says that thinking is progress. Non thinking is stagnation of the individual, organization and the country. Thinking leads to action .Knowledge without action is useless and irrelevant. Knowledge with action, converts adversities into prosperity .He further writes that thinking should become students' capital asset , no matter whatever ups and downs students come across in their lives. So he conveys the message that dream thought and action are inter related. India vision 2050 is also related with the similar theme of providing innovative strategies and methodologies in and outside the classroom especially to the student in young age so that we could easily approach to our ultimate goal of sent percent literacy. The interest of the student is the central point in all the three documents which are discussed about, which can be easily reached by adopting by visual thinking strategies and many more such innovations in the classroom(Pareek , 2017)."

Visual Thinking Strategies

Visual thinking is a way to organize your thoughts and improve your ability to think and communicate. It's a great way to convey complex or potentially confusing information. It's also about using tools — like pen and paper, index cards and software tools — to externalize your internal thinking processes, making them more clear, explicit and actionable.

According to Vygotsky (1986) , 'thinking' remains as 'perception' without inner speech. In other words, perception is the precondition for thinking. He mentioned, "In our

speech, there is always the hidden thought, the subtext". Supported this idea by explaining, "...most of the words we use in our inner speech, before speaking or writing a sentence, exist as auditory or visual images in our consciousness". The concept of 'visual thinking' can be defined as "an active problem-solving process (Goldschmidt ,1994).

Specifically, as McKim (1972) mentioned, "visual thinking is an analytical process of perceiving, interpreting and producing visual messages, an interaction between seeing, imaging, and drawing."

Roots of Visual Thinking Strategies

Visual Thinking Strategies (VTS) has its roots with theorist Rudolf Arnheim. In a discussion of visual analogies, Arnheim (1969) referred to a class exercise requiring students to draw abstract pictures of a good marriage and a bad marriage. The students' drawings were based on implicit analogies between the properties of visual shapes, for example, smoothness versus roughness. He suggested that such connections are the process by which visual designs are able to evoke meaning. He argued that similar connections account for the meaning of representational art as well. This example of visual analogy was used by Flood, Heath, and Lapp (1997) as a source on which educators could draw in designing a visual curriculum. Students could be taught to recognize meaning in artworks and incorporate this recognition into their critical thinking. Beyond encouraging students to become visual thinkers, educators could also assess aptitudes and achievements in this area.

VTS also takes into account the developmental stages documented by Jean Piaget (Housen & Yenawine, 2000). One key principle is that people accommodate to only what is in their capacity to grasp. Learning occurs in developing interests and capacities of the learner. Housen and Yenawine explained that Piaget and Vygotsky suggested that learning occurs with interaction from the environment, especially the social environment, which produces growth. These developmental issues are tenets of VTS, as is encouraging students to talk, therefore using discussion as a thinking tool.

To a greater extent, VTS builds on the work of Abigail Housen, a cognitive psychologist whose focus is on 'aesthetic thought' (Housen & Yenawine, 2000). In studying the way people think and respond to art, she discovered that even beginners use a range of observations that are full of associations, memories, facts, and emotions. She

claimed to see a deep correspondence between aesthetic thought and skills that educators sought. During 20 years of data collection and analysis, she concluded that a stage theory could be applied to aesthetic change. She identified five patterns of thinking that occur when looking at art, which she described as aesthetic stages.

Studies related to the Visual Thinking Strategies

De Santis, Giuliani, Staffoli and Ferrara (2016) expressed that art observation practice seems useful tool to achieve this purpose. In this context VTS (Visual Thinking Strategies) method has been applied in nursing education in partnership with Museum educator with positive results. It used Pub Med, Google Scholar and Cochrane Database, to identify studies designed to evaluate the effectiveness of VTS on the observational skills of nursing students. The analysis of three qualitative studies demonstrated the potential educational benefit of the VTS method in under graduate nursing training. The review suggests that VTS can contribute to development of observational skill, communication, tolerance of ambiguity and to improve feeling safe in learning and collaborative work.

Bentwich and Gilbey (2017) aimed to offer a novel perspective on the effect of art, as it is experienced through VTS, on medical students' tolerance of ambiguity and its possible relation to empathy. Quantitative method utilizing a short survey administered after an interactive VTS session conducted within mandatory medical humanities course for first-year medical students. The intervention consisted of a 90-min session in the form of a combined lecture and interactive discussions about art images. The VTS session and survey were filled by 67 students in two consecutive rounds of first-year students. It was found that comfort with ambiguity, mostly associated with the acceptance of multiple meanings, is a core characteristic of successful clinicians.

Yeom (2018) conducted research aims to explore whether guided visual artwork discussions called Visual Thinking Strategies (VTS) using picture book images can benefit and enhance Korean EFL secondary students' L2 writing. Incorporating content analysis, this research examines how carefully guided artwork discussions can enhance visual understanding, critical thinking skills and interpretive L2 writing skills. The L2 writing samples of the focal students revealed that they were able to think based on visual clues. The discussions were led by the teacher who pointed out significant visual elements and allowed time for the students to explore diverse ideas. The focal students were able to piece together the jigsaw of the images and articulate their thoughts in English, during which time they learned to take risks and to make mistakes in using a foreign language. Their critical comments

and improved L2 writing suggest how critical/aesthetic thinking skills can be developed through continued visual practices in a secondary EFL setting.

Observation Skills

"We have two ears and one mouth so that we can listen twice as much as we speak".

Epictus (AD55-C.135)

Humans interact directly with the environment and learn from the feedback they receive. A second source of learning comes from observing other people interacting with the same environment. In a world where we need to adapt quickly to the ever-changing circumstances (e.g., climate fluctuations, socio political commotion), the ability to learn from others is fundamental because it reduces the effort of acquiring information. This is especially true when observational learning is based on simple reinforcement learning mechanisms, which is the case when an agent imitates others, evaluates the feedback she receives from the environment and chooses whether to keep imitating or not depending on the outcome (Vostroknutov, Polonio & Coricelli, 2018).

Observation skills are when you observe your own behavior and clients' behavior, anticipate individual and multicultural differences in nonverbal and verbal behavior (Ivey, Ivey & Zalaquett, 2010)

Observation is the action or process of observing something and someone in order to gain information. Although phenomenon has long been known, recent studies show that it is much more common than anyone realized, it is one of the major causes of accidents and human error. In 1992, Arien Mack &Irvin Rock coined the term intentional blindness to describe this phenomenon. It is the failure to notice a fully visible but unexpected object because attention was engaged on other task, event or object. In the year 1990, Write brothers with good observation skills on a small flying kite started a glider airplane developing more improved type of aero plane. Observation is something that one learns by seeing or watching others and thinks about it. It is the ability to pay lot of attention to things and notice more about them than most people do.

Observational Learning

Observational learning is learning that occurs through observing the behavior of others. It is a form of social learning which takes various forms, based on various processes. In humans, this form of learning seems to not need reinforcement to occur, but instead, requires a social model such as a parent, sibling, friend, or teacher with

surroundings. Particularly in childhood, a model is someone of authority or higher status in an environment. In animals, observational learning is often based on classical conditioning, in which an instinctive behavior is elicited by observing the behavior of another (e.g. mobbing in birds), but other processes may be involved as well (Shettleworth, 2010).

Studies related to Observation Skills

Wesson (2011) in his study at junior students in geography found that how the students combine fun looking challenges with richly detailed primary sources. If the students miss important details in the activities, they miss important details in bigger pictures in terms of critical thinking, constructing knowledge and creative thinking.

Moorman (2014) found in her study that students improved observation skills and they became more open to hearing other's opinion. They were more likely to give detail to back up observation in their clinical situations and listen to others during report. She considers it as a great method of asking students to reflect upon their knowledge, perspectives and experiences while using observation skills. It took them to think 'Out of the Box' and allowed students to learn through perception and emotion.

Al-Moteri, Plummer, Cooper and Symmons (2015) identified that observational skill improvements did not occur in real and complex clinical conditions where the incidence of perception failure may increase. In six out of seven approaches examined, (I) the visual attention paid by students during observation is more focused than the actual visual attention clinicians usually pay in the real clinical area; (ii) the observations were made on images of clinical cases with visible signs which allowed findings to be noticed easily and with minimal searching efforts; (iii) the improvement in observation skills was based on what was noticed rather than what was missed, hence, perceptual failure was concealed; and (iv) in evaluations, students were asked to describe "what they see", the process of describing has the possibility to increase the tendency to conflate observations with inferences, and as a result, students may have stopped searching after being satisfied with their findings. To conclude, this review showed that perception paradigms have not been acknowledged in clinical observation training approaches with a need for further research relating to visual perception in clinical settings.

Vandermaas-Peeler (2015) conducted a longitudinal case study of children's gardening experiences at a Reggio-inspired preschool in the United States. Eleven children and their teacher were observed over nine days in various activities such as preparing the garden beds, planting, and harvesting. Through sustained participation in a variety of gardening activities, preschoolers engaged in science-rich dialogue utilizing complex and abstract science process skills such as observing, predicting, evaluating, and comparing. Discussion of number-related concepts, spatial orientation, and size estimation and comparison was

also recurrent during gardening activities. In addition, analyses of social interactions and dialogue related to gardening knowledge and ecological awareness indicated that working in the garden was an authentic context for enjoying, learning about, and valuing the natural world. The results of this study support the conclusion that with appropriate teacher guidance, a preschool garden affords myriad opportunities for young children to develop mathematical and scientific thinking, ecological awareness and positive affective responses to the natural world.

Justification of the Study

India's school age children and youth will be tomorrow's parents, workers and citizens. Their energy, curiosity, observations of environment, problem solving skills and hidden talents are to be nurtured very carefully in the school as well as society. In recent years, national tragedies, both manmade and natural- have forced our students to see how much we rely on strong neighborhoods, communities and democratic institutions which follow new pedagogies and are experimental and innovative in their approach. Our new generations need to develop into active; engaged citizens who are able to participate in and contribute fully to a democratic society. The Partnership for 21st Century Skills, a group of major business and educational organizations believes that making the connection between learning and the real world is imperative for success of students. Education system becomes irrelevant unless we bridge the gap between how students live and how they learn. NCERT has given guidelines to make arts compulsory in every school up to 10th standard. It says that arts should be taught in integration with other subjects and teachers should have participatory and interactive approach rather than instructive. The present study will be a step in such a direction as it will focus on not only on the integration of arts with other subjects but also have an interactive approach where there will be nothing wrong and teacher will celebrate all answers. This study will also take care of the principle of *No Child Left Behind* as studies have proven that visual thinking strategies improved scores of children with economically weaker sections and those with the limited English proficiency.

Delimitations of the Study

The present study was delimited to the following areas:

1. It was delimited to the schools of Mohali(SAS Nagar).
2. It was delimited to only two types of learners-Visual learners and Audio learners.

Objectives of the Study

The present study is designed to attain the following objectives:

1. To develop instructional material based on visual thinking strategies in Social Studies.
2. To compare the effect of visual thinking strategies and conventional method on observation skills of audio and visual learners.
3. To compare the effect of visual thinking strategies and conventional method on problem solving skills of audio and visual learners.

Hypotheses of the Study

Based on above stated objectives, following hypotheses were framed:

H1 The two instructional treatments yield comparable mean gain scores on observation skills of the students.

H2 There is no significant difference in mean gain scores of observation skills of the students with audio and visual learning style.

H3 There is no significant interaction between instructional treatments and learning style on observation skills of the students.

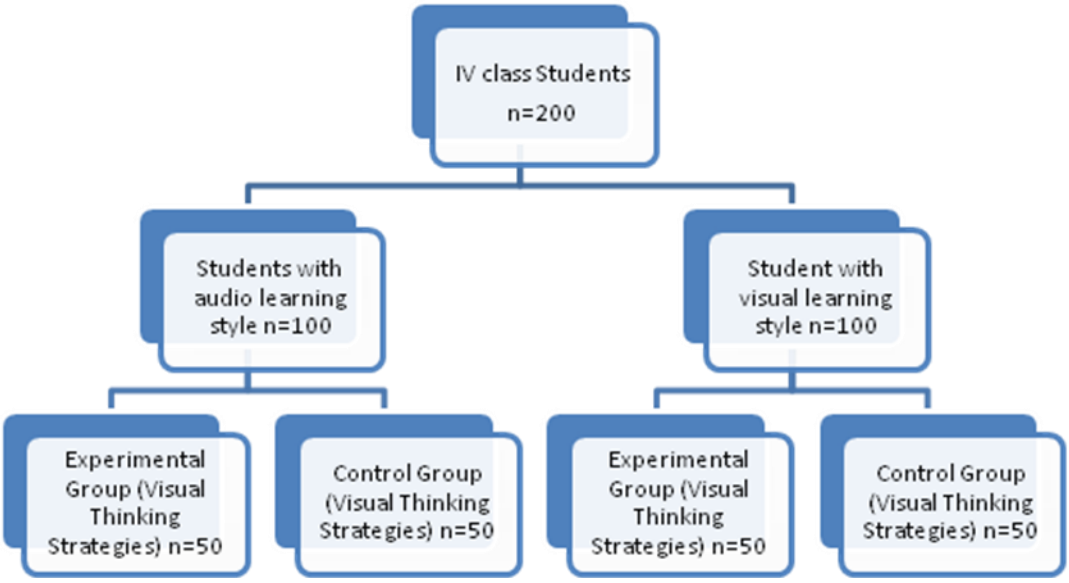
Sample of the Study

The sample of the study was consisting of randomly selected 200 students of 4th grade from 10 C.B.S.E. schools of Mohali City. Two groups were prepared- experimental group and control group, where experimental group was taught with the Visual Thinking Strategies and the control group was taught by the conventional method of teaching-learning.

Design of the Study

2x2 factorial designs were employed on the observation skills and problem solving skills of 4th grade students in Social Studies. The first 2x2 factorial design was employed for mean gain scores on observation skills. The two independent variables were instructional treatment and learning style. The instructional treatment was provided by two strategies viz., Visual Thinking Strategies (T1) and conventional method of teaching (T2). Learning style was studied at two levels viz; Audio learning style and Visual learning style. The dependent variables were difference of scores in the test of observation skills. The students were scored on these variables before and after the treatment. Learning style was organism variable upon which classification of groups were made. Equal number of students was taken in both the learning styles i.e. 100 in each group.

The schematic layout of the design has been presented below:



(Schematic representation of 2x2 ANOVA for mean gain scores on observation skills)

For conducting the study, the investigator divided the 200 students of 4th grade into 2 groups on the basis of learning styles- Audio and Visual learners. In each group based on learning styles, students were divided into experimental and control group then a pre test on Observation Skills was administered to them. The experimental group was taught by Visual Thinking Strategies and the control group was taught by the conventional method. After treatment a post test was taken by both the groups. Data was collected and analyzed with the help of statistical techniques.

Operational Definitions of the terms

Visual Thinking Strategies- It is a student oriented method in which students observes works of art independently and back up their comments with evidence. The investigator developed lesson plans based on Visual Thinking Strategies.

Observation Skills-It is the ability as well as skill that one learns by paying a lot of attention to things and notice more about them than most people do.

Learning Styles- Learning styles could be used to predict what kind of instructional strategies or methods would be most effective for a given individual and learning task. In the present study two types of learning styles – Audio and Visual learners were taken into consideration.

Conventional Method of Teaching- This method uses primarily lecture method; has an authoritarian nature and leads students to only passive learning.

Statistical Employed

The following statistical tools were used for conducting the present study:

1) 30 Lesson Plans were prepared by the investigator based on Visual Thinking Strategies in Social Studies for 4th grade students.

2) Observation Skills measurement Scale was prepared by the investigator.

4) Learning Style questionnaire prepared by investigator was employed to find out learning styles of the students.

Statistical Techniques

The following statistical techniques were employed to analyze the collected data:

1. Descriptive statistics like mean, standard deviation, kurtosis were employed.
2. 2 X 2 analysis of Variance (ANOVA) was employed.

DESCRIPTIVE STATISTICS

The data were complete in respect of 200 subjects i.e.100 each in control and experimental groups. Descriptive statistics such as mean, median, mode and standard deviation were computed to study the frequency distribution of the sample. The above statistics techniques were employed on the pre-test, post-test and mean gain scores separately. Skewness and kurtosis were also worked out to see the trend of its departure of the sample from the normality of the distribution. The analysis of data involved a number of statistical measures such as (i)Mean, Median, Mode, Standard Deviation, Skewness and Kurtosis (ii)Frequency distribution tables The computed value of mean, median, mode, standard deviation, skewness, kurtosis and the frequency distribution of pre-test, post-test and mean gain scores of total sample of each group i.e. control and experimental groups have been given in the tables 1 to 6 for observation skills.

PRE-TEST SCORES

Control Group

The pre-tests score of control group for students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness as per the selected tool were processed in the terms of their mean, median, mode, standard deviation, skewness, kurtosis and their standard errors were also worked out for understanding the nature of the data in the terms of its departure from normality. The obtained values were organized and tabulated in the table 1 separately for students with audio and visual learning style.

Table 1.Showing frequency distribution of pre-test scores of the control group on observation skills and its domains for students with audio and visual learning style

Observation skills and its domains	Learning Style	Mean	Median	Mode	SD	Sk	SEsk	Ku	SEku
Readiness	Audio	12.60	11.50	8.00	3.91	.562	.337	-.311	.662
	Visual	7.50	7.00	6.00	1.77	1.60	.337	5.156	.662
Interest	Audio	11.94	11.00	16.00	4.28	.441	.337	.200	.662
	Visual	7.46	7.00	6.00	1.88	1.55	.337	4.28	.662
Safety and Security	Audio	6.12	6.00	5.00	1.59	.389	.337	-.838	.662
	Visual	4.58	4.00	4.00	0.70	1.17	.337	1.549	.662
Moodiness	Audio	14.42	13.00	12.00	6.64	-.082	-.337	-1.49	.662
	Visual	6.74	6.00	6.00	2.40	. 658	.337	.333	.662
Observation Skills	Audio	45.08	43.00	42.00	15.43	-.010	-.337	-.978	.662
	Visual	25.94	24.00	29.00	6.52	1.05	.337	1.33	.662

Table 1 reveals that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students audio learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness are falling near to each other and not much widely scattered. The values of standard deviations are well distributed. The values for the measure of skewness are near to zero and normally distributed. Readiness, interest, safety and security domains of observation skills are showing positive skewness due to data skewed to the right-hand side. On the other hand, Observation skills and its domain moodiness are showing negative skewness due to data skewed to the left-hand side. Thus, it is interpreted that all distributions are not different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence, it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Further, it is revealed that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students with visual learning style on observation skills all of its four domains viz., readiness, interest,

safety and security and moodiness is falling near to each other and not much widely scattered. The values of standard deviations are well distributed.

The values for the measure of skewness are near to zero or one and it's normally distributed. Observation skills and its domain affective engagement are showing positive skewness due to data skewed to the right-hand side. Behavioral engagement, cognitive engagement and agentic engagement as domains of student engagement are showing negative skewness due to data skewed to the left-hand side. Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Experimental Group

The pre-test scores of experimental group for students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness as per the selected tool were processed in the terms of their mean, median, mode, standard deviation, skewness, kurtosis and their standard errors were also worked out for understanding the nature of the data in the terms of its departure from normality in terms of symmetry. The obtained values were organized and tabulated in the table 5.2 separately for students with audio and visual learning style.

Table : 2 Showing frequency distribution of pre-test scores of the experimental group on observation skills and its domains for students with audio and visual learning style

Observation skills and its domains	Learning Style	Mean	Median	Mode	SD	Sk	SEsk	Ku	SEku
Readiness	Audio	13.16	13.00	7.00	5.31	.562	.337	-.311	.662
	Visual	8.70	8.00	8.00	5.00	.168	.337	-1.048	.662
Interest	Audio	13.50	6.00	6.00	5.25	.441	.337	.200	.662
	Visual	5.00	5.00	4.00	1.51	.369	.337	-.897	.662
Safety and Security	Audio	6.58	7.00	7.00	1.83	.389	.337	-.838	.662
	Visual	7.86	7.00	6.00	2.38	.352	.337	-1.387	.662
Moodiness	Audio	12.58	12.50	12.00	5.31	-.082	-.337	-1.49	.662
	Visual	7.58	7.00	5.00	2.74	.374	.337	-1.224	.662
Observation Skills	Audio	45.28	43.00	42.00	15.43	-.010	-.337	-.978	.662
	Visual	29.22	26.50	21.00	8.37	.309	.337	-1.530	.662

Table 2 reveals that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the experimental group of students audio learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness are falling near to each other and not much widely scattered. The values of standard deviations are well distributed. The values for the measure of skewness are near to zero and normally distributed. Readiness, interest, safety and security domains of observation skills are showing positive skewness due to data skewed to the right-hand side. On the other hand, Observation skills and its domain moodiness are showing negative skewness due to data skewed to the left-hand side. Thus, it is interpreted that all distributions are not different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence, it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Further, it is revealed that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the experimental group of students with visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness is falling near to each other and not much widely scattered. The values of standard deviations are well distributed.

The values for the measure of skewness are near to zero or one and it's normally distributed. Observation skills and its domain affective engagement are showing positive

skewness due to data skewed to the right-hand side. Behavioral engagement, cognitive engagement and agentic engagement as domains of student engagement are showing negative skewness due to data skewed to the left-hand side. Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

POST-TEST SCORE

Control Group

The post-tests score of control group for students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness as per the selected tool were processed in the terms of their mean, median, mode, standard deviation, skewness, kurtosis and their standard errors were also worked out for understanding the nature of the data in the terms of its departure from normality. The obtained values were organized and tabulated in the table 3 separately for students with audio and visual learning style.

Table: 3 Showing frequency distribution of post-test scores of the control group on observation skills and its domains for students with audio and visual learning style

Observation skills and its domains	Learning Style	Mean	Median	Mode	SD	Sk	SEsk	Ku	SEku
Readiness	Audio	20.44	22.00	23.00	4.83	-1.138	.337	.310	.662
	Visual	22.84	23.00	24.00	2.16	-.354	.337	.826	.662
Interest	Audio	19.98	21.00	24.00	4.01	-.779	.337	-.654	.662
	Visual	20.60	20.00	19.00	2.41	-.014	.337	-1.04	.662
Safety and Security	Audio	7.68	7.50	7.00	1.36	1.068	.337	2.42	.662
	Visual	6.94	7.00	7.00	1.96	-.200	.337	-.676	.662
Moodiness	Audio	16.42	20.00	22.00	3.70	-.766	-.337	-.305	.662
	Visual	21.60	21.00	21.00	2.38	.376	.337	-.249	.662
Observation Skills	Audio	67.42	71.00	71.00	11.76	-.799	-.337	-.548	.662
	Visual	71.82	72.50	79.00	8.52	-.327	.337	-.981	.662

Table 3 reveals that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students audio learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness are falling near to each other and not much widely scattered. The values of standard deviations are well distributed. The values for the measure of skewness are near to zero and normally distributed. Readiness, interest, safety and security domains of

observation skills are showing positive skewness due to data skewed to the right-hand side. On the other hand, Observation skills and its domain moodiness are showing negative skewness due to data skewed to the left-hand side. Thus, it is interpreted that all distributions are not different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence, it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Further, it is revealed that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students with visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness is falling near to each other and not much widely scattered. The values of standard deviations are well distributed.

The values for the measure of skewness are near to zero or one and it's normally distributed. Observation skills and its domain affective engagement are showing positive skewness due to data skewed to the right-hand side. Behavioral engagement, cognitive engagement and agentic engagement as domains of student engagement are showing negative skewness due to data skewed to the left-hand side. Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Experimental Group

The post-test scores of experimental group for students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness as per the selected tool were processed in the terms of their mean, median, mode, standard deviation, skewness, kurtosis and their standard errors were also worked out for understanding the nature of the data in the terms of its departure from normality in terms of symmetry. The obtained values were organized and tabulated in the table 5.4 separately for students with audio and visual learning style.

Table : 4 Showing frequency distribution of post-test scores of the experimental group on observation skills and its domains for students with audio and visual learning style

Observation skills and its domains	Learning Style	Mean	Median	Mode	SD	Sk	SEsk	Ku	SEku
Readiness	Audio	20.30	22.00	23.00	3.66	-.932	.337	-.404	.662
	Visual	22.84	23.50	24.00	2.31	-.815	.337	-.186	.662
Interest	Audio	19.48	21.00	22.00	4.13	-.999	.337	.127	.662
	Visual	23.16	24.00	25.00	2.49	-1.30	.337	.318	.662
Safety and Security	Audio	9.120	9.00	9.00	1.23	-.103	.337	-.829	.662
	Visual	7.54	8.00	8.00	1.72	.041	.337	-.343	.662
Moodiness	Audio	18.80	21.00	24.00	4.96	-.360	.337	-1.56	.662
	Visual	23.12	24.00	24.00	2.23	-2.13	.337	7.23	.662
Observation Skills	Audio	67.76	71.00	78.00	12.34	-.676	.337	-.800	.662
	Visual	76.68	80.00	81.00	7.233	-.104	.337	-.104	.662

Table 4 reveals that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the experimental group of students audio learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness are falling near to each other and not much widely scattered. The values of standard deviations are well distributed. The values for the measure of skewness are near to zero and normally distributed. Readiness, interest, safety and security domains of observation skills are showing positive skewness due to data skewed to the right-hand side. On the other hand, Observation skills and its domain moodiness are showing negative skewness due to data skewed to the left-hand side. Thus, it is interpreted that all distributions are not different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence, it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Further, it is revealed that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the experimental group of students with visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness is falling near to each other and not much widely scattered. The values of standard deviations are well distributed.

The values for the measure of skewness are near to zero or one and it's normally distributed. Observation skills and its domain affective engagement are showing positive skewness due to data skewed to the right-hand side. Behavioral engagement, cognitive

engagement and agentic engagement as domains of student engagement are showing negative skewness due to data skewed to the left-hand side. Thus, it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

The values of kurtosis for observation skills and its domains are within the acceptable limits of normality of distribution (±1). Hence it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

MEAN GAIN SCORES

Control Group

The gain scores as measured by the difference of post-test scores and pre-test scores were worked out for each student of the control group for students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness as per the selected tool were processed in the terms of their mean, median, mode, standard deviation, skewness, kurtosis and their standard errors were also worked out for understanding the nature of the data in the terms of its departure from normality. The obtained values were organized and tabulated in the table 5 separately for students with audio and visual learning style.

Table : 5 Showing frequency distribution of mean gain scores of the control group on observation skills and its domains for students with audio and visual learning style

Observation skills and its domains	Learning Style	Mean	Median	Mode	SD	Sk	SEsk	Ku	SEku
Readiness	Audio	7.84	10.5	15	0.92	-1.7	.337	0.621	.662
	Visual	15.34	16	18	0.39	-1.954	.337	-4.33	.662
Interest	Audio	8.04	10	8	-0.27	-1.22	.337	-0.854	.662
	Visual	13.14	13	13	0.53	-1.564	.337	-5.32	.662
Safety and Security	Audio	1.56	1.5	2	-0.23	0.679	.337	3.258	.662
	Visual	2.36	3	3	1.26	-1.37	.337	-2.225	.662
Moodiness	Audio	2	7	10	-2.94	-0.684	.337	1.185	.662
	Visual	14.86	15	15	-0.02	-.282	.337	-0.582	.662
Observation Skills	Audio	22.34	28	29	-3.67	-0.789	.337	0.43	.662
	Visual	45.88	48.5	50	2	-1.377	.337	-2.311	.662

Table 5 reveals that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety

and security and moodiness are falling near to each other and not much widely scattered. The values of standard deviations are well distributed. The values for the measure of skewness are near to zero. Student engagement and its domains affective engagement and cognitive engagement are showing positive skewness and data skewed to the right-hand side. Behavioral engagement, and agentic engagement as domains of student engagement are showing negative skewness and data skewed to the left-hand side. Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

The values of kurtosis for student engagement and its domain affective engagement and cognitive engagement are within the acceptable limits of normality of distribution (±1). Affective engagement and agentic engagement as domains of student engagement are showing leptokurtic distribution because the value of kurtosis is more the acceptable limits of normality of distribution (±1). Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Further, it is revealed that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students with average creativity on student engagement and its domains viz., behavioral engagement, affective engagement, cognitive engagement and agentic engagement are falling near to each other and not much widely scattered. The values of standard deviations are well distributed.

The values for the measure of skewness are near to zero. Behavioral engagement and cognitive engagement as domains of student engagement are showing positive skewness and data skewed to the right-hand side and student engagement and its domains affective engagement and agentic engagement are showing negative skewness and data skewed to the left-hand side. Thus it is interpreted that all distributions are not different from the normal curve in terms of symmetry.

The values of kurtosis for behavioral engagement, affective engagement, cognitive engagement and agentic engagement as domains of student engagement are within the acceptable limits of normality of distribution (±1). Student engagement is showing leptokurtic distribution because the value of kurtosis is more the acceptable limits of normality of distribution (±1). Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Experimental Group

The gain scores as measured by the difference of post-test scores and pre-test scores were worked out for each student of the experimental group for students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety

and security and moodiness as per the selected tool were processed in the terms of their mean, median, mode, standard deviation, skewness, kurtosis and their standard errors were also worked out for understanding the nature of the data in the terms of its departure from normality. The obtained learning style.

Table: 6 Showing frequency distribution of mean gain scores of the experimental group on observation skills and its domains for students with audio and visual learning style

Observation skills and its domains	Learning Style	Mean	Median	Mode	SD	Sk	SEsk	Ku	SEku
Readiness	Audio	7.14	8.5	16	-1.65	-1.494	.337	-0.093	.662
	Visual	14.14	15.5	16	-2.69	-0.983	.337	0.862	.662
Interest	Audio	6.14	14	16	-1.12	-1.44	.337	-0.073	.662
	Visual	18.16	19	21	0.98	-1.669	.337	1.215	.662
Safety and Security	Audio	2.54	2	2	-0.6	-0.492	.337	0.009	.662
	Visual	-0.32	1	2	-0.66	-0.311	.337	1.044	.662
Moodiness	Audio	6.22	8.5	12	-0.35	-0.278	.337	-0.07	.662
	Visual	15.54	17	19	-0.51	-2.504	.337	8.454	.662
Observation Skills	Audio	22.48	28	36	-3.09	-0.666	.337	0.178	.662
	Visual	47.46	53.5	60	-1.137	-0.413	.337	1.426	.662

Table 6 reveals that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students with audio and visual learning style on observation skills all of its four domains viz., readiness, interest, safety and security and moodiness are falling near to each other and not much widely scattered. The values of standard deviations are well distributed. The values for the measure of skewness are near to zero. Student engagement and its domains affective engagement and cognitive engagement are showing positive skewness and data skewed to the right-hand side. Behavioral engagement, and agentic engagement as domains of student engagement are showing negative skewness and data skewed to the left-hand side. Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

The values of kurtosis for student engagement and its domain affective engagement and cognitive engagement are within the acceptable limits of normality of distribution (±1). Affective engagement and agentic engagement as domains of student engagement are showing leptokurtic distribution because the value of kurtosis is more the acceptable limits

of normality of distribution (±1). Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

Further, it is revealed that the absolute values for the measure of mean, median, mode, standard deviation, skewness and kurtosis for the control group of students with average creativity on student engagement and its domains viz., behavioral engagement, affective engagement, cognitive engagement and agentic engagement are falling near to each other and not much widely scattered. The values of standard deviations are well distributed.

The values for the measure of skewness are near to zero. Behavioral engagement and cognitive engagement as domains of student engagement are showing positive skewness and data skewed to the right-hand side and student engagement and its domains affective engagement and agentic engagement are showing negative skewness and data skewed to the left-hand side. Thus it is interpreted that all distributions are not different from the normal curve in terms of symmetry.

The values of kurtosis for behavioral engagement, affective engagement, cognitive engagement and agentic engagement as domains of student engagement are within the acceptable limits of normality of distribution (±1). Student engagement is showing leptokurtic distribution because the value of kurtosis is more the acceptable limits of normality of distribution (±1). Thus it is interpreted that all distributions are not very different from the normal curve in terms of symmetry.

INTERACTIONAL EFFECT

Two-Way Analysis of Variation

In two way classification, two independent variables are taken simultaneously. It has two main effect and one interaction effects or joint effect of two variables on the dependent variable. Two- way classification three F- values were calculated. Two F-values for two main effects and one F-value for interaction effect were calculated.

Table 5.7 Showing descriptive statistics of instructional treatments and learning style on observation skills

Descriptive Statistics				
Variable			**N**	**Mean**
Instructional Treatments		Control	100	8.550
		Experimental	100	18.630
Category		Audio	100	15.420
		Visual	100	13.620
Instructional Treatments and Category	Control	Audio	50	7.98
		Visual	50	8.30
	Experimental	Audio	50	18.15
		Visual	50	16.17

Table : 5.8. Showing interactional effect between instructional treatments and learning style on observation skills

Dependent Variable: Observation Skills					
Source of Variation	**Sum of Squares**	**Df**	**Mean Sum of Square**	**F Value**	**Level of Significance**
Corrected Model	8256.100	3	2905.17	58.714	Significant at .01 level (F= 3.88)
Intercept	160556.35	1	160556.35	19807.61	Significant at .01 level (F= 6.72)
Group (Control & Experimental	7125.093	1	7125.093	102.37	Significant at .01 level (F= 6.76)
Category (Audio and Visual Learning Style)	1103.220	1	1103.220	8.064	Significant at .01 level (F= 6.76)
Group X Category	20.508	1	30.508	9.876	Significant at .01 level (F= 6.76)
Error	2130	196	7.987		
Total	2562.000	200			
Corrected Total	13456.002	199			

Main Effect in Instructional Treatments

Table 5.8 reveals that the F value 102.37with df 199 for the difference between control and experimental group had higher the table value at.01 level of significance. It stated that there was significant difference in mean gain scores of observation skills in respect two instructional treatments i.e. traditional strategies and visual thinking strategies as shown in the table 5.21.

The result of significant difference among groups i.e. students taught through visual thinking strategies modules are highly effective or highly engaged than students taught through traditional way.

Main Effect of Learning Style

Table 5.8 reveals that the F value 8.064 with df 199 for the difference between categories was found to be significant at. 01 level of significance. There is no significant difference in mean gain score of observation skills in the variable of category i.e. audio learning style and visual learning style students' as shown in the table 5.21. Thus, it can be inferred that students are not affected in mean gain scores on observation skills in relation to learning with different styles might engaged in the category.

Interactional Effect between Instructional Treatments and Learning Style

Table 5.8 reveals that the F value 9.876 with df 199 for the first order interaction effect between instructional treatments and learning style was found to be significant, because the F value is more than table value at. 01 level of significance. The result revealed that there was no significant interaction between instructional treatments and learning style on observation skills

Therefore, hypothesis **H-3 there will be no significant interaction between instructional treatments and learning style on observation skills may** be rejected**.**

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