A Study on the Effect of Online Learning Mode on Academic Achievement and Span of Attention among Primary Level Students

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Abstract: The present study was conducted to assess theAcademic achievement and Span of attentionamong primarylevel students in relation to Online Learning. The current research was followed by anExperimental method. For the study 40 students fromSt. Anne'sJodhpur were assessed. A self-made pretest & post-test was used for assessing Academic achievement and Span of attentionis observed through the instrument named Tachistoscope.

The percentage of responses was calculated to assess the Span of attentionbefore and after online learning. Mean, SD, t-test, Percentage, Paired T-test were used to compare the Academic achievement and Span of attentionin relation to Online learning in reference to gender. The result obtained by the analysis of data stated that there was no significant difference in theAcademic achievementof boys and girls towards online learning but a significant difference in respect to Span of attention. The result showed higher Span of attentionin girls in comparison to boys.

Introduction - The rapid shift to online learning during the COVID-19 pandemic has significantly influenced educational practices worldwide and increased the use of online learning platforms.

In the era of digital education, maintaining a strong attention span is crucial. Attention span refers to the length of time one can concentrate on a task without distraction. For online learning, this is particularly important because it affects how well students absorb and retain information.

Online education promotes a student-centred approach, whereby students are expected to actively participate in the learning process. The digital tools used in online learning include interactive elements, computers, mobile devices, the internet, and other devices that allow students to receive and share knowledge.

It empowers individuals to take control of their learning process, fostering autonomy and lifelong learning skills. Online education places learners at the forefront of their educational journey, emphasizing their autonomy, motivation, and goal setting

Online learning offers several advantages to students, such as its adaptability to individual needs, ease, and flexibility in terms of involvement. Furthermore, while technology facilitates accessibility and ease of use of online learning platforms, it can also have restrictive effects, where many students struggle to gain internet access, in turn causes problems with participation and attendance in virtual classes, which makes it difficult to adopt online learning platforms Maintaining student engagement in an online classroom can be more difficult than in a traditional face-to-face setting.

Online learning environments often differ significantly from traditional classrooms, influencing how attention is allocated and maintained. Factors such as digital distractions and multimedia content can either enhance or impair students' ability to concentrate.

Academic achievement, in the context of Online learning extends beyond grades and test scores. It encompasses holistic growth and the development of transferable skills that prepare students for diverse academic and real-world environments.

Academic achievement refers to the level of success and accomplishments attained by students in their educational pursuits.

Academic achievement is a multifaceted concept that goes beyond mere test performance. It also includes the development of critical thinking skills, problem-solving abilities, creativity, and social-emotional competencies.

High academic achievement is often seen as an indicator of students' engagement, motivation, and effective learning strategies. It reflects their ability to meet academic standards, grasp complex concepts, and apply knowledge to real-world situations.

Additionally, increased screen time contributes to digital

fatigue, which diminishes the ability to sustain attention. Prolonged exposure to screens can cause eye strain, mental exhaustion,

Attention is defined as the process which compels the individuals to select some stimulus according to his interest and attitude out of the multiplicity of stimuli present in the Environment. Thus, in short it is the selective activity of consciousness as a process of getting an object of thought clearly before the mind.

Attention is the term used or given to the perceptual processes that select certain inputs for inclusion in our conscious experience, or awareness at any given time. It is the process involving the act of listening, and concentrating on a topic, object or event for the attainment of desired ends.

"Attention is the process of getting an object or thought clearly before the mind"—Ross.

"Attention is being keenly alive to some specific factors in our environment. It is a preparatory adjustment for response"—Morgan.

The attention is not merely a cognitive factor but is essentially determined by emotions, interest, attitude and memory

Attention includes a few components, one of which, attention span, is the ability to maintain focus and alertness over a period. Sustained attention requires persistence and motivation. Thus, individuals with short attention spans may appear to give up or not put sufficient effort into tasks.

A good **attention span** helps students stay engaged with their lessons, participate in discussions, and grasp complex concepts. Conversely, a short attention span can lead to missed information, incomplete assignments, and lower academic performance. Understanding and improving attention span can significantly enhance the online learning experience, making it more effective and enjoyable.

Attention allows to "tune out" information, sensations, and perceptions that are not relevant now and instead focus your energy on the information that's important.

Attention span is the ability to attend to a stimulus over a period and is important in accomplishing other tasks. This ability is dependent on different factors including event rate and probability of events.

Attention span refers to the amount of time a person can focus on a task or activity without becoming distracted. It is a critical aspect of cognitive functioning and is closely linked to information processing and memory development, as it influences how effectively information is encoded, stored.

Span of attention tells us that how many things can exist in the focus of consciousness at one time in an individual. It refers to the numbers of object which can be grasped in one short presentation.

Attention span varies significantly across different ages, generally increasing from childhood through adolescence and into adulthood.

1. Shorter attention spans are often observed in younger children, impacting their ability to engage in tasks that require prolonged concentration.
2. Environmental factors, such as distractions from technology and social media, can negatively affect attention spans in both children and adults.
3. Training techniques, like mindfulness and focus exercises, can help improve attention span by enhancing cognitive control and reducing impulsivity.
4. Attention span is crucial for academic performance; longer attention spans are associated with better learning outcomes and memory retention.

Attention span directly influences how effectively individuals can process and retain information. A longer attention span allows for deeper engagement with material, enabling better encoding of information into memory. When attention is divided or short-lived, it can hinder the ability to form lasting memories, leading to challenges in recall later. Essentially, a greater capacity for sustained attention leads to more successful learning outcomes.

The impact of online learning on attention span has become a pivotal concern in today's educational landscape, especially as digital platforms dominate student experiences.

In the context of online learning, understanding attention span is vital due to the unique digital environment students engage withand reduced motivation, all of which negatively affect engagement levels in online learning environments.

Defining the Terms:

Online learning- Online learning **is** a student-centred approach, whereby students are expected to actively participate in the learning process through interactive elements, computers, mobile devices, the internet, and other devices that allow students to receive and share knowledge.

Academic achievement - It encompasses a range of outcomes, including grades, test scores, academic awards, completion of coursework, and participation in extracurricular activities.

Attention is defined as the process which compels the individuals to select some stimulus according to his interest and attitude out of the multiplicity of stimuli present in the Environment.

Span of Attention- Attention span refers to the ability to attend to a stimulus over length of time,amount of time a person can focus on a task or activity, can concentrate on a task without distraction.

Statement of the Problem: A study on the effect of online learning mode on Academic achievement and Span of attention among primary level students

Objectives of the study:
1. To find out Academic achievement scores before online classes of primary level students.
2. To assess Span of Attention before online classes of

primary level students.

3. To find out Academic achievement scores after online classes of primary level students.
4. To assess Span of Attention after onlineclasses of primary level students.
5. To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievementsin reference to online classes.
6. To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Span of Attention with reference to online classes.
7. To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievements with reference to online classes in relation to gender.
8. To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Span of Attention with reference to online classes in relation to gender.

Hypothesis of the study:
The study was guided by two kinds of hypothesis.
Null Hypothesis and Alternate Hypothesis
Null Hypothesis-
Ho-1 There will be no significant difference in the Pre assessment scores(pretest) and post assessment scores(post-test) of Academic achievements in reference to online classes.
Ho-2 There will be no significant difference in Span of Attention in the Pre assessment scores(pretest) and post assessment scores(post-test) ofwith reference to online classes.
Ho-3- There will be no significant difference in the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievements with reference to online classes in relation to gender.
Ho-4 There will be no significant difference in Span of Attention of the Pre assessment scores(pretest) and post assessment scores(post-test) with reference to online classes in relation to gender.
Alternate Hypothesis- Research indicates that attention span in virtual settings tends to be shorter than in face-to-face education. This decline is linked to the ease of distraction online, such as technical issues, lack of proficiency, long screen time, fatigue and multitasking tendencies.

Environmental factors, such as distractions from technology and social media, can negatively affect attention spans in both children and adults. Attention span is crucial for academic performance; longer attention spans are associated with better learning outcomes and memory retention.

Based on the facts studied earlier the Alternate Hypothesis was also formulated.
Ha-1 There will be a significant difference in the Pre assess-ment scores (pretest) and post assessment scores (post-test) of Academic achievements in reference to online classes.

Ha-2 There will be a significant difference in Span of Attention in the Pre assessment scores(pretest) and post assessment scores(post-test) ofwith reference to online classes.
Ha-3- There will be a significant difference in the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievements with reference to online classes in relation to gender.
Ha-4 There will be a significant difference in Span of Attention of the Pre assessment scores(pretest) and post assessment scores(post-test) with reference to online classes in relation to gender.
Design of the study:The study was based on Experimental design. **For this study Single group/ one-group pretest-post-test design** was selected.

Experimental design refers to the process of planning a study to test a hypothesis, where variables are manipulated to observe their effects on outcomes. By carefully controlling conditions, researchers can determine whether specific factors cause changes in a dependent variable.

A one-group pretest–post-test design is a type of research design that is most often utilized by behavioural researchers to determine the effect of a treatment or intervention on a given sample.

The **one-group pretest-post-test design** is a type of quasi-experiment in which the outcome of interest is measured 2 times: once before and once after exposing a non-random group of participants.
This research design is characterized by two features.
The first feature is the use of a single group of participants. The second feature is a linear ordering that requires the assessment of a dependent variable before and after a treatment is implemented (i.e. a pretest–post-test design).
Method:
1. The group of participants who received the intervention were selected in a non-random way, which makes it a quasi-experimental design.
2. he all participants were part of a single condition, meaning all participants were given the same treatments and assessments.
3. The effect of the intervention/treatment is measured by comparing the pre- and post-intervention measurements.
Population: The students of Primary classes from St. Anne's Jodhpur.
Sample: Total 40 students were selected for the study.
The sample was selected from class 5th A and 5th B. The students whose prior percentage was ranging from 75% to 85% were considered for the study.
Table -1 Showing sample size.

S.	Class	Boys	Girls	Total
1	V-A	11	8	19
2	V-B	9	12	21
		20	20	40

Tools used-The tools were used for study:
1.   **Academic Achievement-Self-made test (Both pre and post-test).**
2.   **Span of attention-** Tachistoscope, Cards with 3 to 15 letters containing non-meaningful word and meaningful words)
1.   A falling door Tachistoscope was used for the measurement of span of attention. Tachistoscope is an apparatus designed to expose objects for a brief space of time.

Tachistoscope is an apparatus having a window in its middle portion that is called screen. The window is covered by an aluminium plate, which relates to the lever.
This instrument was manufactured by Hamilton and was first used by Whipple.
Procedure/Administration of tool
Instructions For the Subject:
1.   Get prepared when ready signal is given
2.   As soon as say "yes" focus your attention on screen on which you will see some words.
3.   Whatever you see write on paper immediately.

To determine the span of attention the subject was provided a chair and the apparatus was placed on a stool in front of the subject so that the subject easily saw the alphabets (ranging from 3 to 15) through the tachistoscope window. When the lever was pressed, the screen opens for 1/10 Sec or 100ms. In that short period the subject read the number of alphabets and wrote the same. 13cards with alphabets (ranging from 3 to 15 letters containing non-meaningful word and meaningful words) were used. The alphabets were made with black ink on white background. The size of the cards was 12×8 cm. As the students were failed to response correctly the experiment was stopped on that levelonly.
Statistical techniques used: The data were analysed by using –
1.   **Mean: Mean is the sum of all the values in the data set divided by the number of values in the data set. It is also called the Arithmetic Average.**
The Mean is denoted as x.
The formula to calculate the mean is: **Mean ($\overline{x}$) = Σxi/ n**
2.   **Percentage:** A percentage is a number or ratio that can be expressed as a fraction of 100. **Percentage means,** a part per hundred. It is represented by the symbol "%".
3.   **Percentage difference** is defined as the absolute value of the ratio of the difference between two numbers and their average, expressed as a percentage.
i.   **Percentage = (Obtainedscores/ Total scores) × 100**
ii. **Percentage Difference**=100 × [a-b] **/ [**(a+b]) /2]
Here a and b are the % of the two groups
4.   **Standard Deviation -** Standard Deviation is a measure of how widely distributed a set of values is from the mean. It compares every data point to the average of all the data points.

Standard Deviation Formula

$$s = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \overline{x})^2}$$

Where:
1.   **s** is Population Standard Deviation
2.   **xi** is the ith observation
3.   **$\overline{x}$** is the Sample Mean
4.   **N** is the Number of Observations
3.   **t-test:** A t-test is used to compare the mean of two groups of samples. It helps evaluate if the means of the two sets of data are statistically significantly different from each other.

$$t = \frac{m_A - m_B}{\sqrt{\frac{S^2}{n_A}} + \sqrt{\frac{S^2}{n_B}}}$$

4.   **Paired t-test:** Paired t-test is used when each subject has a pair of measurements, such as a before and after score. A paired t-test determines whether the mean change for these pairs is significantly different from zero.

Paired t-test is a test that is based on the differences between the values of a single pair, that is one deducted from the other. In the formula this difference is notated as d.

The formula of the paired t-test is defined as the sum of the differences of each pair divided by the square root of n times the sum of the differences squared minus the sum of the squared differences, overall n-1.
The formula for the paired t-test is given:
t=Σd**/**$\sqrt{n(\Sigma D2)-(\Sigma d)2}$ **/**n-1
Where, Σd is the, (ΣD2 = sum of the differences squared, $\sqrt{n(\Sigma D2)-(\Sigma d)2}$ **/**n−1=Standard deviation of differences (SD diff)
Data Analysis:
1.   **Using Paired t-test analysis:**
Table.1 (see in last page)
The table 1 shows calculated t-value is -0.80 which is less than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes no significant difference in pretest and post-test after online classes.
Thus Ho-1 is accepted.
Table.2 (see in last page)
The table 2 shows calculated t-value is -0.80 which is less than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes no significant difference in pretest and post-test after online classes.
Thus Ho-2 is accepted.
II.   Using A-statistics
Table.3 (see in last page)
The table 3 shows the calculated A-value is less than the table indicates an insignificant difference in Academic achievement before and after online classes.
Table.4 (see in last page)

The table 4 shows the calculated A-value is less than the table indicates an insignificant difference in Academic achievement before and after online classes.

III-t-test analysis

Table. 5-To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievements in reference to online classes of primary level Boys.

S.	Intervention	N	Mean	SD	Mean diff(Mx=M1-M2)
1	Pretest	20	35.0	8.20	5.0
2	Post-test	20	40.0	4.15	

Table. 6-To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievements in reference to online classes of primary level Girls.

S.	Intervention	N	Mean	SD	Mean diff(My=M3-M4)
1	Pretest	20	37.0	3.57	2.0
2	Post-test	20	39.0	5.94	

Table. 7-To compare the of Academic achievement scoresin relation to gender with reference to online classes

S.	Sample	N	Mean	SD	t-value	Significance
1	Boys	20	5.0	4.15	1.85	NS*Not
2	Girls	20	2.0	5.94		significant

The table shows calculated t-value is 1.85 which is less than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes no significant difference in Boys and Girls in reference to online classes

Table. 8-To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Spans of attention in reference to online classes of primary level Boys.

S.	Intervention	N	Mean	SD	Mean diff(Mx=M1-M2)
1	Pretest	20	20.0	5.72	8.0
2	Post-test	20	12.0	4.32	

Table. 9-To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of in reference to online classes of primary level Girls.

S.	Intervention	N	Mean	SD	Mean diff(Ms=M1-M2)
1	Pretest	20	16.0	4.0	6.0
2	Post-test	20	22.0	5.51	

Table. 10- To compare the Span of Attention in relation to gender with reference to online classes

S.	Sample	N	Mean	SD	t-value	Significance
1	Boys	20	8.0	4.32	5.71	S*Significant
2	Girls	20	6.0	5.51		

The table shows calculated t-value is 5.71 which is more than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes significant difference in Span of Attention in Boys and Girls in reference to online classes

IV-Analysis based on Percentage

Table.11-To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Spans of attention in reference to online classes of primary level Boys.

S.	Intervention	N	Percentage	Difference in %
1	Pretest	20	27.78%	49.98% fall in
2	Post-test	20	16.67%	percentage

Table. 12- To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of in reference to online classes of primary level Girls.

S.	Intervention	N	Percentage	Difference in %
1	Pretest	20	22.22 %	31.58% Increase in
2	Post-test	20	30.55%	percentage

Analysis of Hypothesis:

Ho-1 There will be no significant difference in the Pre assessment scores(pretest) and post assessment scores(post-test) of Academic achievement in reference to online classes.

Ha-1 There will be a significant difference in the Pre assessment scores(pretest) and post assessment scores(post-test) of Academic achievement in reference to online classes.

The calculated t-value is -0.80 which is less than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes no significant difference in pretest and post-test after online classes.

Thus Ho-1 is accepted and Ha is rejected.

Ho-2 There will be no significant difference in Span of Attention in the Pre assessment scores(pretest) and post assessment scores(post-test) ofwith reference to online classes.

Ha-2 There will be a significant difference in Span of Attention in the Pre assessment scores(pretest) and post assessment scores(post-test) ofwith reference to online classes

The table shows calculated t-value is -0.80 which is less than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes no significant difference inSpan of Attention in pretest and post-test after online classes.

Thus Ho-2 is accepted, and Ha-2 is rejected

Ho-3- There will be no significant difference in the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievement with reference to online classes in relation to gender.

Ha-3 There will be a significant difference in the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievement with reference to online classes in relation to gender.

The calculated t-value is 1.85 which is less than the table value 1.96 and 2.57 on .05 and .01 level respectively concludes no significant difference in Boys and Girls in reference to online classes

Thus Ho-3 is accepted, and Ha-3 is rejected

Ho-4 There will be no significant difference in Span of Attention of the Pre assessment scores(pretest) and post assessment scores(post-test) with reference to online classes in relation to gender.

Ha-4 There will be a significant difference in Span of Attention of the Pre assessment scores(pretest) and post assessment scores(post-test) with reference to online classes in relation to gender.

The calculated t-value is 5.71 which is more than the

table value 1.96 and 2.57 on .05 and .01 level respectively concludes a significant difference in Span of Attention in Boys and Girls in reference to online classes.

Thus Ho-4 is rejected, and Ha-3 is accepted.

Findings:
1. There was no significant difference foundin pretest and post-test scores of Academic achievementafter online classes.
2. There was no significant difference was found inSpan of Attention in pretest and post-test after online classes.
3. There was no significant difference found in Boys and Girls in Academic achievement after online classes.
4. A significant difference was found in Span of Attention in Boys and Girls after online classes.
5. There was 49.98% fall in percentage of boys when pre and post test scores were compared.
6. There was 31.58% Increase in percentageof girls when pre and post test scores were compared.
7. The study revealed higherspan of attention in girlsbased onhigher mean value and percentage values.

Conclusion- In the context of online learning, boys were influenced and distracted more by digital environment. This reduces motivation and span of attention which negatively affect engagement levels in online learning environments.Thus, boys have less span of attention in comparison to girls. The Academic achievement was not affected by online classes as pretest scores and post-test scores didn't show much difference. The Academic achievement is also influenced by students' engagement, motivation, and effective learning strategies which online classes offers.

Educational Implication: Online learning offers several advantages to students, such as its adaptability to individual needs, ease, and flexibility in terms of involvement. Online learning environments often differ significantly from traditional classrooms, influencing how attention is allocated and maintained. It encompasses holistic growth and the development of transferable skills that prepare students for diverse academic and real-world environments but factors such as digital distractions and multimedia content can either enhance or impair students' ability to concentrate.

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Table.1- To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Academic achievements in reference to online classes of primary level students.

S.	Intervention	N	Σd=Mean of the sum of the differences (pre and post-test)	(ΣD2sum of the differences squared	SD of diff	t-value	Significance
1	Pre assessment scores (pretest)	40	-3.75	860	29.45	-0.80	NSNot significant
2	Post assessment scores (post-test)						

df=40-1=39　　　　.05=1.96　　　　.01=2.57

Table.2- To compare the Pre assessment scores(pretest) and post assessment scores (post-test) of Spansof attention in reference to online classes of primary level students.

S.	Intervention	N	Σd=Mean of the sum of the differences (pre and post-test)	(ΣD2sum of the differences squared	SD of diff	t-value	Significance
1	Pre assessment scores (pretest)	40	0.60	908	30.5	0.12	NSNot significant
2	Post assessment scores (post-test)						

df=40-1=39　　　　.05=1.96　　　　.01=2.57

Table.3- Showing significant difference ofAcademic achievement in pretest and post-test after online classes using A-statistics:

S.	Intervention	N	Σm = sum of the differences (pre and post-test)	(ΣD2sum of the differences squared	t-value	Significance
1	Pre assessment scores (pretest)	40	-150	860	-0.038	NSNot significant
2	Post assessment scores (post-test)					

df=40-1=39　　　　**A-statistics** value on .05 level=0.368

Table.4- Showing significant difference of Span of attention in pretest and post-test after online classes using A-statistics:

S.	Intervention	N	Σm = sum of the differences (pre and post-test)	(ΣD2sum of the differences squared	t-value	Significance
1	Pre assessment scores (pretest)	40	24	908	1.57	NSNot significant
2	Post assessment scores (post-test)					

df=40-1=39　　　　**A-statistics** value on .05 level=0.368

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