



# INCORPORATING BLENDED LEARNING FOR DEVELOPMENT OF HIGHER ORDER THINKING SKILL IN SECONDARY STUDENTS

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**Abstract:** The present study investigates the impact of blended learning on the development of higher order thinking skills in secondary students. The sample consists of 262 students belonging to two different schools of Siwan. Self constructed and validated blended lesson plans and Test for higher mental ability in science (THMAS) developed by Dr. D.N. Sansanwal and Dr. Anuradha Joshi have been used for the experimentation and collection of data. The result revealed that there is a significant difference in the mean gain scores of higher order thinking skills in science between the students of experimental group and control group also differences were observed between girls and boys of secondary classes in their development of higher order thinking skills in science and overall differences were also observed in between class IX and class X secondary students studying through blended learning.

**Key words :** Blended learning, Higher order thinking skills

## INTRODUCTION

Learning is a process that enhances one's capacity for comprehension, reasoning, judgment and makes it possible to find novel ideas and concepts. Education offers pupils the tools and chances to develop a variety of thinking skills. The education and training sector has aggressively implemented tasks and solutions to strengthen support management, teaching, learning, assessment, and the application of ICT in the context of the quickly increasing scientific and technical education enabling learners to become divergent. These revolutionary, dynamic teaching techniques help students become more capable of conducting self-research and identifying their own learning needs, thinking critically, participating actively in their education, taking greater initiative in various contexts, and honing their problem-solving abilities leading towards advanced thinking capacities and one of such technique is blended learning.

## Blended Learning

Teachers when carry out learning that combines conventional learning with online learning, known as blended learning. This is considered the most popular and successful method of learning because of its ability to facilitate ongoing learning as it promotes student centric pattern of learning which encourages self leaning and flexibility. It enables the teachers that they can share and preserve content making it accessible from any location which provides chances for educators and learners to use a variety of ICT tools and apps shaping teaching learning process.

In order to create a generation that is prepared for the twenty-first century, teachers are essential to the effective implementation of HOTSs in schools. It is vital to establish an atmosphere that allows pupils to develop critical thinking abilities and it is education that offers opportunity and means for students to improve their critical thought processes.

Advance thinking skill is one of the essential skills of the 21st century and is recognized as an essential aspect of learning. In line with the advancement in the 21st century, teaching and learning has also been transformed from the traditional method to blended learning, a combination of face-to-face teaching strategy with online technology. This strategy is the most current digital pedagogical method in the field of education which can contribute to meaningful learning. Blended learning is recognized as an effective learning paradigm for enhancing learners' twenty-first-century skills.

A critical thinker is able to thoroughly assess information and arrive at the right conclusions or apply different approaches to challenges. Learners' activities of exploration and collaboration with others to reading, asking, listening and interacting are the critical processes of learning whereby they become active. The active participation of students ensures in-depth learning. Conventional classrooms have failed to develop these activities, as learners receive knowledge passively. Therefore, an alternative is to change the focus of the classroom by blending face-to-face with online learning modalities. The learners become critical thinkers through a blended learning approach, being able to ask questions, collect information, verify the possible answers, and apply the acquired knowledge to various scenarios. Pedagogy also needs to become more inclusive and sensitive to classroom diversity (NCF 2005). Blended learning engages learners in problem-based and meaningful activities. These activities allow learners to explore, challenge, and learn through dialogue, discussion, argument, and debate. It provides an opportunity for learners to engage in autonomous learning strategies to enable them to solve problems along with their group members. When using blended learning strategies, students receive supplementary information from their teachers in the form of teaching videos, graphics, and deeper reading materials. After in-person instruction concludes, students receive the advanced content in order to allow students to study on their own schedule, wherever they are.

## Higher Order Thinking Skills

Thinking skills are divided into two levels, namely higher order thinking skills (HOTs) and lower order thinking skills (LOTs). Low-level knowledge, or LOTs, is defined as simply needing memorization, retrieval, and comprehension while HOTs start with the application process and continue through creation. A person's ability to think in highly cognitive way is demonstrated by the reasoning behind his actions and the confidence with which he expresses his thoughts. Students' critical thinking abilities must be cultivated in the classroom so that they can apply critical thinking to solve problems.

The ability to think in a critical way requires analyzing and collecting information that is needed for every decision, formulating concepts, reasoning, and problem-solving. This can affect the work environment, such as being easy to solve problems, knowing one's abilities, being open-minded, and being able to communicate well (Sunubi & Bachtiar, 2022).

As a result, students are better equipped to reconstruct knowledge to give it meaning. They are also able to pick and integrate pertinent information, add own understandings, and accumulate significant knowledge and views. Therefore, the ability to think analytically is a component of higher order thinking abilities that allow thinkers to elevate the caliber of their thinking through ownership of the knowledge-generation process. It's like upgrading our thinking capacity to a whole new level. These skills enable us to tackle real-life challenges with confidence and make informed decisions. They also foster curiosity and flexibility, helping us adapt to ever-evolving circumstances.

## **Related Literature**

Yaniawati et al. (2022) aimed to develop a mathematics learning application, namely Android-based mobile learning to increase students' High Order Thinking Skills in the form of a developmental research. They found that students' creative thinking in learning straight-line equations, after receiving m-learning-based learning media, on average, the students increased drastically. The m-learning teaching materials are found effective in the development of divergent thinking among students and positive effect is also seen in the learning motivation of mathematics as a subject. This also concludes that the learning is better because it can be done anywhere, anytime, and is suitable for student characteristics.

Ertikanto et al. (2022) worked on Implementation of Written Assessment Higher Order Thinking Skills in Physical Learning with a Scientific Approach based Blended Learning and found that implementation of a written assessment of higher order thinking skills in physics learning with a scientific approach based on blended learning was developed effectively. The efficiency of the suitability of the learning objectives of Physics through a blended learning- based scientific approach with HOTS written assessment, is very efficient in use. The safety of HOTS written assessments through a blended learning-based scientific approach in physics learning is very meaningful.

Idawat et al. (2022) intended to find the effectiveness of blended learning on HOTS(Higher Order Thinking Skill) for fifth-grade students in science learning. during research, they reported that there is a difference between the HOTS of experimental and control classes, where the average of the experimental group is more than the average of the control group confirming the utility of blended learning over the conventional learning. They also observe that there is difference in learning outcomes between the experimental and control class where experimental class scored higher than the control.

## **SIGNIFICANCE OF THE STUDY**

The world has advanced tremendously in the modern era. These are more important than ever in the fast-paced, constantly-changing world of today. With so much information coming at us from so many different directions, it is crucial to be able to assess and critically examine the veracity and accuracy of what we come across. In such times blended learning is the only saviour. It caters to different learning styles, allowing students to access information at their own pace while receiving valuable guidance from teachers. Furthermore, blended learning promotes independent thinking, critical reasoning, and problem-solving skills by incorporating real-world applications into the curriculum at every level. Students must acquire the skills required to successfully navigate and absorb content in this digital age where knowledge is easily accessible at our fingertips. In this way blended learning provides students with essential knowledge of technology, high level of cognition that will surely be helpful in their future actions, in addition to meeting the needs of today's education system.

## STATEMENT OF THE PROBLEM

### INCORPORATING BLENDED LEARNING FOR DEVELOPMENT OF HIGHER ORDER THINKING SKILLS IN SECONDARY STUDENTS

#### OBJECTIVE OF THE STUDY

1. To study the effect of Blended learning on higher order thinking skills in Science of secondary school students.
2. To study the differential effect of Blended learning on higher order thinking skills in Science of secondary school students on the basis of their gender.
3. To study the differential effect of Blended learning on higher order thinking skills in Science of secondary school students on the basis of their class.

#### HYPOTHESES OF THE STUDY

1. There is significant difference in the mean gain scores of higher mental ability in science of the students of experimental group studying through blended learning and the students of control group studying through traditional method.
2. There is no significant difference in the mean gain scores of higher mental ability in science of the boys and girls of secondary classes studying through blended learning.
3. There is no significant difference in the mean gain scores of higher mental ability in science of class IX and class X secondary students studying through blended learning.

#### METHODOLOGY OF THE STUDY

For this study, Pre test- Post test control group true experimental research design has been used.

**Population and Sample** Population consists of government secondary school students of Siwan district of Bihar.

Sample consists of 262 secondary school students from government secondary schools selected randomly by the researcher. In order to justify the experimental design the researcher has performed one-to-one matching of the subjects to assign the equivalence of the experimental and control group.

#### Tools used in this study

1. Instructional tool: Blended Learning lesson plans in Science, developed by the researcher (for class IX& X).
2. Standardized tool on HOTS: Test of higher Mental Ability in Science (THMAS) developed by D.N. Sansanwal and Anuradha Joshi (2012).

#### STATISTICAL TREATMENT

The data were collected and analysed by using mean, standard deviation and t ratio test.

## RESULT AND DISCUSSION

**H1 There is significant difference in the mean gain scores of higher mental ability in science of the students of experimental group studying through blended learning and the students of control group studying through traditional method.**

For testing this hypothesis scores of higher mental ability in Science of students of experimental and control group are compared and the results has been presented in table no. 01.

Table: 01: t- ratio test findings on gain score in higher mental ability in science of experimental and control group

Groups	N	Mean gain score	SD	Df	t – ratio value	P- value	Remarks	Effect size
Experimental	131	10.89	3.70	260	5.177**	0.000	Significant	0.639
Control	131	8.17	4.74					

The obtained data reports t- ratio test value 5.177 at  $p=0.000$ , signifying the differences in the mean scores of both the groups. So, the hypothesis is accepted and it can be said that there is a significant difference in the mean gain scores of higher mental ability in science between the students of experimental group and control group.

**H2 There is no significant difference in the mean gain scores of higher mental ability in science of the boys and girls of secondary classes studying through blended learning.**

For testing the above hypothesis scores of higher mental ability in Science of girls and boys of experimental group are collected and summarised in table 02 and t-test results have been also presented.

Table: 02 : t- ratio test findings on gain score in higher mental ability in science of boys and girls of experimental group

Groups	N	Mean gain score	SD	df	t – ratio value	P- value	Remarks	Effect size
Experimental Boys	65	12.66	3.85	129	6.178*	0.000	Significant	1.075
Experimental Girls	66	9.14	2.57					

From the observation of the above table it can be seen that the t- ratio value is 6.178 (at  $p=0.000$ ). So, the above framed hypothesis is rejected and it is concluded that there exists a significant difference in the mean gain scores of higher mental ability in science between the girls and boys of secondary classes studying through blended learning. The high effect size 1.075 is confirming the efficacy of treatment.

### H3 There is no significant difference in the mean gain scores of higher mental ability in science of class IX and class X secondary students studying through blended learning.

In order to check this hypothesis the mean gain score of higher mental ability in science of experimental class IX and class X is observed and compared through performing t-ratio test and arranged in table 03.

Table: 03: t- ratio test findings on gain score in higher mental ability in science of class IX and class X of experimental group

Groups	N	Mean gain score	SD	df	t – ratio value	P- value	Remarks	Effect size
Experimental Class IX	68	11.98	3.59	129	3.673	0.000	Significant	0.643
Experimental Class X	63	9.71	3.47					

The above table indicates high score of t- test (3.673) at 0.05 level of significance. Thus the null hypotheses framed cannot be accepted. Hence concluding that there is a significant difference in the mean gain scores of higher mental ability in science between class IX and class X secondary students studying through blended learning. The large value of effect size indicates the efficiency of the experimental intervention.

## FINDING AND CONCLUSION

There is significant difference between the mean gain score of higher mental ability in science of experimental group studying through blended learning and control group studying through traditional method. This result indicates the fruitfulness of blended learning intervention in increasing higher order thinking skills of students of the experimental group. Further there is significant difference between the mean gain scores of higher mental ability in science of boys and girls of secondary classes studying through blended learning. The findings of Shivam & Mohalik (2022) reported the same where the boys achieved higher than the girls. Lastly it is also found that there is a significant difference in mean gain scores of higher mental ability in science of class IX and X secondary school students studying through blended learning. The students of class IX scored better than the class X students. This result is in tune with the work of Suriansyah, & Augusta(2021).

It can be thus clearly reflected from this study that the blended learning is an efficient method of teaching and learning and found to be effective in developing higher order thinking skills among the students. Thus it can be concluded that the blended lesson incorporated in the class through science lessons have been effective for students learning performance and better their science process skills or higher mental abilities in science and can lead towards effective teaching learning practices in the age of ICT integrated learning.

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