



ACHIEVING NEP 2020 GOALS: REFORMING INDIA'S EXAMINATION AND EVALUATION SYSTEM WITH A COGNITIVE LOAD THEORY FRAMEWORK

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Paper Received On: 21 AUG 2026

Peer Reviewed On: 25 SEPT 2026

Published On: 01 OCT 2026

Abstract

The Cognitive pressure of India's learning and evaluation system overloads students, hampering the learning process and leading to low achievement. In some cases, the immense stress and anxiety of exams and the evaluation system lead to suicide as well. The National Education Policy 2020 (NEP 2020) has attempted to address this challenge by reforming the country's examination and evaluation system, which relies mostly on standardized board exams and competitive entrance tests based on rote memorization and theoretical knowledge. NEP 2020 has a goal of shifting the current examination system into a more holistic, flexible, and competency-based 360-degree approach to assessment that leads to a learner-centred education system. According to Cognitive Load Theory (CLT), to obtain learning efficiency and effectiveness, it is mandatory to optimize the three kinds of loads: extrinsic, intrinsic, and germane cognitive load experienced by students. CLT is a cognitive psychology theory that emphasizes how instructional systems can reduce the learning and evaluation load of the learners. This paper has highlighted the key challenges of the existing examination system and the need for a CLT framework in achieving the NEP 2020 goals in reforming the current examination and evaluation system, as well as provided insights to all the stakeholders associated with the education system in optimizing the existing challenges, thus creating a conducive learning environment and providing meaningful learning experiences. The CLT framework has tremendous potential to smoothen the path of achieving the NEP 2020 goals by optimizing students' stress and anxiety.

Keywords: NEP 2020, Cognitive load, Learning experience, Holistic assessment, Examination and Evaluation system

Introduction

India reported 1, 70,924 suicides in 2022, out of which 7.6% were by students, and 2248 suicide deaths were attributed to exam failure (NCRB,2022). A system of education that emphasizes scoring marks, one-point evaluation, and pressure on teachers from administration and parents to obtain a 100% pass percentage, and lack of career guidance and counselling in schools are contributing factors to this (Vijayakumar, 2024). This alarming situation of losing dynamic

young minds in exam distress has put a huge question mark on the examination and education system of India. Indian education system is mostly rooted in a theoretical base and emphasizes memorizing concepts. Over time, the whole education system turned into a competitive phenomenon where the unique strengths and limitations of any student got depressed (George and George, 2023). The affective and psychomotor development got pushed away, highlighting the focus only on cognitive capacity development and competition (Yashmin, Farook and Shah, 2023). The private coaching institutions and parents' expectations added fuel to the cognitive competition race. No place for individual interest and skills was found in the examination and evaluation system (Bansal, 2015). Beginning from nursery to university in every stage the priority has been given to score the top in class exams or any state-level exams. Each student tries their best to run in the race so that the highest rank will be occupied by them (Jain, 2020). Students learn how to celebrate success, but no one learns how to cope with academic failures. Looking into the seriousness of the Whole education system, where dynamic young lives are being lost at the cost of marks, the National Education Policy-2020 has tried to bring reformation in the current examination and evaluation system of India. Where the major shift from cognitive competition to inclusive and 360-degree evaluation is aimed at keeping 21st-century skills in mind (Madheswari, Mageswari and Niranjana, 2021). NEP 2020 has a high vision towards meeting the global demand, thus reducing the pressure of the standardized examination and evaluation system of India through the introduction of a more comprehensive and student-centered examination system. This fosters the yielding of effective learning outcomes and provides a platform for students to enjoy the learning and evaluation system by reducing the pressure on the cognitive domain of the student mass (Mookkiah and Kumar, 2023). This cognitive pressure is addressed by a theory called Cognitive Load Theory given by John Sweller. According to this particular theory, students experience 3 types of cognitive loads: Intrinsic load, extrinsic load and Germane cognitive load during the learning process, and this hampers the ultimate learning outcome thus creating stress and anxiety for facing the examination and evaluation if any (Kalyuga, 2011). According to John Sweller, humans have a limited working memory capacity, which limits the amount of information to be processed in the brain. By optimizing these loads, the education system can be enhanced, thus leading to the creation of a holistic environment for the students (Sweller, Merriënboer, Paas, 2019). Awareness of the cognitive load and its sources allows necessary steps to be taken to make students stress-free during the learning and assessment process.

CLT has several strategies to optimize the whole teaching-learning process and simultaneously keep the mental well-being of students healthy. This study aims to explore how the alignment of the cognitive load theory principles with NEP 2020 goals can nurture students' learning outcomes and achieve the national goals. It has highlighted the potential of the CLT framework to achieve the NEP 2020 goals in transferring the current examination and evaluation system of the country.

Current examination and evaluation system of India

The examination and evaluation system is an integral part of the formal learning environment. Though both examination and evaluation aim at checking out the learning attainment level of learners, the examination system basically focuses on a standardized test, and Evaluation is more comprehensive in nature, providing value judgment over the scores obtained in examination (Hauer, Chou, Souza, Henry, Loeser, Burke, Mayfield and Sullivan, 2010).

Examination is segmental in nature, whereas evaluation provides a comprehensive view of judging the learning outcome. The examination and evaluation system provides direction to all educational stakeholders (Ding, 2017). From ancient times, India has adopted the examination and evaluation system as an integral part of showcasing individual learning attainment. In the gurukul system, students used to appear for the final examination at the end of their education and training. Gradually, many reforms came in the Indian education system. In pre- and post-independence also, many reforms took place. As English became the screening medium to get any job or educational admission, the holistic aspect of assessment turned into academic achievement and evaluation. Quantitative marks, grades, and value judgements, along with standardized tests, came into practice. The written and oral methods of standardized testing became the medium to measure the learning achievement of learners over a specific period of time. Even after many reforms, there are still many challenges in the Indian examination system. At present, the Indian examination system is subjective by nature, with poor content accuracy and overemphasis on memorization (Sarkar and Rathee, 2023). This enables a stressful environment for all the students enrolled in the formal learning system of India, which emphasizes more on testing memory rather than understanding, analysis, and application (Kumar and Behera, 2021). The curriculum and syllabus are more focused on bookish content rather than skills and experiences. In many places, unethical practices like cheating are practiced. This puts a question mark on the integrity of the examination system.

NEP 2020 AND ITS VISION

Keeping the global demands of society in focus, the Indian government has formulated a new policy to reform the current education system into a more comprehensive, multidisciplinary, and flexible one to reduce the academic stress on students and provide a platform to foster the 21st-century skills needed. This policy provides a roadmap for revamping the structure and function of the Indian Education system that includes all levels of education from elementary to higher education. The formation of the policy started in 2015.

A consultation committee was formed in 2015 (under former cabinet minister T.S.R Subramaniam)

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The report was given by the committee in 2017

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A draft was formed on this report in 2019 (Team was led by Dr. Krishnaswami Kasturirangan)

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Draft released for public consultation in 2019

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After consultation, the final policy was approved by the cabinet in 2020

The vision of NEP 2020 is:

“National Education Policy 2020 envisions an India-centric education system that contributes directly to transforming our nation sustainably into an equitable and vibrant knowledge society by providing high-quality education to all.”

Education is a complex system that consists of many parts functioning together to achieve the common goal of a country as per the global demands. The examination system is an inseparable part of this. It provides direction and motivation to all the stakeholders to successfully acquire the learning objectives. So, when NEP 2020 aims at revamping the education system, it has to

work on examinations also. Some key reforms in the examination system of India led by NEP 2020 are presented below in Table 1.

Table 1: Transformation of the examination system

From the old examination system	To an examination system based on NEP 2020
High-stakes exam	Continuous assessment approach
Focusing on theoretical base and rote memorization	Practical application and understanding
Examining cognitive capacity of learners	Holistic 360-degree assessment
Limited assessment method	Variety of assessment methods with real-world projects and portfolios
From year-end exams	Semester system and fragmented exams
Standardized exams	Flexible testing
Fixed subject choice	Flexible subject choice
Board exams in 10 th and 12 th	Census exam in classes 3, 5, and 8
Knowledge based	Competency based
Separate courses and exams for vocational subjects	Integrating vocational courses in the regular classroom and assessment
Cognitive skill oriented	Life skill oriented
Examination and evaluation system	Assessment system
Subject centric	Student centric

COGNITIVE LOAD THEORY

Learning and problem-solving challenges are dealt with by a theory known as Cognitive Load Theory (CLT) (Sweller,1994). Cognitive load refers to the amount of information that working memory holds at a time (Sweller,1988). As the usage of memory on computers becomes high, the system functions slowly. Likewise, when the load on human cognition becomes high, the efficiency of learning decreases (Fuhrman,2017).

Cognitive load theory (CLT) originated in educational psychology and is related to human cognitive architecture (Leppink,2017). By understanding the models for memory organization, forms of knowledge representation, mechanisms of problem solving, and the nature of human expertise, the cognitive architecture can be understood (Leppink and Hanham, 2018). Human memory refers to an abstract concept that deals with retaining and recalling information over time. It consists of a three-phase process. That is encoding, storage, and retrieval, just like a computer (Leppink and Hanham, 2018; Zlotnik and Vansintjan, 2019; Fietta and Fietta, 2011). Human memory is divided into sensory memory, working memory, short-term memory, and long-term memory (Zlotnik and Vansintjan, 2019; Atkinson and Shiffrin,1968). The processing of memory begins with sensory memory. The working memory then manipulates the information gained. After this, the information goes to short-term memory, where the existence period is less than 30 seconds, and lastly to long-term memory, where the information is stored permanently as the duration is lifetime (Sweller,1988; Baddeley, 2012; Cowan, 2008; Atkinson and Shiffrin,1968). Working memory is not entirely separate from short-term memory (D'Esposito, Detre, Alsop, Shin, Atlas and Grossman,1995; Cowan,2008). After

sensory memory, working memory is the leading factor in the learning process of an individual because it is related to successful task performance and execution. It is a multi-component concept of multi component (Baddeley and Hitch,1974; Chai,2018; Baars and Franklin,2003). Working memory deals with important cognitive functions like reasoning, language, and comprehension. Short-term memory holds a small amount of information for a short period of time, whereas working memory is a multi-component system and can both retain and process information (McLeod, 2023). Also Manipulates with complex cognitive tasks (Baddeley and Hitch,1974). Working memory is related to intelligence, information processing, execution, comprehension, problem solving, and learning (Cowan, 2013). Though working memory plays a key role in human learning, it has very limited capacity (Buschman, 2021). For our everyday learning and academic performance, we need a well-functioning working memory (Owens, Stevenson, Norgate and Hadwin,2008; Nutley and Söderqvist, 2017). Working memory is responsible for the manipulation of incoming sensory information by dealing with the stored information in long-term memory (Funahashi, 2013). As the capacity of working memory is limited, it gets loaded when simultaneously many tasks are assigned to an individual or the working memory fails to associate the novel task with the data stored in long-term memory (Chen, Kao, Wang and Lai,2022). Thus, causing ineffective learning. Because the cognitive load occupies much of the working memory, leaving very little or no resources to deal with new tasks or learning (Sweller, Merriënboer and Paas, 2019; Baddeley,2006).

TYPES OF COGNITIVE LOAD

CLT reflects that there are three types of cognitive load: intrinsic, extraneous, and germane load (Sweller, 1994). These 3 are different from each other in their characteristics and the way information gets processed.

INTRINSIC COGNITIVE LOAD

Intrinsic cognitive load is characterized by the element of interactivity (Sweller, 1994). When most schemas/materials to be learned simultaneously are interactive in nature, then intrinsic cognitive load happens (Sweller, 1994; Merrienboer and Ayers,2005). This load is due to the inherent complexity of the learning tasks and depends on two factors such as the element of interactivity and the learner's prior knowledge (Merrienboer and Ayers,2005). The capacity of working memory is such that it can simultaneously process a limited number of chunks. When the simultaneous processing of information exceeds that limited number, this leads to overloading the working memory and thus inhibiting the learning process (Sweller,1994). Learners' prior knowledge is a factor in deciding the load on working memory, as dealing with new information depends on the information available in the long-term memory (Leppink, Paas, Gog, Vleuten, Merriënboera,2014). High-prior knowledge leads to the construction of larger meaningful information chunks. Thus, cognitive load is reduced. Hence, the definition of intrinsic load can be stated more precisely: The complexity of the learning content is relative to a learner's level of prior knowledge (Renkl, Atkinson,2003). The load due to these inherent learning materials and tasks can't be reduced, but the load can be managed with effective teaching and learning strategies. For example, novice learners face difficulties and experience load due to the mathematical formulas for calculating force on a body, $F=Ma$. There is no way to eradicate the formula or avoid doing calculations. But cognitive schemas related to each symbol mentioned in the formula can be developed, and the steps of solving a problem can be done one by one.

EXTRANEOUS COGNITIVE LOAD

It is caused by the unnecessary instructions provided to the learner during the teaching-learning process. This extra information doesn't lead to learning; instead, it consumes the working memory space, thus leaving no or very little space for the processing of required information (Renkl and Atkinson, 2003., Sweller and Chandler, 1994). Use of weak problem-solving methods (e.g., working backward from a goal using means-ends analysis), integrating information sources that are distributed in place or time, searching for information that is needed to complete a learning task in instructional materials, etc leads to extraneous load on learners (Merrienboer and Ayre, 2005). For example, in the above-mentioned example of calculating the force on an object, if there are unnecessary diagrams with written text, then the learner expends their working memory in assimilating the required information from the images and written text, thus leaving almost no/very little space in working memory to solve the problem. This leads to extraneous cognitive load. This can be reduced with proper representation of information and instructional designs.

GERMANE COGNITIVE LOAD

Germane load refers to demands placed on working memory capacity that are imposed by mental activities that contribute directly to learning (Renkl and Atkinson, 2003). It is the load related to processes that contribute to the construction and automation of schemas (Paas, Tuovinen, Tabbers and Gerven, 2003). This type of load arises from relating relevant information from long-term memory or context to the new information elements (Sweller, 2010). Germane cognitive load is now considered as germane resources that reflect the amount of working memory capacity dedicated to learning (Korbach, Brünken and Park, 2017). For example, in the previously stated problem of calculating the mass of an object when the learner tries to solve variable problems related to the same formula, it leads to cognitive load, but it constructs the schema properly in long-term memory and transfers the learning. It may be necessary to increase learners' motivation and encourage them to employ learning processes that yield germane cognitive load (Merrienboer and Ayre, 2005).

For easier learning, the intrinsic cognitive load on the learner must be assessed by the facilitator, the extraneous and Germane cognitive load need to be adjusted (Weslake, 2019)



Fig.1: TYPES OF COGNITIVE LOAD Davis, M.E. (2015). Types of cognitive load. https://www.researchgate.net/publication/276299704_Bringing_Imagination_Back_to_the_Classroom_A_Model_for_Creative_Arts_in_Economics

CLT Effects and its alignment with NEP 2020 goals with respect to assessment

CLT stands on the principle that effective learning happens when the learner gets the acquisition of new concepts and ideas in the form of schema in long-term memory. It is attained when the overall cognitive load is optimised. There are certain effects of Cognitive Load Theory that can be used in minimising the extraneous cognitive load, managing intrinsic cognitive load, and enhancing the germane cognitive load. From planning to assessment, the whole learning system can be described through a cognitive load framework that is aligned with NEP 2020 goals in reforming the existing examination system. According to John Sweller in 2016, the effects generated by CLT are as follows.

Table 2: The effects and functions of Cognitive Load Theory

Name of the effects	Functions
The worked example effect	Worked examples reduce the working memory load and use the borrowing and organizing principle instead of random attempts in solving problems.
The problem completion effect	Instead of providing the complete solution of any problem, here the partial solution is being provided
The split-attention effect	This occurs when learners need to split their attention when they have to receive information from multiple sources. So instead of providing separate texts or images in the same modality, the mental integration of these enhances working memory capacity.
The modality effect	Information reaches learners' memory in a better way when presented in mixed modes(visual+audio) rather than a single mode.
The redundancy effect	As repetition of the same information occurs, learning is hampered. So, the unnecessary sources need to be reduced.
The expertise reversal effect	This is caused by the interaction between the learners' expertise level and the type of instruction provided accordingly. Ex-Worked example effect is useful for novice learners but redundant for experienced ones.
The guidance fading effect	As the learners' expertise level increases, the support and guidance must be faded away.
The transient information effect	This effect occurs when the same written information is presented verbally, thus leading to hamper learning.
The imagination effect	Imagining or rehearsing the previously learned concepts mentally leads to

	transferring the information to long-term memory.
The element interactivity effect	The inherent complexity of the learning materials leads to cognitive load.
The isolated elements effect	If the number of elements presented is high, then the isolation of elements leads to better understanding and lessens the cognitive load.
The goal-free effect	A specific goal increases the load on learners to opt for different modes, whereas a task without any specific predefined goal is beneficial to learners.
Collective working memory effect	Collaborative learning is beneficial in solving a complex problem, as many working memories get involved. If all the members have a similar level of knowledge, it is ineffective.

There are mainly 3 phases of any formal education setting. Before assessment, during assessment, and after assessment. The cognitive load of students is associated with all these phases or any single one, which leads to the development of stress and anxiety.

Before assessment:

Here in this phase, the teachers try to make the learners ready for learning and assessment through various instructional strategies. Effective instructional designs enhance the learning process, and effectiveness in learning comes when the overall cognitive load is optimized. Where the extraneous load needs to be reduced, intrinsic load needs to be optimized, and germane load needs to be enhanced.

Alignment with NEP 2020 goals: As NEP 2020 aims at providing inclusive, effective, and lifelong learning, understanding the cognitive load on students and its sources helps the stakeholders to design and transact the curriculum accordingly. Appropriate use of technology is used to provide proper assistance and support to students with any kind of learning difficulties. Diverse learning needs can be catered to, and appropriate professional training can also be provided. Proper care must be taken to remove the distracting elements of learning and relate the new information to the preexisting schemas successfully. Through chunking the information, using multimodal presentation in appropriate situations, providing needful scaffolding, and allowing learners to learn at their own pace with appropriate instructional strategies, CLT provides a platform where the students can be well prepared for facing the assessment processes.

During Assessment:

Students feel stressed about appearing for standardized tests. Many students fail to understand the instructions and questions to be answered. High-stakes examinations overload the students as they demand that students remember the dense content of every subject, creating anxiety about getting low grades in comparison to fellow mates or failing in class exams or entrance

tests. The limited time period to answer the questions, lack of proper preparation, and inappropriate format of the questionnaire cause stress on students' minds.

Alignment with NEP 2020 goals: The focus is not only on academics but on a comprehensive nature of learning outcomes. Hence, CLT provides scope for assessing critical thinking, creativity, and problem-solving skills through real-world projects, collaborative learning tasks, and 360-degree learning acquisition skills. Instead of conducting a standardized content-based question set that is subjective and theoretical in nature, CLT emphasizes framing application-based questions that can assess the understanding level of students. Formative assessments at regular intervals reduce the cognitive pressure on students' minds. The questions and instructions in the exam must be clear and concise in nature, without any unnecessary diagrams and text that prevent learners from taking extra load and focus on writing the answers.

After Assessment:

During this phase, feedback is provided to learners about their achievement level. The mark/scoring system or fear of getting failure in an exam overwhelms students, thus increasing stress and anxiety about the exam result.

Alignment with NEP 2020: CLT reduces this exam pressure and fear by introducing formative assessments at regular intervals that assess the performance of students in a flexible format. This eradicates the standardized test exam fear. The analysis of these assessment results enables teachers to practice the data-informed teaching practices mentioned in NEP. Through practicing an equitable remediation process, novice and struggling learners get the appropriate scope to be assessed for their unique abilities. Thus, the NEP goal of inclusive education can be achieved. Following reflective assessment strategies, the learners can be aware of their own strengths and weaknesses without getting overloaded.

Strategies to reform examination system with a cognitive load theory framework

Achieving NEP 2020 goals through the CLT framework leads to creating a holistic learning environment with productive results. The strategies can be summarised as follows

- I. Varying the assessment process instead of a standardized examination system.
- II. Considering individual learning styles and differences in curriculum framing, teaching, and assessment practices, thus providing an equitable platform for each learner to showcase their strengths instead of competing against each other for scoring marks.
- III. Adoption of open-book assessment strategies to minimise rote memorization and enhance understanding of concepts.
- IV. Instead of following a high-stakes examination system, break the assessment in several forms with immediate feedback facilities that allow learners to enjoy the learning and assessment process rather than getting overwhelmed.
- V. Adopting real-world project methods as an assessment process to foster collaborative learning, critical thinking skills, and teamwork skills.
- VI. Optimized use of technology, such as interactive tools and simulations, can be used to engage learners in a more active form, thus reducing the learning burden on students.
- VII. Use of multimodal modes in teaching-learning practices rather than a single method while delivering instruction.
- VIII. Consideration of all the effects of cognitive load theory while designing instruction and assessment.

Based on Theories by Van Merrienboer and Sweller, the cognitive load management strategies are given as(Howie, Dharanikota, Gunn, Ambler, Dias, Wigmore, Skipworth, Yule,2022):

Table 3: Managing intrinsic load

Strategy	Description
Simple-To complex	Gradually proceed from low- to high-complexity tasks
Low-to-high fidelity	Proceed from low- to high-fidelity environments
Isolated elements	Presentation of only some task elements initially to help learners combine information into “chunks” (part-task training.

Table 4: Decreasing Extraneous Load

Strategy	Description
Worked example principle	Provide learners with worked solutions
Completion principle	Ask learners to complete a partially completed task (part-task training)
Goal-free principle	Use goal-free tasks that provide learners with a non-specific goal.
Avoid split-attention	Consolidate multiple sources of information into a unified format, removing the need to integrate information from different sources
Avoid redundancy	Avoid providing information that is not required for learning
Modality principle	Use of appropriate multi-modal sources of information to avoid overload

Table 5: Optimizing Germane Load

Strategy	Description
Variability principle	Illustrate tasks or problems using multiple examples
Contextual interference principle	Alternate tasks or problems to avoid learners focusing on only one task before moving onto the next.
Self-explanation principle	Encourage trainees to make their thinking explicit
Activation of prior knowledge	Creation of links between existing knowledge and experience with new knowledge

Though Cognitive Load Theory basically focuses on classroom instructional strategies, all these strategies may be used in the assessment process and while framing questions. Thus, a conducive learning environment can be created where students enjoy the learning and assessment procedures, celebrating their strengths and limitations instead of getting overwhelmed with exam fear and pressure. The policy and curriculum framers must frame their documents keeping these points in mind. So that it will be supportive for the teacher community to mould their instruction as per the situation's demands.

Probable challenges in implementing the above strategies

- I. Lack of teacher awareness and training regarding Cognitive Load Theory principles and their application.
- II. Insufficiency of resources like human resources, time and financial support, and technological constraints.
- III. Rigid mindset of stakeholders to bring about reform in current practices.
- IV. The reliability of tests may be questionable across the state/country.
- V. Lack of coordination among different stakeholders may hinder the successful implementation of the above strategies.
- VI. Large classroom size may hinder providing personal attention and equitable assessment practices within a specific time limit.
- VII. Extra burden on teachers with non-academic work makes them overloaded with physical and mental stress with time constraints; hence they run to complete the

Conclusion

Learning gets hampered when any component of education gets disturbed. As seen in the current assessment practices, NEP 2020 has aimed at bringing a root-to-top reformation in the whole system; the CLT provides a comprehensive framework that guides the curriculum developers, policy framers, teachers, and students to manage the excess stress level of the

student community. Optimizing all the cognitive loads makes the students free from academic anxiety and frustration. Thus, creating a holistic, enjoyable educational system. The awareness and identification of cognitive loads of students by the stakeholders leads to enhancement in learning and retention. Consideration of CLT effects while planning the whole educational process, starting from planning to assessment, smoothen the path of achieving NEP 2020 goals by reforming the current stressful learning environment. Nothing is possible to do alone. Hence, the joint efforts of all stakeholders and the community are essential to successfully achieve the NEP2020 goals with a cognitive load theory framework.

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