Online Learning and Its Influence on Learning Outcomes

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Abstract

Purpose – The study investigates the impact of online course design elements on student learning outcomes to enhance and optimize online education.

Design/methodology/approach – A quantitative approach using a cross-sectional study and data collected from 410 online learning students from various parts of India through an online survey. A snowball sampling is adopted to reach the data points, and structural equation modelling is used to analyze the relationship using Smart PLS (partial least squares).

Findings – The study found that course design elements positively influence student learning outcomes, with content delivery, content design, and assessment playing crucial mediating points.

Practical Implications – The proposed model provides actionable insights for educators and instructional designers to create more effective and engaging online courses, thereby improving student learning outcomes.

Social Implications – The study contributes to the broader understanding of optimizing online education, potentially reducing educational disparities, especially for remote learners.

Originality/value – This study is unique as it investigates the relationships between course information, content delivery, content design, and assessment addressing how they impact student learning outcomes.

Keywords – Course Information, Content Design, Content Delivery, Assessment, Learning Outcome.

Paper Type – Research paper

1. Introduction

Online learning has become a crucial part of modern education, transforming traditional methods of teaching and learning (Allen & Seaman, 2017). Learning happens through digital platforms, allowing students to learn without being physically present in a classroom and this approach has gained popularity due to its flexibility and accessibility, enabling students to learn at their own pace, and catering to different learning styles and schedules (Bates, 2005). This flexibility is especially important in a global context, where geographical limitations, work commitments, or health issues may hinder access to traditional education (Halim et al., 2020).

As the reliance on online education grows, the importance of effective course design becomes evident. (Anderson & Dron, 2011). A well-designed course ensures a structured framework that aligns educational objectives, instructional materials, and assessments and this design with clear course objectives is crucial for student engagement and comprehension (Thompson & Martinez, 2018). When students are given clear expectations, they are more likely to engage actively in their learning, thereby enhancing their overall academic experience (Schunk, D. H., Pintrich, P. R., & Meece, J. L, 2008).

Moreover, the online course design must also address challenges such as lack of motivation among students, leading to higher dropout rates compared to traditional settings (Aragon & Johnson, 2008). Factors like isolation, limited interaction, and self-regulation difficulties contribute to decreased motivation (Lee, 2014). To address these issues, course designers are encouraged to incorporate interactive elements such as discussion forums, group projects, and peer assessments to foster community and improve engagement (Smith & Brown, 2017).

In addition to engaging course content, the role of multimedia tools also plays a significant role in online education (Mayer, 2017). When integrated effectively, they can enhance learning by helping diverse preferences and improving content retention (Patel & Kaur, 2021). However, incorporation of these tools must be done thoughtfully; if not aligned with learning objectives, they can distract rather than support student learning. (Patel & Kaur, 2021).

Assessment strategies are a critical component of effective course design (Black & Wiliam, 2009). Assessments not only measure student understanding but also provide essential feedback that can inform instructional practices and guide student improvement (Hattie & Timperley H, 2007). Formative assessments have proven beneficial in online settings as they offer continuous feedback, supporting student self-regulation (Garcia & Lee, 2021). The unique nature of online environments requires careful consideration of how assessments are implemented to ensure they are both effective and equitable. Research indicates that while peer evaluations can promote critical thinking and collaborative learning, best practices need to be established for their implementation to maximize effectiveness (Smith & Brown, 2019).

The COVID-19 pandemic has further accelerated the shift toward online education, highlighting both the potential and the challenges of this mode of learning. The global transition to remote learning during the pandemic has also highlighted the importance of quality online education and equitable access to resources (Bao, 2020). In many developing countries such as India, the transition has revealed significant disparities in access to technology and educational resources, raising questions about how to design student populations (Evans et al., 2013; Jena, 2020). Addressing these disparities is essential for ensuring that all learners have access to quality educational experiences, regardless of their circumstances.

This paper explores how the design of online courses can impact student engagement and learning outcomes. By examining key elements such as clear course information, content delivery, content design and strategic assessments, it highlights best practices that can make online learning more effective and inclusive. The findings will reveal how intentional course design can enhance engagement while addressing common barriers that hinder success in online education. In the end, this research aims to inspire actionable changes that improve the quality of online education for learners worldwide.

The following paper is divided into six parts: Section 1 contains the introduction, Section 2 reviews the literature and theoretical background, Section 3 provides the hypothesis formation, Section 4 discusses the methodology, Section 5 provides findings, Section 6 deals with the results and discussion, and Section 7 contains the limitations and conclusion.

2. Theoretical background and literature review

2.1 Theoretical background

The current study finds its theoretical roots in several key theoretical frameworks to understand how various aspects of online learning — course information, content design, content delivery, and assessment impact student learning outcomes. The Activity Theory proposed by Alexei Leontiev (1970) is central to this research. Activity Theory offers a comprehensive lens for examining the interactions among elements within the online learning environment.

Course Information and Comprehensiveness: We draw on Schema Theory (Bartlett, 1932) to investigate the role of course information, focusing on its comprehensiveness, clarity, and accessibility. Bartlett's Schema Theory posits that well-organized course information supports schema development, which activates prior knowledge (Ausubel, 1968) and directs learning activities (Paris & Winn, 1998). This organization reduces cognitive load (Chandler & Sweller, 1989) and enhances understanding. Effective course information is therefore essential for optimizing learning outcomes in online settings (Smith J & Johnson A, 2019; Chen L & Wang Q, 2020).

Content Delivery and Interactive Elements: We apply Dual Coding Theory (Paivio, 1986) to examine how content delivery, incorporating multimedia and logical sequencing, impacts learning. Paivio's theory highlights the benefits of using distinct processing channels for language and images. Engaging and interactive content delivery methods (Liu S & Liu D, 2019; Johnson R & Smith K, 2022) facilitate active processing and cater to diverse learners (Zhang H & Chen G, 2021; Wang Y & Lee C, 2018), thereby improving learning outcomes through dual coding.

Content Design and Cognitive Load: John Sweller's Cognitive Load Theory (1980) guides our understanding of how content design affects cognitive load. According to Sweller(1980), the organization of content impacts the cognitive load imposed on learners. Poorly designed courses with fragmented or inaccurate content increase cognitive load, hindering comprehension and retention. Conversely, well-structured content reduces cognitive load, allowing students to focus on understanding and applying knowledge, which enhances performance in assessments.

Assessment and Formative Assessment: We incorporate the Formative Assessment Theory (Black & William, 1998) to explore how assessments can guide learning. Formative assessments (Yang L & Li Q, 2020; Kim S & Park H, 2021) offer feedback and revision opportunities, promoting deeper understanding through metacognitive processes and motivating learners. This iterative assessment process supports active learning and self-regulation, leading to improved learning outcomes.

By integrating these theoretical perspectives, our study utilizes Activity Theory (Leontiev, 1970) as the overarching framework to examine the interactions between course information, content design, content delivery, and assessment and their collective impact on learning outcomes. Activity Theory elucidates the interplay between various components of the online learning environment, offering a comprehensive framework for understanding these interactions. At the centre of this framework is the **Subject**, represented by the learner. Individual characteristics, such as self-regulated learning skills influence how learners interact with the online environment as a mediating tool (Zhang M & Wang L, 2019).

The **Object** refers to the learning goals. These objectives are clarified and communicated through well-structured course information, which ensures alignment between instructor and

learner understanding (Smith J & Johnson A, 2019; Chen L & Wang Q, 2020). By providing clear learning goals, the educational process becomes more targeted and efficient.

The Mediating Tool is the online learning environment itself, which consists of several key components that help the learning process. Course Information plays an important role by enhancing learner understanding and engagement through clear and organized presentation (Chen L & Wang Q, 2020). Content Design is characterized by intentional and thoughtful planning, supports knowledge acquisition and contributes to improved learning outcomes (Liu S & Liu D, 2019; Johnson R & Smith K, 2022). Similarly, Content Delivery employs interactive and diverse methods, which helps in better engagement and comprehension of material (Wang Y & Lee C, 2018; Zhang H & Chen G, 2021). Lastly, Assessment serves as a crucial element, offering effective feedback mechanisms that promote a deeper understanding of the subject matter (Yang L & Li Q, 2020; Kim S & Park H, 2021).

Another essential component of Activity Theory is the Community, Rules, and Division of Labor. The active involvement of peers and instructors creates a collaborative and supportive learning environment. These interactions not only enhance the educational experience but also provide a structured framework for learners to thrive (Chen H & Wu J, 2022). By focusing on these interconnected elements, Activity Theory provides valuable insights into the world of online education.

Activity Theory provides a robust framework for validating our research objectives and hypotheses, emphasising the interconnectedness of elements within the online learning environment. This theoretical approach's strength is in its ability to analyse and optimize the interactions between course information, content design, content delivery, and assessment to enhance learning outcomes and ensure alignment within the online learning environment. (see Figure 1).

Figure 1. Activity Theory (Leontiev,1970)
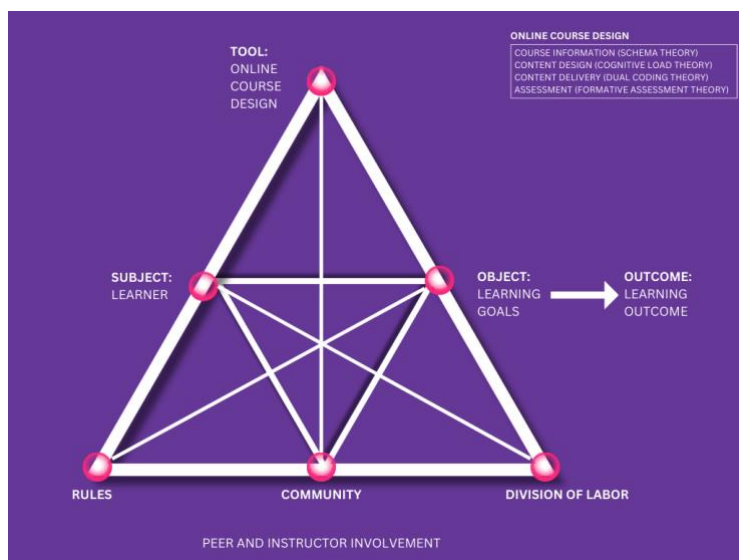
2.2 Literature Review

This section defines and discuss literature on the influence of online learning on learner's outcomes. The review will explore the evolution and significance of online learning platforms and examine studies that investigate the effectiveness of different online learning strategies. In particular, the review will highlight empirical research that measures the impact of online learning on learners and their learning outcomes.

2.2.1 Course Information and Learning Outcomes

Clear Learning Objectives; A key component of educational design is effective course information. To correlate the information with intended learning outcomes, Thompson & Martinez's (2018) content, both precise and comprehensive course objectives are essential. This guarantees the relevance and purpose of the course materials. Furthermore, to provide content that satisfies the needs of learners, Smith & Brown (2017) stress the significance of clear and unambiguous course objectives. They argue that learners can interact with the subject matter more fully when they are aware of what is expected of them. *Thorough Syllabus;* Garcia & Lee's (2019) additional research emphasizes the significance of a thorough syllabus in the creation of logically structured and persuasive material. According to their research, modules that gradually build upon one another can be created with the help of well-organized course materials. *Defined Course Outlines;* in a similar vein, Johnson & Wu (2020) concentrate on the purpose, of course, outlines in course layout, discovering that well-defined outlines aid in the methodical arrangement of subjects and subtopics, improving the overall educational process. *Targeted Multimedia;* finally, research by Patel & Kaur (2021) shows that the integration of multimedia components is guided by said learning objectives found in course materials. According to this research, selecting suitable multimedia tools that support well-defined objectives is simpler, which results in more engaging and beneficial material layouts.

2.2.2 Course Information and Content Delivery

Clear Objectives for Delivery Methods; The organisation and clarity of course material have a significant impact on how the content is delivered. Clear course objectives, in the opinion of Davis & Singh (2018), make it easier to utilise a variety of delivery strategies that are suited to various learning preferences. Their research shows that choosing the best distribution method, synchronous or asynchronous, becomes simpler when goals are clearly defined. *Comprehensive Course Schedules;* Harris & Roberts (2019) investigate how content delivery is affected by comprehensive course schedules. They discover that instructors can plan and deliver content more efficiently and cover all required topics methodically by using a set schedule. *Accessible Course Materials;* additionally, Miller & Taylor (2020) stress the value of easily accessible course materials, demonstrating how having access to course materials improves content delivery by enabling students to prepare and study material ahead of time. *Interactive Delivery Tactics;* similar research by Zhang & Chen (2021), the utilization of interactive delivery tactics, like in-person conversations and group projects, is supported by well-organized instructional resources. They believe that explicit guidelines and expectations promote involvement and active participation. *Transparent Assessment Criteria;* furthermore, Williams & Davis (2022) emphasize how transparent and open criteria for assessing can influence how information is delivered since they make it simpler for students to comprehend how their involvement and assignments affect their final grades.

2.2.3 Course Information and Content Design

Focus and Understanding; Obtaining successful learning outcomes requires having course material that is organized and presented. Students are more likely to attain higher levels of comprehension and retention if they have a clear knowledge of the course objectives (Brown & white, 2018). According to their research, students can better focus their efforts and understand what they need to learn when they have well-defined objectives. *Effective Learning Programs;* in the words of Smith & Lee (2019), comprehensive educational programs are essential for promoting learning objectives. They discover that students may more effectively manage their study time and resources and achieve higher academic results when they have

access to a thorough curriculum. According to more research by Chen & Kim (2020), students' enthusiasm and engagement are increased when they are given clear rules for assessment and grading standards. This helps them comprehend how to achieve in the course. Johnson & Li (2021) investigate how established standards in the educational setting affect students' performance. According to their findings, students are more likely to meet or beyond expectations when they are aware of what is expected of them. Finally, Garcia & Wu (2022) investigate how the development of critical thinking abilities is aided by clear course material. They contend that clear goals and expectations motivate students to interact more thoroughly with the content, which develops higher-order thinking abilities.

2.2.4 Content Design and Assessment

Aligned Assessments; the way that the course is designed influences how evaluation strategies are developed. *Logically structured content;* according to Thompson & Martinez (2019), makes it easier to create evaluations that effectively measure students' comprehension. They contend that creating assessments that are in line with learning objectives is made simpler by well-organized content. *Multimedia for Diverse Assessments;* to accommodate a variety of evaluation methodologies, Smith & Brown (2018) emphasize how crucial it is to integrate multimedia aspects into content design. According to their research, the development of diverse assessment forms—like interactive quizzes and video projects—that more accurately reflect student learning is made possible by multimedia-rich content. *Targeted Assessments;* according to another research, Garcia & Lee (2020) highlight the importance of material division in assessment design and show that doing so makes it easier to create assessments that are more targeted and focused. *Easy Access for Review;* Johnson & Wu (2021) investigate how assessment is impacted by easy navigation within the course material. According to their findings, students who can discover and review relevant materials are very easily better equipped to do well on assessments. *Formative Assessment Techniques;* finally, Patel & Kaur (2019) show how formative assessment techniques may be supported by well-designed content, which gives students continuous feedback to help them perform better throughout the course.

2.2.5 Content Design and Learning Outcome

Engagement and Retention; A useful content design is essential to attaining positive learning outcomes. Davis & Singh (2019) observed that including multimedia components in content design improves student engagement and retention. They also found that multimedia-rich content supports various learning styles, which improves comprehension overall. *Logical Organization;* the effect of logically organized content on learning outcomes is examined by Harris & Roberts (2018). They discover that students do better academically when the material is well-organized and has a clear flow and progression, which enables them to systematically add to their knowledge. *Easy Navigation;* additionally, Miller & Taylor (2019) stress how crucial it is for content design to have easy navigation. According to their research, students have a higher chance of staying engaged and finishing the course when they can simply navigate through the content. *Content Division;* the importance of content division in improving learning outcomes is emphasized by Zhang & Chen (2020). They contend that dividing the material into more digestible pieces facilitates students' better information processing, which enhances comprehension and memory. *Interactive Content Design;* furthermore, Williams & Davis (2021) show how interactive content design—which includes items like discussions and quizzes—promotes deeper engagement and active learning, which in turn improves learning outcomes.

2.2.6 Content Delivery Influencing Learning Outcome

Interactive Delivery; student learning outcomes are strongly impacted by the way content is delivered. Interactive material delivery techniques, like personal interactions and group projects, help improve understanding and retention, claim Brown & White (2019). According to their research, students are more likely to succeed when they actively engage in the learning process. *Hybrid Delivery Systems;* the effectiveness of synchronous versus asynchronous delivery systems is examined by Smith & Lee (2018). They discover that a hybrid approach, which combines the two approaches, improves overall learning outcomes while accommodating a variety of learning preferences. *Prompt Material Distribution;* Chen & Kim's (2019) Additional research highlights the importance of prompt and easily accessible distribution of materials. According to their findings, improved time management and academic achievement are supported when students have access to course resources whenever they require them. *Organized Content Delivery;* Johnson & Li (2020) investigate how learning outcomes are affected by the delivery of organized and unambiguous content. According to their research, students learn and retain knowledge more efficiently when it is presented in a logical and orderly manner. *Customized Content Distribution;* finally, Garcia & Wu (2021) emphasize how the customized distribution of content can enhance learning outcomes by offering customized support and feedback. They claim that personalized delivery strategies meet the demands of each unique learner, resulting in increased success and engagement.

2.2.7 Assessment and Learning Outcome
The methods used for assessment are essential to identifying the learning objectives of students. *Formative Feedback;* formative evaluations that offer continuous feedback, according to Thompson & Martinez (2020), assist students in identifying areas for development and enhancing their comprehension of the subject content. Their research demonstrates how continuous feedback promotes both improved academic achievement and a deeper learning process. *Peer Evaluation;* according to Smith & Brown (2019), peer evaluations are a fantastic way to encourage critical thinking and a deeper level of comprehension. They suggest that peer feedback enhances learning outcomes by motivating students to consider critically their work and absorb knowledge from others. *Variety in Assessment;* Garcia & Lee's (2021) additional research highlights the significance of using a variety of evaluation techniques to accommodate varying learning styles and preferences. According to their findings, a more thorough assessment of students' learning can be obtained by combining several types of assessments, such as projects, quizzes, and presentations. *Explicit Grading Standards;* in the meanwhile, Johnson & Wu (2022) investigate how learning outcomes are affected by explicit grading standards. According to their research, learners are more driven to do better and achieve expectations when they are aware of how their performance is assessed. *Realistic Assessments;* finally, Patel & Kaur (2020) show that learning results and student engagement are improved by realistic assessments that link course material to real-world applications. They contend that students are more inclined to put in effort and produce better work when assessments are relevant and meaningful.

A greater knowledge of how course information, content design, content delivery, and assessment affect students' learning outcomes is possible when these foundational works are combined. Better learning outcomes can be achieved by using these findings to direct the development of more effective systems for learning online. Although an extensive amount of research has been done on numerous aspects of online learning and how it affects learning outcomes, there is still a significant knowledge gap on the overall relationship between these variables. There is little research that examines these elements such as learner characteristics, content design strategies, assessment methodologies, content distribution methods, and clarity

of course material. Further research is required to truly comprehend how these components interact and work together to optimize learning outcomes in online environments.

3. Hypothesis Development

3.1 Course Information.

Clear, comprehensive and easily accessible course information plays an important role in increasing student engagement and achieving learning objectives. Research has shown that students who have a clear understanding of course objectives are better able to comprehend expectations and engage effectively with course material (Thompson & Martinez, 2018; Smith & Brow, 2017). Well-organized course materials further enhance student involvement by promoting clarity and structure, ensuring that students can follow the learning journey without confusion (Garcia & Lee, 2019).

The syllabus, as a central document is particularly significant because it delineates the course framework, expectations, learning objectives, schedule, assessment methods, grading criteria, and important deadlines. This clarity supports students in effectively planning their time and staying on track, which in turn increases their chances of success (Hummel, 2014).

Moreover, providing clear and organized course information is especially important in international contexts, where students may face challenges such as language barriers, cultural differences, and time zone variations (Mohzana, Murcahyanto & Haritani, 2019). Clear course materials bridge these gaps, offering equal access to learning resources for students from diverse backgrounds. Therefore, it can be hypothesized that:

> **H1.** Clear and comprehensive course information positively influences learning outcomes by enhancing student engagement and understanding.

This hypothesis warrants testing because understanding course objectives and expectations plays a pivotal role in facilitating student engagement, especially in diverse learning environments.

Research further supports the notion that well-structured course information influences the effectiveness of content delivery methods When educators utilize interctive, synchronous and asynchronous delivery strategies alongside clear course information, student learning outcomes improve (Harris & Roberts, 2019; Davis & Singh, 2018).

Research by Johnson and Aragon (2020) reveals that easily accessible and well-organized course materials, whether presented online or offline, are important in shaping student performance. This alignment between content organization and delivery methods influences student learning outcomes. Therefore, the hypothesis can be proposed:

> **H2.** Clear and structured course information enhances the effectiveness of content delivery methods, thereby improving student learning outcomes.

This hypothesis calls for exploration as it can deepen our understanding of how structured information complements diverse delivery methods to improve educational effectiveness.

Finally, clear and structured course information also positively influences content design. Studies by Thompson and Martinez (2019) and Smith and Brown (2018) reveal that well-organized course information helps educators create multimedia elements and interactive activities that engage students.

According to Mayer (2014), the principles of multimedia learning emphasize that clarity and organization are key to enhancing student comprehension and retention. This can be speculated as follows:

H3. Clear and structured course information positively influences content design, leading to more organized and engaging educational materials.

Testing this hypothesis is essential as it will validate the link between well-organized course information and the design of engaging and effective educational content.

3.2 Content Delivery. Effective content delivery strategies, which cater to diverse learning preferences, are essential for improving student learning outcomes. Research by Harris & Roberts (2019) and Davis & Singh (2018) shows that interactive, synchronous, and asynchronous delivery approaches foster better student engagement and retention. Interactive delivery methods such as group discussions and hands-on activities promote active learning, while synchronous methods like live lectures allow real-time feedback. Asynchronous methods provide flexibility for students, ensuring a more inclusive learning environment.

Freeman et al. (2014) affirm that active learning, particularly interactive techniques, significantly enhances student engagement. Martin, Ahlgrim-Delzell, and Budhrani (2017) add that synchronous learning facilitates real-time engagement, thus improving student satisfaction. According to Hrastinski (2008), asynchronous learning promotes deeper reflection and long-term retention. Given this, the hypothesis can be proposed:

H4. Interactive and learner-centred content delivery methods significantly enhance learning outcomes by promoting better comprehension and retention of course materials.

The need for testing this hypothesis stems from the growing emphasis on interactive and learner-centred delivery approaches to foster better comprehension and retention of course materials.

3.3 Content Design. The effectiveness of evaluation methods is heavily influenced by the design of the content. Thompson & Martinez (2019) and Smith & Brown (2018) argue that content organized logically and makes it easier to develop evaluations that accurately measure student comprehension. Well-designed content can support multiple forms of assessments, including multimedia and interactive components (Garcia & Lee, 2020).

Additionally, Gikandi, Morrow, & Davis (2011) highlight how technology in formative assessments, combined with well-structured content, enhances student learning outcomes. Thus, the hypothesis can be proposed:

H5. Well-organized content design positively influences the effectiveness of assessments.

Testing this hypothesis will provide insight into how content organization affects the design and effectiveness of evaluations, ultimately improving learning outcomes.

Furthermore, content design plays a critical role in enhancing learning outcomes by engaging students effectively. Research by Thompson & Martinez (2019) and Smith & Brown (2018) reveals that well-organized content, which incorporates multimedia elements and interactive activities, helps maintain student engagement.

Garcia & Lee (2020) indicate that content designed to cater to diverse learning styles improves learning efficacy. Thus, the hypothesis can be stated as:

H6. Well-organized content design positively influences learning outcomes

This hypothesis should be tested to determine the direct relationship between the organization of content and the improvement of student learning outcomes.

3.4 Assessment. Assessment practices are key to improving student learning outcomes. Smith & Brown (2019) and Thompson & Martinez (2020) suggest that timely, comprehensive feedback provided through assessments enhances students' understanding and retention of course material.

Nicol & Macfarlane-Dick (2006) emphasize that formative assessments, accompanied by constructive feedback, foster self-regulated learning and improve student performance. Black & William (1998) demonstrate that assessment practices that involve students in the feedback process lead to significant learning gains. Hattie & Timperley (2007) further highlight that feedback is most effective when it is specific, relevant, and focused on the task at hand. Based on this, the following hypothesis is proposed:

H7. Rigorous and timely assessment strategies positively influence learning outcomes

This hypothesis should be tested to evaluate how assessment strategies, particularly those involving timely feedback, influence the overall learning experience and student outcomes. By revisiting these hypotheses, we can explore how clear and organized course information, content delivery, content design, and assessments collectively influence student learning outcomes, offering a holistic approach to improving educational effectiveness.

3.5 Conceptual framework*.* The conceptual framework is based on Riel and Becker's (2008) model and the concept of mediation through Activity Theory proposed by Leontiev (1970) (see Figure 2).

Figure 2. Conceptual framework
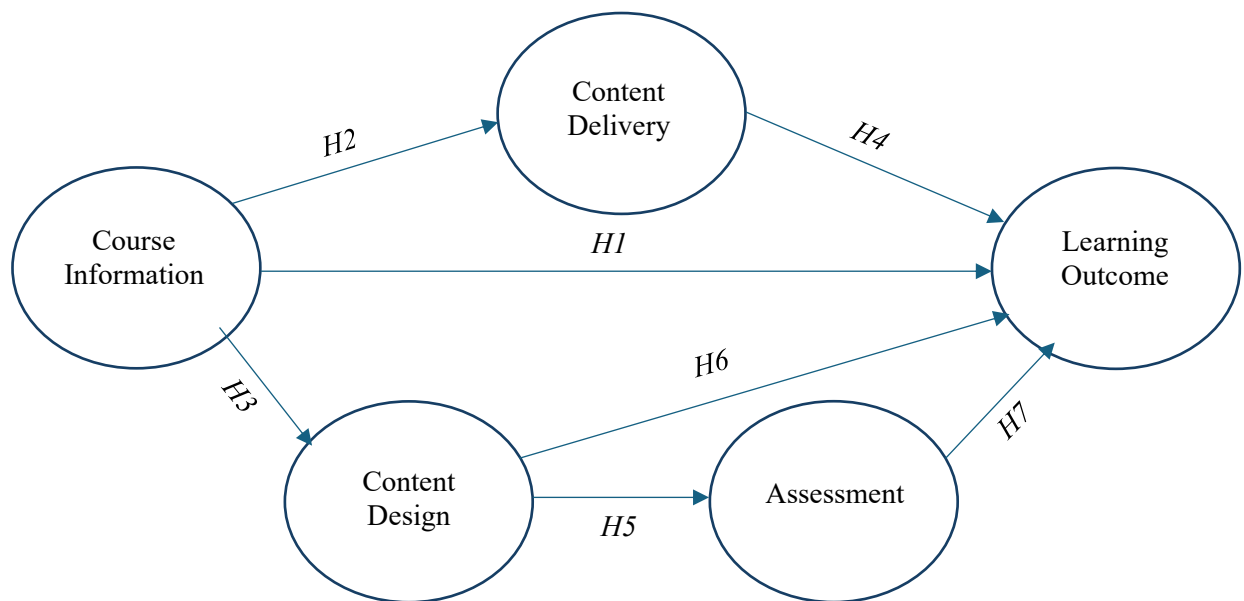
4. Methodology

4.1 Sample

The study adopts a cross-sectional design and a quantitative approach. The study population or the sampling frame used comprises learners who have experienced online courses all across India. This frame is neither readily available to the public domain nor possible to fathom. Therefore, a non-probability-based sampling method such as snowballing was used to achieve an apt and proper representation of the sample required. It is the most effective way to reach a larger population (Patwa et al., 2021). Initial consent was taken via Google Forms and then the survey link was shared through e-mail and WhatsApp as per the protocol. A total of 410 responses from online learners were received for data analysis. The demographic profiles of the respondents are summarized in Table 3.

4.2 Research Instrument

First, all the relevant constructs are identified through the rigorous literature review and are tabulated with their source. The key variables such as Course Information (Thompson & Martinez, 2018), Content Design (Smith & Brown, 2018), Content Delivery (Harris & Roberts, 2019; Davis & Singh, 2018; Freeman et al., 2014; Martin, Ahlgrim-Delzell, & Budhrani, 2017; Hrastinski, 2008), Assessment (Smith & Brown, 2019; Thompson & Martinez, 2020; Nicol & Macfarlane-Dick, 2006; Black & William, 1998; Hattie & Timperley, 2007) and Learning Outcome (Garcia & Lee, 2020). (see Table 1).

Table 1. Construct, Items and Key Sources

Construct	Items	Key Sources
Course Information	1. I was able to understand the subject because of clear course information. 2. My overall learning outcomes improved due to detailed course information. 3. The delivery of course content improved because the course information was well-organized. 4. Effective content delivery was achieved because the course information was easy to access. 5. Clear course information was the main factor that influenced my decision to enrol in the course.	Mayer (2014); Lee & Hirumi (2017); Johnson & Aragon (2020); Davis & Singh (2018); Smith & Brown (2017, 2018); Mohzana, Murcahyanto, & Haritani (2019); Thompson & Martinez (2018, 2019); Hummel (2014); Garcia & Lee (2019); Harris & Roberts (2019).
Content Delivery	6. My learning was easier as I had my course material right away. 7. Easy navigation of course content enhanced my learning. 8. Easily accessible course materials improved my learning. 9. Interactive delivery of content (Live Q&A, case studies, virtual field trips) improved my understanding.	Martin, Ahlgrim-Delzell, and Budhrani (2017); Davis & Singh (2018); Harris & Roberts (2019); Freeman et al. (2014); Hrastinski (2008).

10. Interactive delivery of content (Live Q&A, case studies, virtual field trips) improved my retention of material.
11. My learning was more effective with synchronous content delivery (live virtual class) compared to asynchronous delivery (pre-recorded lectures, online modules).

Content Design		Thompson & Martinez (2019); Smith & Brown (2018); Garcia & Lee (2020); Gikandi, Morrow, & Davis (2011).

Content Design

12. I was able to comprehend and remember the material better because the content was well-organized.
13. My learning improved because multimedia components (text, audio, video) were included in the course design.
14. My academic performance improved because of interactive content design (quizzes, learning games, infographics).
15. Effective assessments were created because the content was well-designed.
16. Organised content made the assessments more accurate.

Thompson & Martinez (2019); Smith & Brown (2018); Garcia & Lee (2020); Gikandi, Morrow, & Davis (2011).

Assessment

17. Clear assessment criteria improved my performance.
18. Formative assessments (quizzes, discussions, homework assignments) improved my understanding.
19. Peer evaluations contributed to my critical thinking.
20. Peer evaluations contributed to my learning.
21. A variety of evaluation techniques provided a more thorough assessment of my learning.
22. Explicit grading standards increased my engagement.
23. Explicit grading standards increased my academic performance.
24. I find formative assessments (quizzes, homework assignments) more helpful for guiding my learning process compared to summative assessments (final exams, end-of-term projects).

Smith & Brown (2019); Thompson & Martinez (2020); Nicol & Macfarlane-Dick (2006); Black & William (1998); Hattie & Timperley (2007).

| Learning Outcome | 25. My motivation significantly impacts my learning outcomes.
26. Prior knowledge influences the effectiveness of my learning.
27. My individual learning style affects my comprehension of course material.
28. My individual learning style affects my retention of course material.
29. Self-discipline is important for achieving positive learning outcomes.
30. My engagement level influences my academic performance. | Garcia & Lee (2020). |

Further, the research instrument is developed to measure the variables on a 5-point Likert scale along with demographic variables. The instrument is sent to domain experts for content validation. Around 5-6 academicians holding senior leadership positions have validated the contents of the instrument. A pilot study was conducted with 70 online learners across India to determine the reliability and validity of the instrument. The instrument was reworded based on pilot respondents.

4.3 Statistical tool and technique

The research model was analyzed using the Smart PLS 3.0 tool, using partial least squares structural equation modelling (PLS-SEM) (Chin, 2010; Ringle et al., 2005). The measurement model is tested before accessing the structural model after ensuring reliability and validity (Venkatesh et al., 2012). PLS-Sem is a unique method in which both principal component analysis and regression analysis run simultaneously. Fornell and Bookstein (1982) note that the PLS-SEM method does not require any population or measurement scale assumption. The PLS technique is considered better than the analysis of moment structures (AMOS) and linear structural relations (LISREAL) as reflective and formative indicators can be applied in the model (Fornell and Larcker, 1981). Therefore, in this study, we use the PLS-SEM technique and SmartPLS® software for data analysis. Hair et al. (2016) explain two stages of the PLS-Sem technique. The validity and reliability of the measurement model are checked at the first stage. Then, in the second stage, the structural model (hypotheses testing) is tested.

5. Results

5.1 Reliability and validity

The reliability of the construct is assessed using measures like Cronbach's alpha and Composite Reliability. A value of more than 0.6 for both Composite Reliability and Cronbach's alpha (Hair et al., 2016). However, a value exceeding 0.95 is not ideal, as it suggests that each component is essentially the same but with slight rephrasing.

Further, the Average Variance Extracted (AVE) is considered. It is used to measure the degree of similarity among the components of one construct and dissimilarity concerning other components. Here, a value above 0.5 is desirable for the construct to be valid. Net, the outer loadings of each component of each construct are analysed. Outer loadings indicate the contribution of that component towards the construct. Again, a value above 0.5 is desirable

(Hair et al., 2016). These statistics signal scales' internal consistency. The results are summarized in Table 2.

Discriminant validity is checked using the Fornell-Larcker criteria. The correlations between latent constructs and other latent constructs are calculated, and the highest squared correlation among all correlations is identified. Table 3 provides the discriminant validity measurement. Based on the diagonal elements, it is said that discriminant validity is established. The demographic variables are tabulated in Table 5.

Table 2. Constructs and their reliability and convergence validity values

Constructs	Item	Outer loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	AVE
Assessment	A1	0.770	0.905	0.909	0.924	0.602
	A2	0.762				
	A3	0.720				
	A4	0.746				
	A5	0.807				
	A6	0.811				
	A7	0.789				
	A8	0.797				
Content Delivery	CDe1	0.782	0.875	0.878	0.906	0.615
	CDe2	0.800				
	CDe3	0.794				
	CDe4	0.755				
	CDe5	0.779				
	CDe6	0.796				
Content Design	CD1	0.804	0.712	0.797	0.815	0.501
	CD2	0.794				
	CD3	0.813				
	CD4	0.730				
	CD5	0.180				
Course Information	CI1	0.759	0.841	0.843	0.887	0.612
	CI2	0.808				
	CI3	0.807				
	CI4	0.798				
	CI5	0.736				
Learning Outcome	L1	0.831	0.893	0.894	0.921	0.701
	L2	0.864				
	L3	0.878				
	L4	0.821				
	L5	0.790				

5.2 Hypothesis testing

The hypothesis statements were checked using a two-tailed normal distribution test for a significance level of 95%. According to Hair et al. (2016), a t-value greater than 1.96 is desirable for the hypothesis to be accepted. This rule is followed, and the hypothesis testing results for direct relationships are tabulated in Table 6.

From Table 6, it can be inferred that *H1–H7* are statistically significant. The results further indicate that all the mediation relationships are supported, except for the direct relationship between Content Design and Learning Outcome (t-value: 1.917, p-value: 0.055). The results indicate that Content Design mediates the relationship between Course Information and Assessment (t-value: 11.056, p-value: 0.000). Additionally, Content Delivery mediates the relationship between Course Information and Learning Outcome (t-value: 18.591, p-value: 0.000). The results suggest that Course Information indirectly influences Learning Outcome

through Content Delivery (*t*-value: 18.591, *p*-value: 0.000) and indirectly influences Assessment through Content Design (*t*-value: 13.288, *p*-value: 0.000).

Table 3. Discriminant validity based on the Heterotrait-Monotrait ratio

	Assessment	Content Delivery	Content Design	Course Information	Learning Outcome
Assessment					
Content Delivery	0.823				
Content Design	0.584	0.739			
Course Information	0.574	0.783	0.714		
Learning Outcome	0.718	0.748	0.600	0.624	

Table 4. Demographic profile

SL no.	Demographic Profile		Percentage
1	Respondent age (years)	21–23	56.1
		24–26	14
		27–29	4.2
		Above 29	25.7
2	Gender	Male	73.1
		Female	26.9
3	Level of education	Bachelor's Degree	67.8
		Master's Degree	32.2
4	What is your current occupation?	Student	55.1
		Employed (Part-time / Full-time)	39.9
		Unemployed	5
5	Field of study	Sciences	28.7
		Engineering	45.6
		Business	17.7
		Arts	8

The table 4 was designed to focus on educated individuals because they form the primary audience for online learning platforms and are heavily influenced by digital education trends. By including details about age, gender, education level, and fields of study, the research aims to capture how these factors affect the adoption and effectiveness of online learning.

This demographic (Table 5.) is the key to understanding the impact of online learning, as students and young professionals are the most likely to rely on it for skill-building and career

advancement. The composition helps identify patterns in how different groups engage with online education and how it influences learning outcomes. Overall, it provides valuable insights to improve online learning strategies and make them more effective for this important population.

Table 6. Path co-efficient (direct effect)

Relationship	Standardized co-efficient	t-statistics	p-values	Result
Assessment → Learning Outcome		4.287	0.000	Supported
Content Delivery → Learning Outcome		3.111	0.002	Supported
Content Design → Assessment		11.056	0.000	Supported
Content Design → Learning Outcome		1.917	0.055	Not supported
Course Information → Content Delivery		18.591	0.000	Supported
Course Information → Content Design		13.288	0.000	Supported
Course Information → Learning Outcome		2.361	0.018	Supported

5.3 Model Prediction

In Partial Least Squares Structural Equation Modelling (PLS-SEM), Q^2 is used to estimate the model's predictive accuracy. Q^2 measures the relevance of the model's predictions by using a sample reusing method (Silva, A., Oliveira, L., & Costa, P., 2023). In this method, a portion of the data is intentionally excluded, and the model predicts this excluded part using the remaining data. The Q^2 values for Content Delivery, Content Design, Assessment, and Learning Outcome are 0.459, 0.330, 0.233, and 0.518 respectively. When an omission distance of eight is used, cross-validated redundancy and cross-validated communality values are generated using the blindfolding method to assess the Q^2 predictive relevance (Chin, 2010). According to Hair et al. (2016), Q^2 values up to 0.02, between 0.02 and 0.15, and above 0.35 are considered to have small, medium, and large effects, respectively.

6. Discussion

The study confirms that clear and comprehensive course information significantly enhances student learning outcomes by improving engagement and understanding. This result supports Hypothesis H1, aligning with previous research that emphasizes the importance of well-organised course materials for effective learning (Thompson & Martinez, 2018; Smith & Brown, 2017). Students who have access to well-structured information are better equipped to understand course expectations and engage more deeply with the material.

Additionally, the study supports Hypothesis H2, which tells that clear course information enhances the effectiveness of content delivery methods. This finding underscores the role of well-organized course materials in facilitating various content delivery approaches, such as interactive and learner-centred methods, which have been shown to improve comprehension

and retention (Harris & Roberts, 2019; Davis & Singh, 2018). By providing students with clear guidelines, instructors can implement diverse delivery methods that cater to different learning preferences, leading to improved learning outcomes.

The results also show that content design plays an important role in influencing learning outcomes, supporting Hypothesis H3. Clear and comprehensive course information positively impacts content design, leading to more engaging and well-structured educational materials (Thompson & Martinez, 2019; Smith & Brown, 2018). This aligns with the notion that well-organized content supports effective teaching and learning by aiding the development of interactive and multimedia-rich materials. However, the study finds that while content design significantly impacts assessment (Hypothesis H5), its direct effect on learning outcomes (Hypothesis H6) is not statistically significant. This suggests that although effective content design contributes to better assessments, its direct influence on learning outcomes is less pronounced compared to other factors. The mediation analysis reveals that content design mediates the relationship between course information and assessment, indicating that well-structured content enhances the effectiveness of assessments (Garcia & Lee, 2020).

The findings highlight the critical role of assessments in improving learning outcomes, as supported by Hypothesis H7. Rigorous and timely assessments with comprehensive feedback significantly enhance student understanding and retention (Smith & Brown, 2019; Nicol & Macfarlane-Dick, 2006). This underscores the importance of formative assessments in providing students with actionable feedback that promotes self-regulated learning and deeper engagement with the material.

The study's mediating analysis provides additional insights into the relationships between course information, content delivery, content design, and learning outcomes. The results indicate that course information influences learning outcomes through its impact on content delivery (Hypothesis H2) and assessment (Hypothesis H3). This findings tells that the quality of course information indirectly affects learning outcomes by enhancing the effectiveness of content delivery and assessment practices. (t-value: 19.591, p-value: 0.000). Furthermore, content design mediates the relationship between course information and assessment, illustrating how well-structured course materials facilitate more effective evaluation methods (t-value: 11.056, p-value: 0.000). These mediation effects highlight the interconnected nature of course design elements and their collective impact on student learning outcomes.

The model's predictive validity, indicated by the Q^2 values, reveals that content delivery (Q^2 = 0.459) and learning outcomes (Q^2 = 0.518) have medium to large predictive effects, while content design (Q^2 = 0.330) and assessment (Q^2 = 0.233) show smaller effects. This suggests that while the model accurately predicts learning outcomes and content delivery, there is potential for improvement in predicting the effects of content design and assessment.

The study's findings provide practical insights for educators and instructional designers. It is crucial to have clear and well-organized course information to create an effective online learning experience. Educators should prioritize developing courses with engaging and interactive content that caters to diverse learning styles. Furthermore, it is essential to implement strong assessment strategies that offer timely feedback to enhance student learning outcomes. In conclusion, this research enhances our understanding of online course design and its impact on student learning. It lays the groundwork for improving online education practices and addressing educational disparities.

6.1 Theoretical contribution

The current study provides valuable insights into the design of online courses by confirming the relationships between different elements and their impact on student learning. It shows that clearly presented and comprehensive course information significantly increases student engagement and improves learning outcomes. The research also indicates that well-organized content design enhances the effectiveness of content delivery methods. Furthermore, the study reveals that while content design has an influence on assessment quality, its direct impact on learning outcomes is less significant. Importantly, it demonstrates that course information indirectly affects learning outcomes through content delivery and assessment, shedding new light on these mediating roles. Additionally, the study validates the model by showing medium to large effects of content delivery on learning outcomes and smaller effects of content design and assessment, thereby enhancing the theoretical framework of online education.

6.2 Implications of the study

The study provides valuable guidance for educators and instructional designers to enhance online courses by improving course information, content design, and delivery methods. It assists institutions in optimizing online learning environments, which could help close educational gaps, especially in remote areas. Policymakers can utilize these findings to create supportive frameworks and training programs for effective online education.

7. Conclusion, limitation, and future scope

Although online course elements such as content delivery and assessment significantly enhance student learning outcomes, the direct impact of content design on learning outcomes was less evident. This suggests that while well-structured content is important, its effects are mediated through other factors such as assessment and content delivery. A notable limitation is the study's reliance on a snowball sampling method, which may not fully capture the diversity of online learners across different regions and institutions. Future research should explore the influence of demographic factors and include a broader range of educational settings to provide a more comprehensive understanding of how online course design impacts students' learning outcomes.

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