# A STUDY TO IMPLEMENT AN ONLINE LEARNING ENVIRONMENT FOR ENHANCING COGNITIVE PEDAGOGY PRINCIPLES AND INSTRUCTIONAL STRATEGIES.

Qu Cha, Sreemoy Kanti Das

[1] Lincoln University College, Petaling Jaya, Malaysia.

## ABSTRACT

This study was to build and assess an online learning environment meant to improve instructional strategies in digital education and raise cognitive pedagogy principles. It is rather important to make sure that instructional strategies match the methods in which student's process, recall, and apply various kinds of knowledge since the increasing dependence on virtual platforms for teaching and learning calls for them. The study integrates key educational ideas such scaffolding, active learning, metacognition, and learner autonomy within the framework of the online environment. Grounded in cognitive learning theories including information processing, schema theory, and constructivism are these ideas. Features include interactive material, adaptive feedback, cooperative tasks, and self-assessment tools have been included to support a wide spectrum of cognitive abilities. Based on early results, student involvement, critical thinking, and knowledge have improved. The study also shows how technology-mediated education might be adjusted to fit the particular learning requirements of every student while concurrently promoting a greater knowledge of the taught content. The results provide educators, instructional designers, and educational institutions striving for the development of cognitively enhanced online learning experiences insightful analysis that may be used. Regarding the growing area of educational technology, this work contributes by stressing the need of including efficient cognitive pedagogy into virtual learning settings.

**Keywords:** Instructional Strategies, Digital Education, Cognitive Pedagogy, Active Learning, Cooperative Tasks.

## INTRODUCTION

The quick advancement of technology and the growing demand for flexible learning solutions help to explain the general usage of online learning environments. Though accessibility and convenience are excellent, these systems may not necessarily promote significant learning or more advanced cognitive participation. Rather than pushing students to think critically, solve issues, and remember knowledge, the present crop of online courses is mostly focused in providing facts and data. Dealing

with these challenges depends on online learning environments grounded on cognitive pedagogy concepts. Cognitive pedagogy stresses the three primary areas of knowledge acquisition, processing, and application. The researcher stress cognitive skills including metacognition, memory, attention, and reasoning. Using these ideas in online learning demands for the strategic pedagogical tools scaffolding, adaptive feedback, student agency, active involvement, and group projects. These techniques motivate students to apply what they have acquired, make pertinent inferences, and challenge their own knowledge (Darling-Hammond et al., 2020).

Although cognitive-based training is becoming more and more important, the right application of these ideas into online learning environments is still lacking. This difference persists even if online learning is becoming more and more accepted. This project was created and use an online platform designed especially to support cognitive pedagogy ideas and teaching practices in an aim to close that gap. The aim of this study is to investigate how well the surroundings enhance learner involvement, cognitive processing, and academic performance. The research makes use of a method combining many strategies. The results are aimed to provide teachers, instructional designers, and educational institutions with insightful analysis that can be used to include cognitive learning frameworks into their operations thereby enhancing the quality of online education. The results reflect this aim. When all is considered, the results of this study guide the creation of more efficient, dynamic, learner-centred online learning environments (Hattie & Zierer, 2019).

## BACKGROUND OF THE STUDY

In recent years, there has been a tremendous acceleration in the digital revolution of education, which has resulted in online learning being a key modality of teaching across all levels of education. This occurred as a direct consequence of the quick acceleration of the digital revolution. In spite of the fact that this modification allows for increased liberty and permits access to a more extensive audience, it also raises concerns over the effectiveness and quality of the training that is being provided. These conventional online learning settings usually place a larger focus on the transmission of content than they do on cognitive engagement, which hampers their potential to develop profound comprehension and the long-term retention of knowledge. Consequently, people are less likely to continue to learn in these environments. The use of cognitive pedagogy, which emphasises on the ways in which students take in information, find solutions to problems, and enhance their metacognitive abilities, provides an excellent basis for the development of more successful online learning experiences. This paradigm may be found at a number of different educational institutions (Mayer, 2021).

It has been established via research that instructional strategies that are built on cognitive ideas, such as scaffolding, feedback loops, learner autonomy, and active learning, have the ability to significantly boost academic performance, critical thinking, and comprehension. Such strategies include active learning, feedback loops, and scaffolding. When it comes to online learning environments, on the other hand, a considerable majority of them do not adequately include these notions, which leads to learning that is passive and shallow. An area of research that is becoming increasingly relevant is the investigation of the many ways in which digital platforms may be purposely created to actively drive cognitive engagement and to generate meaningful learning experiences (Means et al., 2020).

## PURPOSE OF THE RESEARCH

This study aims to investigate the effects on the enhancement of cognitive pedagogy principles and instructional methods of an online learning environment, and more especially on the course design of such environment. Online learning environments have a basic need to actively promote meaningful learning, critical thinking, and successful teaching methodologies in addition to delivering knowledge. This is really necessary. This is so because digital education is becoming more and more pervasive and it is rather imperative that this be done. The aim of this study is to assess the ways in which properly designed online courses might increase pedagogical efficacy and enhance cognitive engagement. The purpose of this study was to investigate the ways in which several instructional design elements, such scaffolding, feedback systems, learner autonomy, and active learning activities, help to progress cognitive pedagogy principles. The main emphasis of this study is on course design as the independent variable. Moreover, it looks at how these design features affect the application of teaching approaches inside online learning environments as well as the success of such approaches.

## LITERATURE REVIEW

However, questions about the cognitive depth and instructional quality of many digital platforms remain raised. This is true even if growing reliance on online learning environments has changed the delivery and reception of knowledge. Based on research conducted, online learning often does not fit the ideas of evidence-based cognitive pedagogy even if it gives flexibility and access. These criteria are quite essential if one wants to develop learning that is not only deep but also long-lasting. Investigating how pupils view, absorb knowledge, and grow to comprehend the subject matter is the main emphasis of cognitive pedagogy. Among the skills this approach stresses are memorisation, attention, metacognition, and critical thinking. Within the realm of online education, there are several effective instructional strategies that have their origins in theory. Certain approaches that fall under this category include scaffolding, interactive feedback, active learning, and metacognitive aid, to name a few examples. The students are able to draw

connections, reflect on what they have gained, and apply the information that they have received in meaningful ways because to the help that these tools provide. According to the findings of a study that was carried out by (Martin et al., 2020) it has been shown that when such tactics are employed in online settings, students demonstrate enhanced engagement, higher retention, and improved academic successes. It is still the case that the bulk of online courses continue to depend mostly on passive information delivery methods, which are not effective in enhancing higher-order thinking abilities. Despite the fact that the advantages of carrying out these procedures have been demonstrated, this is the case. Because of the existence of this gap, it is absolutely necessary for cognitive concepts to be included into virtual worlds through the use of conscious instructional design. This is because the necessity to do so is brought home by the fact that this gap exists. In order for online education to be successful, student autonomy and self-regulated learning have emerged as crucial components that must be present. Consequently, this underscores the necessity of providing support for cognitive activity that is independent. Moreover, throughout the course of the past few years, there has been a consistent increase in the number of individuals who are participating in online classes (Zhang et al., 2021).

## RESEARCH QUESTIONS

What is the impact of course design on enhancing cognitive pedagogy principles?

# RESEARCH METHODOLOGY

## RESEARCH DESIGN

The quantitative data analysis used SPSS version 25. The odds ratio and 95% confidence interval were used to determine the degree and direction of the statistical association. The researchers established a statistically significant criteria at $p < 0.05$. A descriptive analysis was conducted to identify the main features of the data. Quantitative methods are often used to assess data collected via surveys, polls, and questionnaires, as well as data altered by computing tools for statistical analysis.

## SAMPLING

A convenient sampling technique was applied for the study. The research relied on questionnaires to gather its data. The Rao-soft program determined a sample size of 80. A total of 120 questionnaires were distributed; 112 were returned, and 16 were excluded due to incompleteness. In the end, 96 questionnaires were used for the research.

## DATA AND MEASUREMENT

The primary method of collecting data for research was questionnaire surveys. In section A, participants were requested to provide fundamental demographic data; in section B, they were instructed to evaluate the significance of many channels, both online and offline, using a 5-point Likert scale. A diverse array of secondary sources, including online databases, was meticulously examined to get the necessary information.

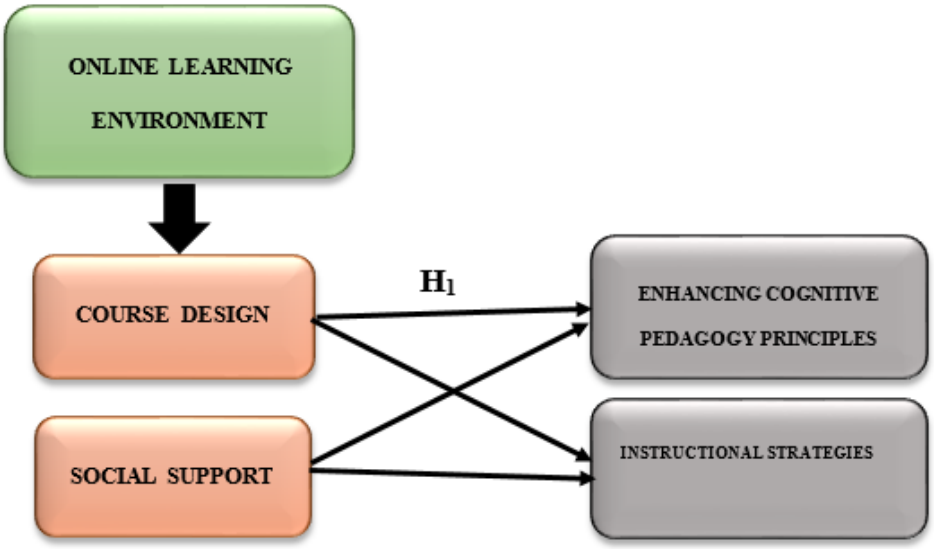
## STATISTICAL SOFTWARE

The statistical analysis was conducted using SPSS 25 and MS-Excel.

## STATISTICAL TOOLS

To grasp the fundamental character of the data, descriptive analysis was used. The researcher is required to analyse the data using ANOVA.

## CONCEPTUAL FRAMEWORK




## RESULT

**Factor Analysis**: One typical use of Factor Analysis (FA) is to verify the existence of latent components in observable data. When there are not easily observable visual or diagnostic markers, it is common practice to utilise regression coefficients to produce ratings. In FA, models are essential for success. Finding mistakes, intrusions, and obvious connections are the aims of modelling. One way to assess datasets produced by multiple regression studies is with the use of the Kaiser-Meyer-Olkin (KMO) Test. They verify that the model and sample variables are representative. According to the numbers, there is data duplication. When the proportions are less, the data is easier to understand. For KMO, the output is a number between zero and one. If the KMO value is between 0.8 and 1, then the sample size should be enough. These are the permissible boundaries, according to Kaiser: The following are the

acceptance criteria set by Kaiser: A pitiful 0.050 to 0.059, below average 0.60 to 0.69

Middle grades often fall within the range of 0.70-0.79.

With a quality point score ranging from 0.80 to 0.89.

They marvel at the range of 0.90 to 1.00.

Testing for KMO and Bartlett's Sampling Adequacy Measured by Kaiser-Meyer-Olkin 0.79

The results of Bartlett's test of sphericity are as follows: approx. chi-square

df=190

sig.=.000

This establishes the validity of assertions made only for the purpose of sampling. To ensure the relevance of the correlation matrices, researchers used Bartlett's Test of Sphericity. Kaiser-Meyer-Olkin states that a result of 0.79 indicates that the sample is adequate. The p-value is 0.00, as per Bartlett's sphericity test. A favourable result from Bartlett's sphericity test indicates that the correlation matrix is not an identity matrix.

**Table 1: KMO and Bartlett's Test.**

| KMO and Bartlett's Test | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure Of Sampling Adequacy. | | 0.79 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1171.54 |
| | Df | 231 |
| | Sig. | 0.000 |
| a. Based on correlations | | |

The first stage in exploratory factor analysis (EFA) is to ascertain the data's appropriateness for factor analysis. Kaiser advised postponing factor analysis until a sample adequacy coefficient over 0.5 is achieved, as shown by the KMO (Kaiser-Meyer-Olkin) measure. The KMO value derived from the data used in this analysis is 0.79. Bartlett's test of sphericity yielded a significant result of 0.00.

**INDEPENDENT VARIABLE**

**Online Learning Environment:** An online learning environment is, one description of a digital platform or ecosystem created especially to enable teaching and learning by means of technology used online. Regardless of their geographical location, teachers and students may collaborate, exchange ideas, and assess one another in a controlled and interesting setting with the aim of learning and instruction. Usually these environments are created using Learning Management Systems (LMS) such as Google Classroom, Moodle, or Blackboard. These systems offer video conferences, discussion forums, quizzes, e-books, electronic books, multimedia materials, and virtual labs among other capabilities. Good online courses are meant to inspire active participation, intellectual development, and real contact among students in addition to providing them with the course materials. In their classes, they use adaptive materials, self-paced courses, group projects, and real-time feedback among other active learning tools. They are not only significant as they satisfy a broad spectrum of learning styles and needs but also offer flexibility in terms of when, where, and how education is administered. Participating in an online learning environment applying ideas from cognitive pedagogy and instructional design can help to develop critical thinking, problem-solving, and metacognition abilities. If done right, it offers students access to resources from all across the world, lets them tailor their educational experience, and lets them engage with the content in a way that is like to that of a conventional classroom, therefore improving their education. Particularly in cases when students have to enrol in hybrid or online courses, it is rather crucial in the modern classrooms (Zawacki-Richter et al., 2020).

**FACTOR**

**Course Design:** Course design is the act of carefully preparing, arranging, and organising the components of a learning process in order to assist an individual in achieving certain educational objectives. Students are guaranteed to gain the necessary information, abilities, and competences if the learning goals, teaching methodologies, evaluation criteria, and course materials are all aligned in a deliberate manner. A well-crafted course takes into account the requirements of the students, the relevance of the content, and the kind of teaching (in-person, online, hybrid, etc.) in light of the most recent research and the most effective methods in the field of education. Each and every other component of a well-designed course need to be directed by learning objectives that are both clearly stated and quantifiable. Before settling on a particular method of education, it is important to keep in mind how it was influenced the students' levels of motivation, participation, and cognitive processes. By directing the development of both formative and summative assessments, these objectives serve as a roadmap for evaluating the performance of students and identifying areas in which teachers may demonstrate improvement. In addition, accessibility, engagement, and flexibility are taken into consideration throughout the design of the course in order to accommodate a wide range of students. Course design is much more significant in

online learning since it involves extensive training on how to utilise digital technologies to mimic or enhance the pedagogical advantages of in-person encounters. This is because online learning is a relatively new form of education. Among the tools that are included in this category are self-paced learning courses, online forums, feedback systems, and multimedia materials. An effective course design seeks to create learning experiences that are not just meaningful but also clear, entertaining, and outcome-driven (Bozkurt & Sharma, 2020).

**DEPENDENT VARIABLE**

**Enhancing Cognitive Pedagogy Principles:** Thus, "improving cognitive pedagogy principles" is the process of implementing and supporting instructional tactics that line up with the ways in which students learn, process, and apply knowledge. Keystones on which cognitive pedagogy is based include memory, attention, perception, reasoning, and problem-solving. Cognitive psychology is where this method of learning first emerged. It is important to deliberately design learning environments that support critical thinking, in-depth knowledge, and metacognitive awareness enhancement with the aim of strengthening these ideas. Cognitive pedagogy consists mostly of concept mapping, active learning, scaffolding, retrieval practice, feedback, and self-explanation. These strategies come from studies meant to support cognitive development and academic performance. By stressing these ideas, teachers may create learning environments that inspire students to participate in critical thinking, investigate information, and apply what they have learnt in real-world contexts. Modern classrooms, cognitive pedagogy, and especially online learning depend on the deliberate application of technologies, interactive materials, and approaches focussed on the student to enhance them. Included are the provision of chances for self-regulated learning, the use of flexible content, and the support of group projects inside the framework of this situation. The main determinant of the nature of instructional design is the evolution of ideas related to cognitive pedagogy. Improved understanding, more cognitive involvement, and higher learning performance follow from this in turn (Bond et al., 2021).

**Relationship Between Course Design and Enhancing Cognitive Pedagogy Principles:** There is a major relationship between the ideas of enhancing cognitive pedagogy and the design of courses, and both of these notions are beneficial to one another. In order to properly execute the ideas brought forward by cognitive pedagogy, it is very necessary to have courses that have been carefully planned. It is feasible for a course that has been prepared with careful consideration to combine efficient cognitive processes for learning, critical thinking, and the ability to recall knowledge. The way in which students acquire, organise, and apply the knowledge that they have gained is the primary focus of cognitive pedagogy, which places an emphasis on the manner in which one learns. During the process of establishing the course design, it is essential to make use of fundamental ideas like scaffolding, active learning, metacognition, and feedback in order to ensure that the course

design is effective (Wong, 2019). For educators, the capacity to properly arrange learning activities, apply effective methods of instruction, and connect assessments to cognitive objectives is made possible via the utilisation of strategic course design. It is possible to guarantee that cognitive engagement is not an afterthought but rather an important part of the learning process by incorporating inquiry-based exercises, reflection prompts, and idea mapping directly into the course modules. This is one way that may be utilised. When it comes to hybrid and online classrooms, having courses that are well-designed is becoming an increasingly critical factor. When it comes to simulations of cognitive interaction, the use of digital tools and platforms is absolutely necessary. Learning that is collaborative, learning pathways that are adaptable, and interactive multimedia are all examples of these types of learning. This is in the event that the expectations are not met. The principles of cognitive pedagogy need to be put into practice through the implementation of efficient course design in order to ensure that teaching does more than simply impart information; rather, it actively promotes cognitive development and learner autonomy (Veletsianos & Houlden, 2020).

Based on the above discussion, the researcher generated the following hypothesis to examine the link between Course Design and Enhancing Cognitive Pedagogy Principles.

**$H_{01}$: There is no significant relationship between Course Design and Enhancing Cognitive Pedagogy Principles.**

**$H_1$: There is a significant relationship between Course Design and Enhancing Cognitive Pedagogy Principles.**

**Table 2: $H_1$ ANOVA Test.**

| ANOVA | | | | | |
|---|---|---|---|---|---|
| **Sum** | | | | | |
| | **Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
| **Between Groups** | 39588.620 | 10 | 5385.289 | 967.533 | .000 |
| **Within Groups** | 492.770 | 86 | 5.566 | | |
| **Total** | 40081.390 | 96 | | | |

In this study, the result is significant. The value of F is 967.533, which reaches significance with a p-value of .000 (which is less than the .05 alpha level). This means the **"$H_1$: There is a significant relationship between Course Design and Enhancing Cognitive Pedagogy Principles."** Is accepted and the null hypothesis is rejected.

## DISCUSSION

With reference to the course design primarily, this study aimed to evaluate the impact of an online learning environment on the improvement of cognitive pedagogy principles and instructional strategies. The results show that a well-organised online course using ideas of cognitive pedagogy might significantly raise learners' cognitive involvement as well as their critical thinking and general degree of instruction quality. It became abundantly evident that the degree to which cognitive ideas are effectively included into online learning depends on the course design. Using scaffolding, interactive materials, formative assessments, and self-regulated learning tools, learners were guided in actively processing and using knowledge. These are being applied in line with cognitive pedagogy's ideas of learner autonomy, mental effort, and metacognitive awareness—that which stresses learner autonomy. When instructional strategies like feedback, reflection, and group projects were deliberately included into the course of the class, students showed stronger degrees of involvement and a deeper knowledge of the material. The studies support the corpus of current knowledge stressing the requirement of including deliberate instructional design into online environments to ensure significant learning opportunities. This comment underlines that the shift to digital education has to include not just the digitisation of knowledge but also the alignment of instructional strategies supporting good cognitive development. Teachers, instructional designers, and educational institutions should not overlook the broad implications of these findings for them. By giving cognitive ideas more importance during the course of course design, stakeholders may increase the effectiveness of education and the outcomes for students in online settings. Furthermore, underlined by the research is the need of continuous assessment and iterative design of online courses to ensure that they remain in line with the always shifting cognitive frameworks and educational criteria. Future studies should assess the long-term effects of cognitive-based design throughout a broad spectrum of topic areas and learner groups in order to enhance cognitive pedagogy in digital learning environments even further. Furthermore, research on the incorporation of fresh technologies such adaptive learning systems and artificial intelligence should be done.

## CONCLUSION

Emphasising course design, this study aimed to find how the ideas of cognitive pedagogy and teacher competencies developed inside the framework of an online learning environment. The results of this study emphasise the need of theory-driven and deliberate course design to increase the efficacy of instruction in online learning environments. Online learning transforms into a dynamic environment that promotes deeper thinking, problem-solving, and the creation of new knowledge when course materials line with the ideas of cognitive pedagogy—which include active learning, scaffolding, reflective practices, and learner autonomy. This helps to assist these goals by means of bettering the arrangement of the course's employed resources. The results of the study show that students who incorporate cognitive notions into

the framework and flow of the course are more likely to interact with the material of the course and gain higher-order thinking ability. Furthermore, crucial for the improvement of cognitive function was the inclusion of pertinent teaching strategies like formative feedback, interactive discussions, and group learning inside the course framework. This makes it abundantly evident that the design of a course serves both a pedagogical and a technological goal, which in turn affects the viewpoint of students and the learning process inside them.

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