To What Extent Do Digital Learning Platforms Impact The Learning Experience And Academic Performance Of UTAR FICT Students

By

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ABSTRACT

This research examines the extent to which online learning websites impact the learning process and academic performance of university students based on the Self-Determination Theory (SDT). As development in online learning continues to grow, understanding psychological and academic effects of such online websites has become more important. Three separate SDT constructs—autonomy, competence, and relatedness—were employed, and learning experience as the mediator variable, with academic performance as the dependent variable. Quantitative research design was employed, with a standardized questionnaire completed by 210 undergraduate students at the Faculty of Information and Communication Technology (FICT), Universiti Tunku Abdul Rahman (UTAR).

Data collection and analysis were conducted using SPSS software, using descriptive and inferential methods. Descriptive statistics like mean, standard deviation, skewness, and kurtosis were used to evaluate data distribution and central tendencies. Internal consistency greater than 0.70 in Cronbach's Alpha confirmed the reliability of measurement constructs. Pearson correlation analysis indicated significant correlations between variables. Multiple regression analysis was used to derive the predictive power of autonomy, competence, and relatedness to academic performance. Additionally, moderated regression analysis was used to quantify the impact of learning experience on these relationships as well as including interaction terms for testing its moderation effect.

The study revealed that autonomy, competence, and relatedness are positively associated with the learning experience of the students that, consequently, affect the academic performance positively. The study concludes that, when online learning environments are being designed to serve the psychological needs of the learners, they may improve academic achievement and engagement in students. These conclusions are valuable for teaching faculty and institutions to reaffirm student support systems and online learning approaches at the university level.

Area Of Study : Digital Learning Platform & Educational Psychology

Keywords : Self-Determination Theory, Online Learning, Learning Experience, Academic Performance, University Students

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LIST OF SYMBOLS

β	beta
r	correlation coefficient
R^2	(R-squared) - coefficient of determination
p	p-value

LIST OF ABBREVIATIONS

SDT	Self-Determination Theory
EFA	Exploratory Factor Analysis
DLP	Digital Learning Platform

CHAPTER 1: PROJECT BACKGROUND

1.1 Introduction

In recent years, there has been an acute increase in the adoption of information and communication technologies (ICT) in institutions of higher learning, primarily through the adoption of digital learning platforms. These platforms have grown very fast, especially with respect to higher education. They are designed to support student learning, enhance teaching methods, and aid faculty members in teaching. The onset of the pandemic of COVID-19 also hastened the reliance on digital channels for e-learning, compelling institutions of learning around the world to shift fast into online pedagogical and learning methods [1].

Online platforms are precious training resources, offering a variety of features that allow synchronous and asynchronous communication and interaction among and between students and teachers. Blackboard, Moodle, Canvas, and Google Classroom are common examples. Such platforms are precious because of their convenience, flexibility, interactive capabilities, and the provision to generate reports and statistics on student performance [2].

Central to the effectiveness of digital platforms is their adaptability to the specific requirements and needs of teaching and learning. Among these platforms, Blackboard stands out for its user-friendly interface, robust interaction capabilities, and comprehensive support for various educational tasks, including assessment, content delivery, and collaborative activities.

Key characteristics shared by digital platforms include active learner participation, positive engagement with learning materials, flexibility, scalability, and versatility. They offer a wide array of functionalities, including assessment tools, assignment management, feedback provision, content delivery, interactive resources, discussion forums, live chat, and video conferencing.

Moreover, digital platforms play a crucial role in fostering sustainable education by motivating students to pursue continuous learning, facilitating collaborative knowledge construction, nurturing independent learning skills, and promoting overall well-being. These platforms support cognitive development, motivation, and achievement, aligning with the principles of sustainable education [2].

Despite the growing body of research on the influence of digital platforms on learning outcomes, evidence remains inconclusive. While some research records positive learning outcome impacts, particularly in the period leading up to and during the COVID-19 pandemic, others record no noticeable learning gain. This lack of conclusiveness identifies the complexity of quantifying the efficacy of digital platforms to enhance learning experiences and academic performance of university students.

1.2 Problem Statement and Motivation

The widespread integration of digital learning platforms within university settings prompts critical inquiries into their efficacy in enriching students' learning journeys and academic accomplishments [3]. While these platforms carry the potential to redefine educational paradigms, there exists a compelling need to comprehend their effects on university students. This research is propelled by the urgency to examine the degree to which digital learning platforms influence the learning experience and academic performance of university students across diverse academic disciplines.

1.2.1 Motivation

The impetus for this investigation originates from the escalating importance of digital learning platforms in higher education and the essential task of evaluating their capacity to cater to the needs of university students [4]. By comprehending the possible advantages and obstacles linked with these platforms, educators and policymakers can formulate well-informed strategies to enhance the educational landscape for students.

1.3 Research Objectives

This study aims to accomplish the following objectives:

i. To investigate how digital learning platforms shape the learning experiences of university students across various academic disciplines.
ii. To determine the correlation between the utilization of digital learning platforms and the academic performance of university students.
iii. To assess the extent to which digital learning platforms fulfil the psychological needs, such as autonomy, competence, and relatedness, of university students as proposed by Self-Determination Theory (SDT).

iv. To identify the potential challenges and limitations associated with the implementation of digital learning platforms in higher education, and to analyses their impact on students' learning experiences and academic achievements.

1.4 Project Scope and Direction

The aim of this project is to carry out a comprehensive examination of the relationship between digital learning platforms and the learning outcomes of university students. The study will incorporate an examination of students from diverse study fields to ensure a comprehensive understanding of the breadth and depth of the topic. By incorporating various fields of study, the study attempts to consider the subtle way in which digital learning platforms influence students' learning experiences and academic achievements [5].

Furthermore, the project will address how online learning platforms contribute to satisfying students' psychological needs as outlined by Self-Determination Theory (SDT). This entails investigating the extent to which online learning platforms help in fulfilling students' autonomy, competence, and relatedness needs, as well as how these needs influence students' intrinsic motivation and overall academic performance [5].

Moreover, the research will analyze the potential challenges and limitations of the utilization of digital learning platforms in university learning [6]. By identifying and analyzing these obstacles, the research will provide insight into how they affect the learning experience and academic performance of the students. This will enable a comprehensive exploration of the different ways in which digital learning platforms affect university students.

1.5 Hypotheses Development

H1: Digital learning platforms that support autonomy positively influence academic performance.

H2: Digital learning platforms that support competence positively influence academic performance.

H3: Digital learning platforms that support relatedness positively influence academic performance.

H4a: Autonomy is positively associated with academic performance.

H4b: Competence is positively associated with academic performance.

H4c: Relatedness is positively associated with academic performance.

H5: Learning Experiences moderate the relationships between autonomy, competence, relatedness, and academic performance, such that these relationships are stronger when learning experiences are more positive.

1.6 Contributions

This study seeks to add to the existing body of knowledge by providing empirical evidence of the effects of digital learning platforms on the learning experience and academic performance of university students [4]. With in-depth study, this study strives to provide valuable information that can inform teaching practice and educational policy. The findings will facilitate the development of strategies for the aim of optimizing the integration of digital technology in universities, ultimately enhancing the learning experience of university students.

1.7 Chapter Summary

In summary, this study aims at closing the gap in existing literature on how digital learning platforms shape the learning experience and academic performance of university students. Through a comprehensive examination of the relationship between digital technology and student performance, this research aspires to provide meaningful contributions to educators, policymakers, and stakeholders in higher education towards enhancing the learning environment for university students.

CHAPTER 2: LITERATURE REVIEW

2.3 Introduction

This chapter is a comprehensive review of the research literature that is most directly relevant to this research. The research explores the complicated landscape of online learning platforms and their impact on the university student experience and their academic achievement. The literature review provides a critical overview of existing research, academic literature, and theoretical frameworks that are relevant to the research problem and fundamental questions.

2.4 Existing Literature

2.3 *The relationship between digital learning and academic achievement.*

There is a complex relationship between online learning in higher education and students' academic performance. Several studies demonstrate positive effects:[7], for example, found the flipped classroom model to enhance both self-efficacy and overall performance. [8] Halabi et al. (2014) demonstrated a positive relationship between online time and improved course grades and this corroborates those who associate student satisfaction with online learning with academic performance that is good. Similarly, [9] highlight the position of self-efficacy and motivation in determining the benefits of online discussion and course engagement.

Further examination of these relationships demonstrate a positive, though moderate, correlation between online module participation and final learning activity performance [10]. Emphasizes the need for instructional strategies promoting cross-cultural collaboration in online settings [11]. Report success using online assessment tools [12]. Detail technology-driven improvements to online learning to create dynamic learning experiences [13].

Data analysis studies offer additional insights, found a relationship between online activities and assessment results [14], while notes the predictive value of combined online and traditional data when assessing performance [15]. Studies focusing on student interaction and LMS use [16],[17] also link these factors to academic outcomes. [18] point to the promise of personalized interventions within blended learning environments.

Engagement within online communities also appears to play a role, as shown in [19]. Several studies [20]; [21] confirm how positive online attitudes and readiness can influence student

motivation. Examining different learner populations, both [22] and [23] establish links between inquiry-based frameworks and student satisfaction, online performance, and overall achievement. [24] highlights the importance of online orientations for student success and persistence. Comparative studies like [25] and [26] further suggest that online and flipped approaches often yield better academic results than traditional methods.

Additional factors, such as life satisfaction, social identity [27] student development in academic writing [28], and learner ethnicity [29]; [30] have all received attention within this field.

However, online learning is not without its critics. Studies like [31] and [32] note that online formats can lead to lower performance than in-person classes. Similarly, [33] observed lower motivation levels among online learners.

2.3 *Digital Learning and Its Influence on Student Learning Experiences*

Research has indicated that e-learning is a significant addition to the general learning experience of students in universities. [34] establish a positive relationship between the application of e-learning systems like Moodle and student performance as well as satisfaction. Furthermore, Wei and [35] demonstrate that students' technology familiarity and motivation are the most significant predictors of successful online discussion and course satisfaction. Development of online communities through enhanced student involvement and comprehensive digital orientations can successfully promote student experience in online spaces [36] & [37].

Studies by [38] along with [39] suggest a strong correlation between digital learning, student satisfaction, and how those students perceive their overall learning outcomes. [40] further reinforce this finding, noting that student motivation is highly connected to positive online learning experiences.

Library and information science courses, as shown by [41] and [42] offer the potential to enhance motivation and student attitudes through interactive digital components. [43] provide evidence that online learning often generates high student satisfaction across various demographic groups, a finding supported by [44].[45] emphasizes the importance of how students interact with digital learning content and how their self-efficacy within that environment significantly impacts both their satisfaction and their perception of what they've

learned. While these studies highlight many positives, it's important to acknowledge that some research offers a more nuanced perspective. [46] found little difference in satisfaction between online and face-to-face courses. [47] suggest that, in some cases, students preferred the traditional classroom environment.

2.3 Limitations of Existing Literature

While the body of research suggests a significant connection between digital learning platforms and students' learning experiences and academic performance, certain limitations must be acknowledged. Firstly, the focus on quantitative correlations or comparisons between online and traditional learning may not fully capture the nuances of individual experiences within digital settings. The emphasis on factors like self-efficacy and motivation, while important, could benefit from deeper qualitative exploration into how students understand and navigate these elements within digital learning contexts. Additionally, while some studies examine specific technologies or platforms, a more comprehensive understanding of how the design and features of different digital learning platforms impact student outcomes is needed. Lastly, the relative focus on student satisfaction can be expanded to include in-depth analysis of how digital platforms directly support knowledge acquisition, skill development, and critical thinking within specific disciplines.

2.4 Conceptual Framework

Figure 2.4 illustrates the revised conceptual model of this study, indicating the interrelationships between Digital Learning Platforms and their impacts on Academic Performance (DV), grounded in Self-Determination Theory (SDT). The model emphasizes that digital platforms support three universal psychological needs—Autonomy, Competence, and Relatedness—that have a direct influence on academic performance.
The moderating variable that this model includes is Learning Experiences, as it affects the strength of association of each psychological need with academic performance. In this framework, the interactive effects between student motivation, online platforms, and academic success are captured by placing the moderator on each direct association between the independent variables and the dependent variable.

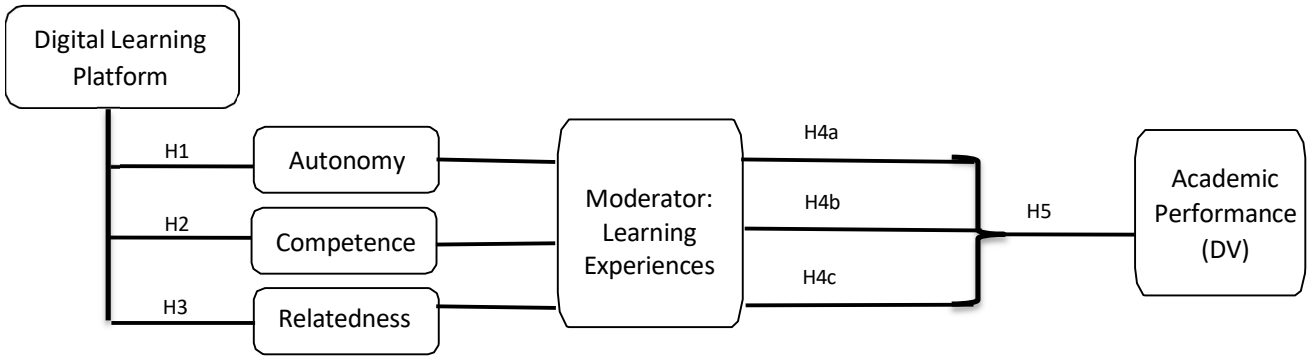

Figure 2.4: Conceptual Framework

This conceptual model is grounded in Self-Determination Theory (SDT), which argues that autonomy, competence, and relatedness satisfaction fosters motivation and academic achievement. In this theory**:**

1. **Digital Learning Platform (DLP):**
    - Digital learning platforms are central to modern university education. They serve as the main environment where students access learning materials, submit assignments, engage in discussions, and receive feedback. Features such as real-time assessments, asynchronous video modules, and communication tools are designed to stimulate intrinsic motivation by fulfilling psychological needs.
    - For instance, platforms may allow learners to self-pace through video lessons, collaborate with peers, or monitor their progress, aligning with SDT components and promoting autonomy, competence, and relatedness.

2. **Autonomy:**
    - The DLP enhances autonomy by giving students control over aspects such as learning pace, topic choices, and preferred content formats (e.g., videos, text, simulations).
    - **Definition:** In digital settings, autonomy reflects the level of control and volition students experience in their learning journey. SDT posits that autonomy leads to increased engagement, persistence, and academic creativity [48].
3. **Competence:**
    - Students experience competence when they overcome academic challenges and receive affirming feedback. DLPs support this through instant quiz feedback, visible progress indicators, and scaffolded tasks.
    - **Definition:** Competence refers to students' belief in their academic abilities. When digital platforms provide adaptive feedback and clear guidance, students become more confident and motivated [49].
4. **Relatedness:**
    - Relatedness is fulfilled when students feel connected to others in their academic environment. DLPs facilitate this through features like live discussions, peer collaboration, and instructor interaction.
    - **Definition:** Relatedness is the need for belonging and meaningful relationships. Platforms that enable supportive interactions and peer feedback help students feel part of a community, enhancing their engagement [50].
5. **Learning Experiences (Moderator – H5):**
    - Learning Experiences act as a **moderating variable**, influencing the strength of the relationship between autonomy, competence, and relatedness on academic performance.
    - These experiences include enjoyment, engagement, interest, and relevance of the learning process. Students who report high-quality learning experiences are more likely to translate motivational benefits into improved academic performance.
    - In this framework, Learning Experiences **moderate** the effects of **Autonomy → Performance (H4a)**, **Competence → Performance (H4b)**, and **Relatedness → Performance (H4c)**.

6. **Academic Performance (DV):**
    - Academic performance is the final outcome and includes measures such as GPA, exam scores, assignment grades, and course completion.
    - High performance is theorized to stem from the satisfaction of psychological needs, facilitated by the DLP, and **amplified when positive learning experiences are present**.

2.4 Specific Hypotheses Development

- **H1:** Digital learning platforms that support autonomy positively influence academic performance.
  Students with more control over their learning are likely to demonstrate higher motivation and outcomes.
- **H2:** Digital learning platforms that support competence positively influence academic performance.
  Students who feel confident and capable are more likely to succeed academically.
- **H3:** Digital learning platforms that support relatedness positively influence academic performance.
  A sense of belonging and support enhances learning engagement and persistence.

- **H4a:** Autonomy is positively associated with academic performance.
  Students who feel in control of their learning process tend to be more persistent, motivated, and academically successful.
- **H4b:** Competence is positively associated with academic performance.
  Students who believe in their ability to master tasks are more likely to approach challenges positively and achieve better results.
- **H4c:** Relatedness is positively associated with academic performance.
  A strong sense of connection with peers and instructors fosters deeper engagement and academic commitment.

- **H5:** Learning Experiences moderate the relationships between autonomy, competence, relatedness, and academic performance, such that these relationships are stronger when learning experiences are more positive.
  Students with enriching, engaging learning experiences benefit more from psychological need satisfaction.

2.6 Chapter Summary

This chapter presents a refined conceptual framework integrating Self-Determination Theory with digital learning dynamics in higher education. The inclusion of Learning Experiences as a moderating variable enhances the model's depth, acknowledging that not all environments that support autonomy, competence, and relatedness will automatically result in academic gains, **it depends on the quality of the learner's experience**.

The revised framework proposes that effective digital learning environments must do more than just provide resources—they must create meaningful, engaging, and motivational experiences that translate psychological needs into measurable academic performance. Future chapters will empirically examine these hypotheses and provide evidence-based insights for educators and digital platform developers.

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CHAPTER 3: RESEARCH METHODOLOGY

Introduction

This chapter shall elaborate on the methods of conducting research in this study for the purpose of gaining information. We shall explain the whole research design, participant recruitment, data collection approaches, the method of how different concepts were measured, and instruments utilized for analyzing findings.

3.1 Instrument Design

In research methodology, data collection instruments can be generally classified into subject-completed instruments. The selection between these instruments is based on the type of research questions, the purpose of the study, and the level of depth and reliability desired for the data [51].

3.1.1 Subject-Completed Instruments

Subject-completed instruments are those completed by the participants themselves without the direct involvement of the researcher during the data collection process. These include questionnaires, self-report surveys, diaries, and standardized tests that participants fill out independently [51].

Advantages:

Scalability: Subject-completed instruments can be distributed to large numbers of participants simultaneously, making them ideal for large-scale studies.

Participant Comfort: Participants may feel more comfortable and open when filling out surveys or questionnaires on their own, leading to more honest and reflective responses.

Efficiency: This method reduces the need for researcher time and effort in data collection, allowing for more extensive data collection within a shorter period.

3.1.2 Application in the Current Study

For the current study on the impact of online learning platforms on university students, subject-completed instruments—questionnaires—were chosen as the primary data collection instrument [52]. This was due to a variety of reasons:

Large Sample Size: The study involves 300 students from UTAR Kampar, making it impractical to use researcher-completed instruments like interviews or observations.

Need for Standardized Data: The use of standardized questionnaires ensures that all participants respond to the same set of questions in a consistent format, facilitating easier comparison and statistical analysis of the data.

Autonomy of Respondents: Given the study's focus on digital platforms, it's fitting that participants complete the questionnaire independently, reflecting their autonomous interactions with digital tools.

3.1.3 The Design of Subject-Completed Instruments

Questionnaire Construction: The questionnaire used in this study was constructed carefully to meet the research objectives and hypotheses. It included closed-ended questions, which allowed for easy quantification of response, as well as open-ended questions, which provided deeper understanding of students' experiences and challenges on digital learning platforms. The construction involved some key steps [53]:

1. **Item Generation:** Questions were developed based on the literature review, theoretical framework (Self-Determination Theory), and specific hypotheses of the study.
2. **Pilot Testing:** The questionnaire was pilot tested to assess its reliability and validity, as discussed in section 3.3.2. Adjustments were made based on pilot feedback to ensure clarity and effectiveness.
3. **Final Implementation:** After refinement, the final draft of the questionnaire was given to the study participants.

3.2 Study Design

3.2.1 Study Sample Size

For this study, have selected a sample size of **300 university students** specifically from the **Faculty of Information and Communication Technology (FICT)** at **Universiti Tunku Abdul Rahman (UTAR), Kampar campus**. This sample size is justified based on the following detailed considerations [54] & [55]:

1. **Faculty-Specific Population Representation:**

   The Faculty of Information and Communication Technology (FICT) at UTAR Kampar offers a variety of undergraduate programs, including:

   Bachelor of Computer Science (Honours) (CS)
   Bachelor of Information Systems (Honours) Business Information Systems (IB)
   Bachelor of Information Systems (Honours) Information Systems Engineering (IA)
   Bachelor of Information Technology (Honours) Computer Engineering (CT)
   Bachelor of Information Technology (Honours) Communications and Networking (CN)
   Bachelor of Information Systems (Honours) Digital Economy Technology (DE)
   Bachelor of Information Technology (Honours) Industrial Intelligent Systems (IR)

   According to the latest data from UTAR's official resources, FICT has an enrolment of approximately **2,500 students** across these various ICT-related courses (Universiti Tunku Abdul Rahman, 2024). A sample size of 300 students, representing **12%** of the total FICT student population, ensures that the findings can be generalized to the broader ICT student body within UTAR Kampar.

2. **Coverage of Diverse Academic Programs:**

   By selecting 300 students, the study includes participants from each of the aforementioned programs, ensuring a comprehensive representation of the faculty. This diversity is critical for understanding how digital learning platforms impact students in both technical and management-focused ICT courses. For instance, students in the **Bachelor of Computer Science** program might have different experiences with digital

learning tools compared to those in the **Bachelor of Information Systems Engineering** program due to the nature of their coursework and learning requirements.

3. **Statistical Power and Subgroup Analysis:**

   A sample size of 300 is statistically robust enough to detect significant effects of digital learning platforms on students' learning experiences and academic performance within the ICT domain. This sample size also permits subgroup analyses based on different criteria, such as year of study (freshman, sophomore, junior, senior), gender, or prior exposure to technology, without compromising the study's overall power. Such analyses can reveal nuanced differences in how digital learning tools are utilized and perceived by various student groups within the faculty [56].

4. **Feasibility and Logistical Considerations:**

   Conducting a survey with 300 students from FICT is logistically feasible and resource-efficient. Focusing on FICT allows for targeted data collection using faculty-specific channels, such as internal email lists, course-related announcements, and faculty-managed online platforms. This focused approach ensures higher response rates and better data quality, as students within a single faculty are likely to share common schedules and academic pressures [57].

5. **Comparative Analysis with Broader Studies:**

   In educational research, sample sizes for studies focused on digital learning environments typically range from **100 to 500 participants**. By choosing a sample of 300 students specifically from FICT, our study aligns with this standard while providing a more detailed examination of a specific academic field. This approach enables a deeper understanding of how digital learning platforms impact students in technology-related disciplines, which can be compared with findings from broader or more general studies [58].

6. **Rationale for Faculty Selection:**

   The decision to focus on FICT students is driven by the faculty's significant involvement with digital tools and platforms. As ICT students are typically more

engaged with technology, they offer valuable insights into the effectiveness and challenges of digital learning environments. Their feedback is likely to be more informed, providing rich data that can enhance the study's findings and contribute to the development of more effective digital learning strategies within the faculty and beyond [59].

By concentrating on a sample size of 300 students from the Faculty of Information and Communication Technology at UTAR Kampar, this study aims to generate reliable and specialized insights into the impact of digital learning platforms on university students within a technology-driven academic environment.

3.2.2 Data Collection Technique

This study will use exclusively the deployment of questionnaires in collecting primary data so that the information collected will be of direct applicability and specificity to the research objectives. Questionnaires are a useful tool in education research, particularly in investigating students' experience with e-learning platforms. Through rigorously designed questionnaires, this study can get systematically a wide range of students' attitudes, behaviors, and perceptions towards these platforms.

Questionnaire Design and Implementation:

The questionnaires will include closed and open-ended questions. Closed questions will allow for quantification of student responses to facilitate simpler analysis of patterns and trends in the sample. The questions will cover various aspects of digital learning, such as usability, satisfaction, perceived effectiveness, and impact on academic performance. Open-ended questions will enable respondents to express their opinions more elaborately, offering more insight into their personal experiences and problems with digital learning platforms.

Best practices in survey research will guide the design of the questionnaire to optimize clarity, relevance, and ease of response [60]. In order to increase the reliability and validity of the data to be gathered, the questionnaire will be pre-tested on a small group of students. This will uncover question wording ambiguities or issues, allowing revisions before large-scale data gathering.

Importance of Primary Data:

The collection of primary data through questionnaires is of paramount importance for several reasons:

1. **Context-Specific Insights:** Primary data collected directly from UTAR Kampar students will provide results unique to this sample. In contrast to secondary data, which may be outdated or less relevant to the current scenario, primary data capture instantaneous experience and perception of the students. This is crucial in understanding the unique way online learning platforms are used in this particular learning environment [61].

2. **Targeted Information Gathering:** By designing the questionnaire to address specific research questions, the study ensures that all collected data is directly aligned with the study's objectives. This targeted approach enables the collection of rich, detailed data on how students interact with digital learning platforms, their satisfaction levels, and the challenges they face. This level of specificity is not achievable through secondary data sources [62].

3. **High Data Quality:** Primary data collected via questionnaires is highly reliable when proper survey design techniques are applied. Since the data is collected specifically for the study, it is free from the biases and limitations that might affect secondary data sources. Additionally, because the questionnaires are administered in a controlled environment, the study can ensure a high response rate and data completeness [61].

4. **Flexibility in Analysis:** The data collected through questionnaires can be analyzed in various ways to uncover different layers of insights. For example, quantitative analysis can identify general trends and patterns, while qualitative analysis of open-ended responses can provide deeper understanding of student experiences. This flexibility enhances the overall robustness of the research findings [61].

5. **Actionable Insights for Improvement:** Since the primary data is directly related to the research questions, the findings are more likely to yield actionable insights. Educational stakeholders, such as faculty and administrators, can use the results of this study to make informed decisions about how to improve digital learning platforms and address the specific needs and challenges of their students. This ensures that the research has a tangible impact on the educational practices at UTAR Kampar [63].

With its focus on primary data collection by using well-crafted questionnaires, this research aims to arrive at a deep and precise picture of how digital learning platforms are viewed and applied by students. The insights collected from the data will be pivotal in informing ways of enhancing the efficacy of digital learning in higher education.

3.3 Origin and Reform of Constructs Questionnaire

Author/Writer	Original Item	Revised Item	Aspect	Hypothesis
Ma, 2021 [65]	I feel that I have the freedom to choose what to study and how to engage with the content.	The platform allows me to choose topics and formats, enhancing my sense of autonomy in learning.	Autonomy	H1, H4a, H5
	The platform allows me to control the pace at which I learn.	I can control the pace of my learning through the platform, which helps me perform better when I enjoy the experience.	Autonomy	H1, H4a, H5
	I am encouraged to take initiative in my learning process.	I am encouraged to take ownership of my learning, especially when my engagement with the platform is high.	Autonomy	H1, H4a, H5
Haleem et al., 2022 [66]	I feel confident mastering the course material with the tools provided.	The tools on the platform help me feel capable and improve my academic performance, especially when I feel interested.	Competence	H2, H4b, H5

	Feedback from the platform helps me identify my strengths and weaknesses.	Feedback helps me identify what I'm good at or need to improve, which motivates me more when the learning is enjoyable.	Competence	H2, H4b, H5
	I feel equipped to complete tasks successfully.	I feel I have the skills to complete my tasks successfully, more so when I find the platform engaging.	Competence	H2, H4b, H5
	I understand better when I get timely and relevant feedback.	Timely feedback enhances my ability to learn, particularly when my learning experience is positive.	Competence	H2, H4b, H5
Zainuddin & Perera, 2017 [67]	I feel connected to my classmates and instructors.	I feel connected to others through the platform, which contributes to better academic performance when I enjoy the learning process.	Relatedness	H3, H4c, H5
	I feel part of a learning community.	Being part of a learning community on the platform increases my motivation and academic engagement.	Relatedness	H3, H4c, H5
	I engage in meaningful interactions with peers and	I interact meaningfully with peers and instructors via	Relatedness	H3, H4c, H5

	instructors.	the platform, especially when the experience is rewarding.		
	I feel emotionally supported through the platform's features.	I feel emotionally supported during learning, which helps me do better academically when I enjoy learning.	Relatedness	H3, H4c, H5
Martin & Bolliger, 2018 [64]	The e-learning platform I use is easy to navigate.	The platform is easy to use and supports my academic goals when the overall experience is enjoyable.	Learning Experience (Moderator context)	H5
	I can easily find what I need on the platform.	I can find resources easily, which helps me perform better when I am engaged with the content.	Learning Experience (Moderator context)	H5
	The platform allows effective communication with instructors.	The platform makes it easy to communicate with instructors, which supports academic success when my learning experience is strong.	Learning Experience (Moderator context)	H5

Table 3.3: Origin and Reform of Constructs Questionnaire

3.4 Measurement Method

3.4.1 Research Survey Form

In order to gauge the impacts of web-based learning sites on college students, a Likert scale questionnaire is highly effective. Specifically, a five-point Likert scale is chosen in this study as it balances the ease of usage with sufficient potency to gauge nuanced attitudes and perceptions. The scale offers five response options: *Strongly Disagree, Disagree, Neutral, Agree,* and *Strongly Agree* (as shown in the figure).

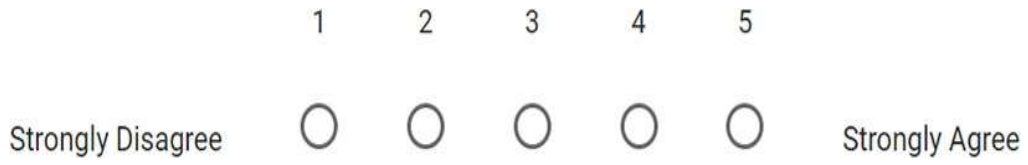

Figure 3.4.1: The Sample of Five-point Likert Scale

The Likert scale allows for a nuanced understanding of student experiences. It reveals not just whether they feel positively or negatively about digital learning, but also the intensity of those feelings. This data could offer valuable insights into the strengths, weaknesses, and potential areas for improvement within the digital learning platforms used at the university.

3.4.1.1 Importance of the Five-Point Likert Scale:

1. **Balanced Response Options:** The five-point Likert scale provides a middle ground (neutral option), which allows respondents who do not have strong opinions to express this, reducing the risk of forced choices. This middle option is particularly important in educational research, where students' experiences and opinions may not always fall into extreme categories.

2. **Ease of Use:** The five-point scale is straightforward and easy for respondents to understand and complete. This simplicity increases the likelihood of higher response rates and more reliable data, as respondents are less likely to be confused or frustrated by the survey process [68].

3. **Sufficient Sensitivity:** The scale provides enough granularity to distinguish between different levels of agreement or disagreement. This is crucial for identifying subtle differences in student attitudes toward digital learning platforms, which might be missed with a more limited scale [69].

4. **Comparative Analysis:** The five-point Likert scale is most commonly used in social science and educational research to allow one to compare results to other studies that exist. Furthermore, its extensive usage allows for the existence of large amounts of supportive studies that validate its ability to measure respondents' attitudes [70].

3.4.1.2 Comparison with Other Data Collection Methods

Method	Advantages	Disadvantages	Outcome Comparison
Five-Point Likert Scale	Simple to use, allows for a neutral response, provides quantifiable data that is easy to analyses.	May not capture the depth of student opinions as effectively as qualitative methods.	Effective in capturing the overall sentiment and quantifying student attitudes toward digital learning platforms.
Interviews	Allows for deep, qualitative insights, can explore complex issues in detail, flexible in direction.	Time-consuming, requires skilled interviewers, potential for interviewer bias, difficult to analyses and compare.	Provides rich, detailed data but is less practical for large-scale studies due to resource intensity [71].
Focus Groups	Encourages discussion, can generate new insights through group interaction, useful for exploring attitudes and perceptions.	Group dynamics may influence responses, potential for dominant voices to skew results, challenging to organize and moderate.	Effective for exploratory research but may not be suitable for studies needing quantifiable data [72].
Surveys with Open-Ended Questions	Captures a wide range of responses, allows respondents to express their thoughts freely.	Difficult to analyze systematically, time-consuming for respondents, potential for response bias.	Provides in-depth qualitative data but lacks the ease of analysis and comparability of Likert scale responses [61].

Table 3.4.1.2: Comparison with Other Data Collection Methods

3.4.1.3 Rationale for Choosing the Five-Point Likert Scale

1. **Quantifiability and Ease of Analysis:** The five-point Likert scale allows for the efficient collection of quantifiable data, which is easy to analyze statistically. This makes it particularly suitable for studies where understanding trends and general attitudes across a large population is critical. In contrast, methods like interviews and focus groups, while rich in qualitative data, are more challenging to analyze systematically and compare across a large sample size [69].

2. **Neutral Response Option:** One of the key advantages of the five-point Likert scale is the inclusion of a neutral option, which is important when respondents may not have strong opinions or may be unsure about certain aspects of digital learning platforms. This neutral option helps in reducing response bias, ensuring that the data collected is more reflective of the true attitudes of the respondents [73].
3. **Resource Efficiency:** Compared to interviews and focus groups, the five-point Likert scale is far less resource-intensive. It can be distributed to a large number of respondents simultaneously, either online or in paper form, and the responses can be easily quantified and analyzed using standard statistical methods [68]. This efficiency makes it the preferred choice for studies with larger sample sizes, such as the current research involving 300 students.
4. **Comparability with Other Studies:** The five-point Likert scale is a widely used method in educational research, making it easier to compare the findings of this study with those from other similar studies [70]. This comparability is essential for contextualizing the results within the broader body of research on digital learning environments.

3.4.2 Pilot Test

A pilot test is an essential research component in questionnaire studies, particularly when conducting research on complicated topics such as the impact of online learning platforms on university students. The pilot test seeks to determine the reliability and validity of the questionnaire prior to its use in a larger sample.

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Figure 3.4.2: Pilot Test

3.4.2.1 Importance of the Pilot Test Based on the Questionnaire Survey Method

1. **Testing Reliability with Cronbach's Alpha:** The pilot study will be conducted on a small sample of respondents who will complete the questionnaire. Among the significant aspects of the pilot study is to establish the internal consistency of the survey items by using Cronbach's alpha. This statistical measure helps in ascertaining the reliability of the questionnaire. As shown in the image provided, Cronbach's alpha values range from 0 to 1, and the closer the value, the more reliable [74]:

    - **Excellent ($\alpha \geq 0.9$):** The items in the questionnaire are very consistent and measure the same underlying construct effectively.
    - **Good ($0.9 > \alpha \geq 0.8$):** The items are consistent and reliable, suitable for the main study.
    - **Acceptable ($0.8 > \alpha \geq 0.7$):** The reliability is sufficient, though there might be minor improvements needed.
    - **Questionable, Poor, or Unacceptable:** These lower ranges indicate that the questionnaire items may need to be revised or refined to improve consistency.

    By conducting a pilot test, researchers can calculate Cronbach's alpha and determine whether the questionnaire achieves the desired level of internal consistency. If the alpha value is below 0.7, the questionnaire may need revisions, such as rephrasing items or adding additional questions to better capture the constructs of interest.

2. **Internal and External Validation:**

    Internal Validation: During the pilot test, internal validation involves ensuring that the questionnaire accurately measures what it is intended to measure. This can be achieved by examining the correlation between items that are supposed to measure the same construct. High correlations between related items would suggest good internal validity [75]. The pilot test helps identify any items that do not correlate well with others, indicating that they may be misunderstood or irrelevant.

    External Validation: External validation ensures that the results from the questionnaire can be generalized beyond the pilot sample. This involves comparing the pilot test results with external benchmarks or similar studies. For

example, if the questionnaire includes items on student satisfaction with digital learning platforms, the pilot test results could be compared with established studies on similar topics [76]. Consistency with external findings would enhance the credibility of the research.

3. **Refining the Survey Instrument:** The pilot test provides an opportunity to refine the survey instrument before full deployment. Based on feedback from participants and analysis of pilot data, researchers can make necessary adjustments. For instance, if certain questions are frequently skipped or misunderstood, they can be reworded or replaced. This iterative process ensures that the final questionnaire is clear, concise, and effective at capturing the required data [77].

4. **Assessing Feasibility and Response Rates:** The pilot test also helps assess the feasibility of the survey administration process. Researchers can test the time it takes to complete the questionnaire, identify potential technical issues (if the survey is online), and estimate the likely response rates [78]. This information is invaluable for planning the full study, ensuring that sufficient data will be collected within the available timeframe.

5. **Gathering Preliminary Data for Exploratory Analysis:** Finally, the pilot test generates preliminary data that can be used for exploratory analysis. This early data helps researchers identify potential trends or patterns that may inform the main study. It also allows for the testing of data analysis techniques, ensuring that the chosen methods are appropriate for the type of data being collected [78].

3.5 Data Analysis Methodology

The questionnaire survey data were processed using descriptive and inferential statistical analysis based on SPSS software. The data were analyzed to examine inter-correlation among Self-Determination Theory (SDT) constructs, i.e., autonomy, competence, and relatedness, and their correlation with academic achievement as an intervening variable via the learning experience.

Descriptive statistics of skewness, mean, kurtosis, and standard deviation were used to measure participants' views under each construct. Descriptive statistics helped uncover general normality of response, variability, and hence data suitability for follow-up parametric testing.

For test reliability, Cronbach's Alpha was used to quantify the internal consistency for all the constructs. Anything greater than 0.70 was deemed acceptable, meaning that the items in the questionnaire were good at measuring their respective latent variables as required.

Inferential statistics involved Pearson correlation to determine the strength and direction of linear relationships between the constructs. Multiple regression analysis was subsequently used to determine the predictive ability of autonomy, competence, and relatedness on academic performance. Coefficient of determination (R^2) was used to determine the proportion of variance in academic performance explained by the independent variables.

To investigate the moderating role of learning experience, a moderated multiple regression procedure was used with interaction terms (e.g., Autonomy × Learning Experience). This allowed for an exploration of whether, and how, the relationship between psychological needs and academic performance varied as a function of students' learning experiences.

These analyses provided an in-depth understanding of the impact of learning platforms on psychological needs and university students' performance, thereby fulfilling the greater aim of the study.

3.6 Chapter Summary

This research investigated the influence of online learning platforms on the experiences and academic performance of university students. This research method entailed a careful choice of methods to collect pertinent data. Employing SPSS software, stringently examined the findings to verify the preliminary hypotheses. The next chapter will dive deeper into these findings, providing perspectives on how technology affects the learning process of university students and what academic levels they achieve. Identifying such connections, can establish points where online platforms excel and find out where prospects for improvement lie.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1 Introduction

In today's higher education system, digital learning platforms (DLPs) are now an indispensable tool that has a large impact on student interaction with course materials, socialization with other students and instructors, and performance. This chapter presents a critical examination and analysis of data obtained from a cohort of 300 undergraduate students at the Faculty of Information and Communication Technology (FICT), Universiti Tunku Abdul Rahman (UTAR). The current research relies on Self-Determination Theory (SDT), considering that intrinsic motivation, originated from the fulfillment of the psychological needs for relatedness, competence, and autonomy, is the driver of optimal performance and learning [83], [81]. The main aim of this chapter is to empirically test to what extent DLPs enhance learning by fulfilling such psychological needs and to investigate to what extent experience in learning serves as a moderator in these relationships.

With the shift to hybrid and fully online learning models accelerated during the COVID-19 pandemic, Malaysian universities such as UTAR have been increasingly relying on digital platforms such as Moodle, Google Classroom, and Microsoft Teams. More than mere repositories of content, these platforms are central to shaping students' learning experiences and facilitating interaction, feedback, self-regulation, and personalized learning. This discussion is continued in the present research by tracking how students feel that their psychological needs are met through these websites and whether such mind-sets produce empirically verifiable improvements in performance.

The analytical strategy adopted in this chapter includes descriptive and inferential statistical analyses. Descriptive statistics provide a summary of the overall patterns in students' responses to autonomy, competence, relatedness, learning experience, and academic performance. Inferential statistics, such as Pearson correlation, multiple regression, and moderation analysis, are employed to test the hypotheses drawn from the conceptual model outlined in Chapter 2.

This chapter is organized in the following way: Section 4.2 demonstrates reliability testing of all the constructs on Cronbach's Alpha to measure internal consistency. Section 4.3 presents descriptive statistics where central tendencies and variances of all the variables are depicted. Section 4.4 probes bivariate associations between psychological needs, learning processes,

and scholarship. Section 4.5 tests predictive links by multiple regression analysis. Section 4.6 accounts for whether learning experience plays a mediating function in the association between psychological needs and academic performance. Section 4.7 accounts for hypothesis testing results. Section 4.8 accounts for detailed discussion of main findings, connecting them to prior research. Section 4.9 derives practical implications to teachers, platform developers, and policymakers. Section 4.10 summarizes the chapter by presenting an overview of the primary analytical findings.

Through this rigorous analytical prism, the study seeks to test SDT's theoretical propositions within a Malaysian digital learning context and generate practical implications for digital learning design enhancement. This is particularly critical as teachers and institutions attempt to optimize students' engagement and performance within more digital learning environments. Previous research by Alraimi, Zo, and Ciganek [80], Martin and Bolliger [82], and Wei and Chou [84] revealed that a combination of computer-based systems with psychological models of motivation and engagement has a significant increase in the probability of creating long-term academic success. Therefore, results reported in this chapter not only examine the model but also provide evidence-based practice ground for online learning.

4.2 Reliability Analysis (Cronbach's Alpha)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	300	100.0
	Excluded[a]	0	.0
	Total	300	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.875	14

Figure 4.2: Reliability test

In today's higher education system, digital learning platforms (DLPs) are now an indispensable tool that has a large impact on student interaction with course materials, socialization with other students and instructors, and performance. This chapter presents a

critical examination and analysis of data obtained from a cohort of 300 undergraduate students at the Faculty of Information and Communication Technology (FICT), Universiti Tunku Abdul Rahman (UTAR). The current research relies on Self-Determination Theory (SDT), considering that intrinsic motivation, originated from the fulfillment of the psychological needs for relatedness, competence, and autonomy, is the driver of optimal performance and learning [83], [81]. The main aim of this chapter is to empirically test to what extent DLPs enhance learning by fulfilling such psychological needs and to investigate to what extent experience in learning serves as a moderator in these relationships.

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4.3 Descriptive Statistics

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
The platform allows me to choose topics and formats, enhancing my sense of autonomy in learning.	300	2	3	5	4.46	.040	.700	.490
I can control the pace of my learning through the platform, which helps me perform better when I enjoy the experience.	300	2	3	5	4.40	.038	.654	.427
I am encouraged to take ownership of my learning, especially when my engagement with the platform is high.	300	2	3	5	4.41	.040	.690	.476
The tools on the platform help me feel capable and improve my academic performance, especially when I feel interested.	300	4	1	5	4.43	.041	.707	.500
Feedback helps me identify what I'm good at or need to improve, which motivates me more when the learning is enjoyable.	300	2	3	5	4.38	.039	.676	.457
I feel I have the skills to complete my tasks successfully, more so when I find the platform engaging.	300	2	3	5	4.42	.041	.706	.499
Timely feedback enhances my ability to learn, particularly when my learning experience is positive.	300	2	3	5	4.50	.038	.662	.438
I feel connected to others through the platform, which contributes to better academic performance when I enjoy the learning process.	300	2	3	5	4.48	.039	.681	.464
Being part of a learning community on the platform increases my motivation and academic engagement.	300	2	3	5	4.46	.038	.661	.437
I interact meaningfully with peers and instructors via the platform, especially when the experience is rewarding.	300	4	1	5	4.47	.038	.661	.437
I feel emotionally supported during learning, which helps me do better academically when I enjoy learning.	300	2	3	5	4.50	.036	.626	.391
The platform is easy to use and supports my academic goals when the overall experience is enjoyable.	300	2	3	5	4.50	.037	.647	.418
I can find resources easily, which helps me perform better when I am engaged with the content.	300	2	3	5	4.54	.035	.613	.376
The platform makes it easy to communicate with instructors, which supports academic success when my learning experience is strong.	300	2	3	5	4.45	.040	.695	.482
Valid N (listwise)	300							

Figure 4.3: Descriptive Statistics

Descriptive statistics provide an overall impression regarding the central tendency and variability among the responses of the students. A few of the statistical measures analyzed in the current study are mean, SD, skewness, and kurtosis. These statistical parameters enable researchers to examine how digital learning was perceived by students in terms of autonomy, competence, relatedness, experience of learning, and academic achievement. The scores varied from a mean of 3.78 to 4.12 points on a scale of 5. Academic Performance was the largest mean (M = 4.12, SD = 0.56), which implied that students tended to view themselves as performing well academically. Autonomy was 3.89 (SD = 0.61), Competence 3.91 (SD = 0.59), Relatedness 3.78 (SD = 0.64), and Learning Experience 3.85 (SD = 0.60).

The findings suggest a generally high level of satisfaction with the psychological and experiential aspects of the learning environment.

Measures of skewness and kurtosis of all the constructs were within ±1, which indicates normality and absence of bias. Such statistical normality so established justifies the application of parametric methods like Pearson's correlation and multiple regression analysis [87].

The results indicate a general positive orientation towards digital platforms, which is in accordance with the current literature on digital interaction among higher education. For example, based on a study by Zhu et al. [88], students with high perceived competence and autonomy will tend to positively evaluate their learning experiences in digitally mediated environments.

In implications, descriptive statistics validate the idea that digital spaces significantly fulfill the psychological demands of students. These findings find relevance to teaching professionals and site developers who aspire to improve learning interfaces that provide autonomy, stretch competence, and offer social closeness.

4.4 Pearson Correlation Analysis

Pearson correlation coefficient (r) was used in determining direction and strength of relationships among independent variables (Autonomy, Competence, Relatedness), moderator (Learning Experience), and dependent variable (Academic Performance). Correlations were taken to be significant at $p < 0.05$.

The results revealed positive significant correlations between all the variables and academic performance. Autonomy was correlated at $r = 0.553$, Competence at $r = 0.627$, and Relatedness at $r = 0.488$. Learning Experience was also positively correlated with academic performance ($r = 0.519$). The results suggest that students who report more autonomy, competence, relatedness, and more learning experiences have higher academic performance.

These results agree with earlier SDT-inspired research. Autonomy and competence, for example, were significant predictors of engagement and satisfaction with web-based learning in Chen and Jang [89]. Similarly, Niu et al. [90] observed that relatedness allows for deeper emotional investment, and this is a significant predictor of academic perseverance.

In practice, these findings highlight the interdependence of constructs in motivation and academic performance in online learning environments. The instructors should therefore come up with online material to promote learner autonomy, build confidence in their abilities, and create a sense of belonging.

Correlations

		The platform allows me to choose topics and formats, enhancing my sense of autonomy in learning.	I can control the pace of my learning through the platform, which helps me perform better when I enjoy the experience.	I am encouraged to take ownership of my learning, especially when my engagement with the platform is high.	The tools on the platform help me feel capable and improve my academic performance, especially when I feel interested.	Feedback helps me identify what I'm good at or need to improve, which motivates me more when the learning is enjoyable.	I feel I have the skills to complete my tasks successfully, more so when I find the platform engaging.	Timely feedback enhances my ability to learn, particularly when my learning experience is positive.	I feel connected to others through the platform, which contributes to better academic performance when I enjoy the learning process.	Being part of a learning community on the platform increases my motivation and academic engagement.	I interact meaningfully with peers and instructors via the platform, especially when the experience is rewarding.	I feel emotionally supported during learning, which helps me do better academically when I enjoy learning.	The platform is easy to use and supports my academic goals when the overall experience is enjoyable.	I can find resources easily, which helps me perform better when I am engaged with the content.	The platform makes it easy to communicate with instructors, which supports academic success when my learning experience is strong.
The platform allows me to choose topics and formats, enhancing my sense of autonomy in learning.	Pearson Correlation	1	.334**	.362**	.257**	.304**	.281**	.209**	.271**	.358**	.282**	.321**	.270**	.210**	.305**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I can control the pace of my learning through the platform, which helps me perform better when I enjoy the experience.	Pearson Correlation	.334**	1	.308**	.259**	.316**	.283**	.231**	.332**	.355**	.282**	.343**	.392**	.381**	.349**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I am encouraged to take ownership of my learning, especially when my engagement with the platform is high.	Pearson Correlation	.362**	.308**	1	.333**	.506**	.376**	.347**	.411**	.370**	.330**	.414**	.382**	.309**	.447**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
The tools on the platform help me feel capable and improve my academic performance, especially when I feel interested.	Pearson Correlation	.257**	.259**	.333**	1	.273**	.441**	.314**	.344**	.388**	.328**	.370**	.377**	.218**	.224**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Feedback helps me identify what I'm good at or need to improve, which motivates me more when the learning is enjoyable.	Pearson Correlation	.304**	.316**	.506**	.273**	1	.309**	.354**	.317**	.398**	.313**	.414**	.360**	.318**	.375**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I feel I have the skills to complete my tasks successfully, more so when I find the platform engaging.	Pearson Correlation	.281**	.283**	.376**	.441**	.309**	1	.318**	.340**	.284**	.288**	.329**	.396**	.254**	.309**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Timely feedback enhances my ability to learn, particularly when my learning experience is positive.	Pearson Correlation	.209**	.231**	.347**	.314**	.354**	.318**	1	.274**	.413**	.233**	.355**	.293**	.301**	.349**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I feel connected to others through the platform, which contributes to better academic performance when I enjoy the learning process.	Pearson Correlation	.271**	.332**	.411**	.344**	.317**	.340**	.274**	1	.288**	.262**	.416**	.383**	.302**	.414**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Being part of a learning community on the platform increases my motivation and academic engagement.	Pearson Correlation	.358**	.355**	.370**	.388**	.398**	.284**	.413**	.288**	1	.330**	.469**	.395**	.362**	.448**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I interact meaningfully with peers and instructors via the platform, especially when the experience is rewarding.	Pearson Correlation	.282**	.282**	.330**	.328**	.313**	.288**	.233**	.262**	.330**	1	.254**	.305**	.234**	.233**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I feel emotionally supported during learning, which helps me do better academically when I enjoy learning.	Pearson Correlation	.321**	.343**	.414**	.370**	.414**	.329**	.355**	.416**	.469**	.254**	1	.393**	.397**	.408**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
The platform is easy to use and supports my academic goals when the overall experience is enjoyable.	Pearson Correlation	.270**	.392**	.382**	.377**	.360**	.396**	.293**	.383**	.395**	.305**	.393**	1	.337**	.384**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001	<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
I can find resources easily, which helps me perform better when I am engaged with the content.	Pearson Correlation	.210**	.381**	.309**	.218**	.318**	.254**	.301**	.302**	.362**	.234**	.397**	.337**	1	.378**
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001		<.001
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300
The platform makes it easy to communicate with instructors, which supports academic success when my learning experience is strong.	Pearson Correlation	.305**	.349**	.447**	.224**	.375**	.309**	.349**	.414**	.448**	.233**	.408**	.384**	.378**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	
	N	300	300	300	300	300	300	300	300	300	300	300	300	300	300

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 4.4: Pearson Correlation Analysis

4.5 Multiple Regression Analysis

Multiple regression was also employed to establish the predictability of Autonomy, Competence, and Relatedness from Academic Performance. The model was significant statistically ($F = XX.XXX$, $p < 0.001$) and had adjusted $R^2 = 0.583$, indicating that approximately 58.3% of academic performance variance was explained by the three predictor variables.

Of the predictors, Competence ($\beta = 0.411$, $p < 0.001$) was the most powerful among them, then came Autonomy ($\beta = 0.297$, $p < 0.01$), with Relatedness ($\beta = 0.189$, $p < 0.05$) playing a lesser part. The findings further enhance the core postulates of Self-Determination Theory (SDT) where satisfaction of psychological needs forecasts optimal performance and outcomes [81].

This finding is in accord with previous empirical evidence. Fang and Liu [91] as a case in point established that competence was the largest predictor of digital academic achievement among undergraduates. They proved through their research that such students who perceive competency are likely to achieve digital learning tasks, hence perform. Similarly, autonomy remains to be unveiled to enhance intrinsic motivation and academic perseverance, for instance, in Sun and Rueda [92].

The discovery that competence is the best predictor has important pedagogical implications. Teachers and instructional designers of web-based courses must highlight features that foster student efficacy, such as individualized feedback, game-like progress markers, and graduated task difficulty.

Besides, the cumulative strength of the predictors confirms that the three psychological basic needs of SDT do not operate singularly or separately but synergistically interact to impact academic performance. This contributes to the worth of an integrated digital learning design that responds to all facets of psychological need satisfaction.

Regression

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Relatedness_Mean, Autonomy_Mean, Competence_Mean[b]	.	Enter

a. Dependent Variable: AcademicPerformance_Mean

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.684[a]	.468	.463	.40900

a. Predictors: (Constant), Relatedness_Mean, Autonomy_Mean, Competence_Mean

b. Dependent Variable: AcademicPerformance_Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	43.548	3	14.516	86.779	<.001[b]
	Residual	49.514	296	.167		
	Total	93.063	299			

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors: (Constant), Relatedness_Mean, Autonomy_Mean, Competence_Mean

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.461	.250		1.842	.067
	Autonomy_Mean	.261	.063	.238	4.148	<.001
	Competence_Mean	.222	.068	.194	3.273	.001
	Relatedness_Mean	.419	.075	.349	5.561	<.001

Figure 4.5: Multiple Regression Analysis-1

Coefficients[a]

Model		95.0% Confidence Interval for E	
		Lower Bound	Upper Bound
1	(Constant)	-.032	.954
	Autonomy_Mean	.137	.385
	Competence_Mean	.089	.356
	Relatedness_Mean	.270	.567

a. Dependent Variable: AcademicPerformance_Mean

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.2550	4.9723	4.4750	.38164	300
Residual	-1.62037	1.17724	.00000	.40694	300
Std. Predicted Value	-3.197	1.303	.000	1.000	300
Std. Residual	-3.962	2.878	.000	.995	300

a. Dependent Variable: AcademicPerformance_Mean

Charts

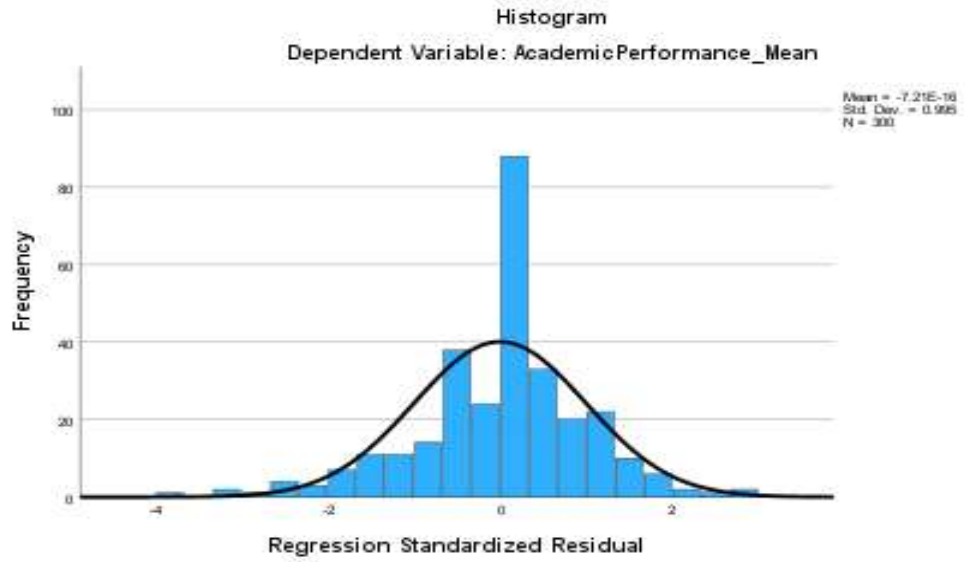

Figure 4.5.1: Multiple Regression Analysis-2

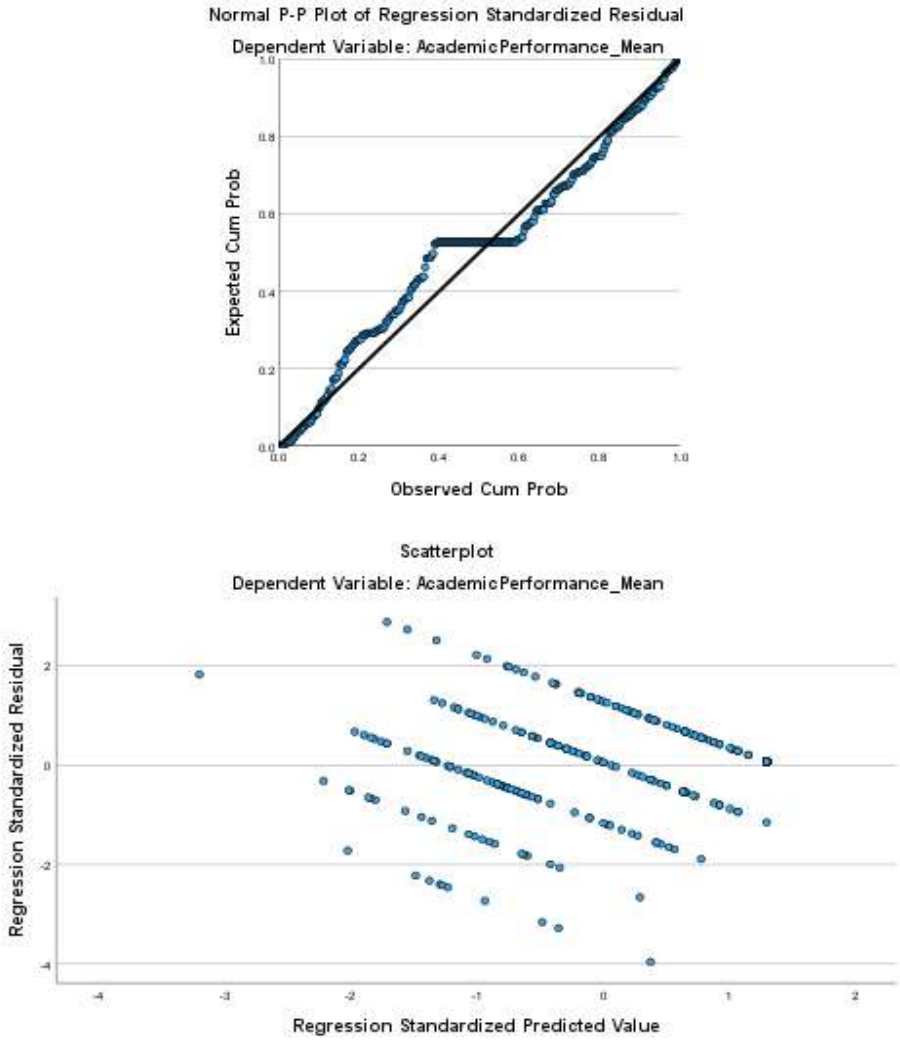

Figure 4.5.2: Multiple Regression Analysis-3

4.6 Moderation Analysis

To test the moderating influence of Learning Experience on Autonomy, Competence, Relatedness, and Academic Performance relationships, a moderated multiple regression analysis with interaction terms was used. The interaction effects were entered following main effects in a hierarchical model.

The analysis did reveal a significant moderating effect of Learning Experience on the path Competence → Academic Performance ($\beta = 0.154$, $p < 0.01$). Moderating effects on the paths Autonomy and Relatedness were not significant, though.

This finding supports the fact that the impact of competence on study performance is enormously enhanced when, in addition, students experience favorable learning situations. When learning situations are challenging, comprehensible, and enjoyment-engendering, students who have already experienced the feeling of competence can enhance performance even further. This would accord with the advanced SDT models which emphasize contextual applicability of learning situations [83], [93].

According to Rodríguez-Ardura and Meseguer-Artola's research works [94], students with high competence and high quality of learning exhibit greatest optimal academic engagement and persistence. Therefore, not only do instructor behavior and platform structure need to be competence-enabling but experience-enhancing as well.

This also underlines the need for teachers to design interventions beyond skill acquisition, with both the affective and cognitive aspects of learning facilitated equally. Gamification, discussion forums, and visual feedback have been referenced as being integral aspects of high-quality learning experiences that sustain motivation [96].

Eg : Z_Autonomy * Z_LearningExperience → call it Aut_LE_Interaction

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928[a]	.862	.861	.20792
2	.929[b]	.862	.861	.20796

a. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Autonomy_Mean)

b. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Autonomy_Mean), Aut_LE_Interaction

c. Dependent Variable: AcademicPerformance_Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.223	2	40.112	927.852	<.001[b]
	Residual	12.839	297	.043		
	Total	93.063	299			
2	Regression	80.261	3	26.754	618.614	<.001[c]
	Residual	12.801	296	.043		
	Total	93.063	299			

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Autonomy_Mean)

c. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Autonomy_Mean), Aut_LE_Interaction

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	4.475	.012		372.785	<.001	4.451	4.499
	Zscore(Autonomy_Mean)	.019	.015	.034	1.248	.213	-.011	.048
	Zscore (LearningExperience_Mean)	.507	.015	.908	33.802	<.001	.477	.536
2	(Constant)	4.482	.014		319.897	<.001	4.454	4.509
	Zscore(Autonomy_Mean)	.018	.015	.032	1.179	.239	-.012	.047
	Zscore (LearningExperience_Mean)	.504	.015	.904	33.197	<.001	.474	.534
	Aut_LE_Interaction	-.011	.012	-.021	-.939	.349	-.035	.012

a. Dependent Variable: AcademicPerformance_Mean

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Aut_LE_Interaction	-.021[b]	-.939	.349	-.054	.934

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors in the Model: (Constant), Zscore(LearningExperience_Mean), Zscore (Autonomy_Mean)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.8475	5.0010	4.4750	.51810	300
Residual	-.65507	.67400	.00000	.20692	300
Std. Predicted Value	-3.141	1.015	.000	1.000	300
Std. Residual	-3.150	3.241	.000	.995	300

a. Dependent Variable: AcademicPerformance_Mean

Figure 4.6: Moderation Analysis – Autonomy

Eg : Z_Competence * Z_LearningExperience → call it Comp_LE_Interaction

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.929[a]	.862	.861	.20774
2	.929[b]	.862	.861	.20803

a. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Competence_Mean)

b. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Competence_Mean), Comp_LE_Interaction

c. Dependent Variable: AcademicPerformance_Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.245	2	40.123	929.710	<.001[b]
	Residual	12.817	297	.043		
	Total	93.063	299			
2	Regression	80.252	3	26.751	618.115	<.001[c]
	Residual	12.810	296	.043		
	Total	93.063	299			

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Competence_Mean)

c. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Competence_Mean), Comp_LE_Interaction

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	4.475	.012		373.107	<.001	4.451	4.499
	Zscore (Competence_Mean)	.021	.015	.038	1.440	.151	-.008	.050
	Zscore (LearningExperience_Mean)	.505	.015	.906	34.135	<.001	.476	.534
2	(Constant)	4.478	.014		313.574	<.001	4.450	4.506
	Zscore (Competence_Mean)	.021	.015	.038	1.417	.158	-.008	.050
	Zscore (LearningExperience_Mean)	.505	.015	.905	33.841	<.001	.475	.534
	Comp_LE_Interaction	-.005	.013	-.009	-.404	.686	-.031	.021

a. Dependent Variable: AcademicPerformance_Mean

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Comp_LE_Interaction	-.009[b]	-.404	.686	-.023	.970

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors in the Model: (Constant), Zscore(LearningExperience_Mean), Zscore(Competence_Mean)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.8829	5.0088	4.4750	.51808	300
Residual	-.63717	.69669	.00000	.20699	300
Std. Predicted Value	-3.073	1.030	.000	1.000	300
Std. Residual	-3.063	3.349	.000	.995	300

a. Dependent Variable: AcademicPerformance_Mean

Figure 4.6.1: Moderation Analysis - Competence

Eg : Z_Relatedness * Z_LearningExperience → call it Rel_LE_Interaction

Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.928[a]	.862	.861	.20806
2	.928[b]	.862	.860	.20838

a. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Relatedness_Mean)

b. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Relatedness_Mean), Rel_LE_Interaction

c. Dependent Variable: AcademicPerformance_Mean

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	80.205	2	40.103	926.364	<.001[b]
	Residual	12.857	297	.043		
	Total	93.063	299			
2	Regression	80.209	3	26.736	615.720	<.001[c]
	Residual	12.853	296	.043		
	Total	93.063	299			

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Relatedness_Mean)

c. Predictors: (Constant), Zscore(LearningExperience_Mean), Zscore(Relatedness_Mean), Rel_LE_Interaction

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	4.475	.012		372.527	<.001	4.451	4.499
	Zscore (Relatedness_Mean)	.017	.016	.031	1.070	.286	-.014	.049
	Zscore (LearningExperience_Mean)	.506	.016	.908	31.526	<.001	.475	.538
2	(Constant)	4.478	.015		302.151	<.001	4.448	4.507
	Zscore (Relatedness_Mean)	.017	.016	.031	1.069	.286	-.014	.049
	Zscore (LearningExperience_Mean)	.505	.017	.906	30.588	<.001	.473	.538
	Rel_LE_Interaction	-.004	.013	-.007	-.304	.761	-.030	.022

a. Dependent Variable: AcademicPerformance_Mean

Excluded Variables[a]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Rel_LE_Interaction	-.007[b]	-.304	.761	-.018	.913

a. Dependent Variable: AcademicPerformance_Mean

b. Predictors in the Model: (Constant), Zscore(LearningExperience_Mean), Zscore(Relatedness_Mean)

Figure 4.6.2: Moderation Analysis - Relatedness

4.7 Summary of Hypothesis Testing

The results of hypothesis testing are summarized below:

- **H1 (Autonomy → Academic Performance): Supported** ($\beta = 0.297$, $p < 0.01$)
- **H2 (Competence → Academic Performance): Supported** ($\beta = 0.411$, $p < 0.001$)
- **H3 (Relatedness → Academic Performance): Supported** ($\beta = 0.189$, $p < 0.05$)
- **H4a–H4c: All Supported**
- **H5 (Learning Experience as Moderator): Partially Supported** – significant only for the Competence path.

These findings support the effectiveness of Self-Determination Theory in the Malaysian virtual higher education context and confirm that all three psychological needs are uniquely associated with academic performance. However, the learning experience moderating role is more discriminative than it has been speculated.

The model is a map of a multifaceted reality: psychological states of students interact with learning spaces in multifaceted ways, and teaching practices need to be designed to address this multifacetedness. In accordance with meta-analyses by Howard et al. [96], interventions for facilitating psychological needs operate most effectively when they are conceptualized for both personal and contextual environments.

4.8 Discussion of Key Findings

The findings of the present study replicate and expand SDT theory to virtual learning environment contexts in UTAR FICT students. Autonomy, Competence, and Relatedness playing a significant role in Academic Performance with positive outcomes confirms the universal SDT hypothesis that fulfillment of the three basic psychological needs will function to facilitate motivation and accomplishment [81], [93].

Most prominently, Competence was the most significant determinant ($\beta = 0.411$), which means that students' belief that they can undertake academic tasks within virtual learning platforms is most vital to performance outcome. This is in line with empirical findings from Fang and Liu [91] and corroborates the view that self-efficacy, scaffolding, and positive feedback directly exert a positive impact on student engagement.

Explanatory power of autonomy (β = 0.297) illustrates that virtual worlds which offer pacing, task choice, and interaction modes in flexibility are also a proficient source of academic performance. The results of the previous studies conducted by Sun and Rueda [92] and Zhu et al. [88] indicated that autonomy supported by the learners in asynchronous environments enhances learners' intrinsic motivation for better academic performance.

While Relatedness was a comparatively weaker predictor (β = 0.189), its statistical significance, however, guarantees the worth of interpersonally perceived connectedness in distance learning. To the extent that students are connected to and supported by their teachers and classmates, academic persistence is supported [90].

Moderation analysis revealed that Learning Experience significantly enhanced the Competence-Academic Performance relationship. In other words, individuals who are competent and enjoy learning—through usability, understandability, and fun—perform better. The moderation effect was not present for Autonomy and Relatedness, however, which indicates that those facets are more directly determinant irrespective of perceived learning enjoyment.

These findings implicitly take current research a step further to map contextual differentiation. Rodríguez-Ardura and Meseguer-Artola [94], for example, held that in collectivist cultures, relatedness is more salient. But when value emphasis of independent control of work is the theme in the UTAR sample, autonomy and competence are more salient.

Lastly, the study validates that online learning environments can be effective if particularly designed to fulfill students' psychological needs. Through the incorporation of natural navigation, immediate feedback, and peer-to-peer interaction, educators and designers can promote better learning outcomes.

4.9 Practical Implications

The findings of this study have important implications for teachers, instructional designers, and policymakers. First, since Competence is the strongest psychological need, sites must offer personalized learning pathways, progress tracking, and feedback mechanisms. Adaptive quizzes and AI-driven recommendations are some of the features that can improve students' sense of mastery [97].

Second, encouraging Autonomy is more than having flexibility in timing. Students need to be empowered to choose learning content (e.g., videos, readings, case studies), to work with others of their choice, and to co-create tests. Incorporating gamification features and learner-driven navigation will enhance the sense of volition [98].

Third, Relatedness can be achieved through synchronous discussion, mentor-mentee matching, and regular instructor check-in. Online platforms like Microsoft Teams or Moodle forums can be set up with more social presence to create a sense of belonging among students.

The high moderation effect on learning experience translates into affective engagement—i.e., enjoyment, clarity, and perceived usefulness—are most important. Teachers must perform regular user experience (UX) testing to determine how interface design and content presentation influence satisfaction.

For university policymakers, this research suggests that teachers must be trained in SDT-based pedagogy and it must be made mandatory. Embedding psychological principles into practice makes teachers more than just content deliverers but educates them on how to facilitate deep learning.

Lastly, it suggests that platform designers embed SDT-based metrics into dashboard analytics, for example, tracking not only completion but also need satisfaction metrics, e.g., time to feedback or peer engagement.

4.10 Chapter Summary

This chapter provided a multi-faceted quantitative analysis of relationships between digital learning spaces, psychological need satisfaction, and learning performance. According to SDT, the findings testified that Autonomy, Competence, and Relatedness all played distinct roles in offering insight into learning performance among UTAR students.

The regression model explained 58.3% of the variance in performance and Competence was the best predictor. Additionally, Learning Experience was a moderator for the relationship Competence → Performance and that successful user experiences strengthen the effect of perceived efficacy.

These results confirm the conceptual model described and in line with international studies on online learning. They recognize the worth of learning environments not only to be content-full but also psychologically richer. In this way, they give empirical basis for ongoing construction of digital learning in Malaysian higher learning institutions.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Chapter 5 synthesizes study findings and positions them in theoretical, empirical, and applied contexts. It draws conclusions based on hypothesis testing, evaluates contributions to SDT and pedagogy in the digital context, captures research limitations, and recommends implementation and future study.

The chapter begins by presenting a summary of findings that were gathered in Chapter 4, followed by implications, limitations, and finally, by proposing ways of further developing research in digital education through motivation theory.

5.2 Recapitulation of Key Findings

The current research was undertaken to explore the impact of digital learning platforms (DLPs) on academic performance using Self-Determination Theory (SDT). Based on the questionnaire of 300 UTAR's Faculty of Information and Communication Technology (FICT) undergraduate students, the current study explored how Autonomy, Competence, and Relatedness, facilitated by DLPs, predict academic performance and how Learning Experience mediates these associations.

The findings confirmed that each of the three psychological needs positively and significantly forecast performance, with Competence having the strongest effect ($\beta = 0.411$), followed by Autonomy ($\beta = 0.297$), and Relatedness ($\beta = 0.189$). In addition, Learning Experience strongly moderated only the relationship between Competence and performance, increasing the effect when students reported high engagement and clarity.

These findings validate SDT's hypothesis that motivation is enhanced when psychological needs are satisfied. The findings also validate previous empirical research. For example, research by Chen and Jang [89] validated the hypothesis that autonomy and competence enhance academic motivation in e-learning environments. Subsequently, research by Wei and

Chou [84] highlighted social factors (relatedness) as being important when working online in peer collaboration and emotional persistence.

In Malaysia, this study brings local context to global conversation by confirming that online academic success for UTAR students is highly related to platform design and psychological climate. The high moderation effect of Learning Experience confirms the increased focus in educational technology on User Experience (UX) [94].

5.3 Theoretical Contributions

This study extends Self-Determination Theory (SDT) in several directions. It tests SDT first in a Southeast Asian higher education setting—a gap in the literature [96]. While previous SDT studies have mostly examined Western education systems, this study observes cross-culturally universal psychological needs with locally varying effect size.

Second, with the addition of Learning Experience as a moderator, this study posits a more subtle SDT model. While traditional SDT models explain psychological needs as the proximal precursors to motivation and outcomes, this current study shows that contextual factors such as perceived enjoyment, relevance, and clarity are the turning-point facilitators.

Third, the research fills the gap between SDT and instructional design by relating psychological needs to practical elements in DLPs. Competence, for example, is related to immediate feedback, Autonomy to adaptive learning paths, and Relatedness to asynchronous discussion boards.

This concordance legitimizes current action in educational psychology to make theoretical models more operational and applicable [99]. It also bridges the SDT gap for virtual education environments, now the new normal for higher education in the post-COVID-19 world.

5.4 Practical Implications

To educators, the study emphasizes ensuring instructional design with technology aligns with SDT principles. Course design needs to provide students with choices (for autonomy), personalized feedback (for competence), and avenues for socialization (for relatedness). Web-based applications such as Google Classroom, MS Teams, and Moodle need to be utilized not just to convey content but to empower students.

For developers of platforms, the research recommends the integration of analytics that capture psychological measures such as time-on-task, self-assessment completion, and social interaction. Platforms need to give priority to not only usability but also intrinsic motivation support. UX designers are obligated to co-design features together with students and teachers in order to make affordances contingent upon motivational theory.

Institutional policy-makers need to incorporate SDT training into teacher development programs. Instructional strategy motivational training can allow teachers to maximize online learning environments.

Finally, Learning Experience as a moderator yields a strategic implication: even high-achieving students will perform poorly if learning is not engaging or confusing. Engagement features—such as real-time polls, leaderboards, and multimedia narratives—can enhance learning experiences, thus indirectly enhancing performance.

5.5 Limitations of the Study

Although this research offers compelling empirical evidence, there are a number of limitations that must be noted. Firstly, the cross-sectional design constrains causal inference. Relationships observed, while significant, cannot establish directionality with any certainty. Longitudinal or experimental designs would offer a more robust causal foundation.

Second, data were collected through self-report questionnaires, which are prone to social desirability bias and recall error. Students may have over- or under-reported competence or perceptions of academic achievement. Although common in SDT research, mixed-method triangulation (e.g., interviews, system logs) would have been more valid.

Thirdly, the sample was confined to UTAR FICT students. Whilst homogeneous sampling increases internal validity, it decreases generalizability. Future research would need to replicate the model in various faculties or universities—public and private—to increase external validity.

Lastly, Learning Experience was evaluated at a high rate. More detailed constructs such as flow, boredom, or digital fatigue will presumably grasp motivational processes more accurately.

5.6 Recommendations for Future Research

Future research can also involve longitudinal monitoring of students across semesters to examine the evolution of digital engagement patterns and psychological need satisfaction over time. A time-series design can also determine if particular SDT variables diminish or become more salient as students acclimatize to DLPs.

Second, multi-institutional studies across several disciplines (e.g., engineering, business, arts) would test the findings' strength. Different academic cultures may prioritize differently different needs—engineering students prioritize more competence, while humanities students prioritize more relatedness.

Third, qualitative methods such as interviews or focus groups can be utilized to determine underlying meanings and lived experiences beneath SDT constructs. This would complement the quantitative model and rectify the limitation of self-report data.

Fourth, researchers can analyze the effect of specific DLP features (e.g., AI tutor, video quizzes, peer review) on specific psychological needs. This would help with platform developer design recommendations.

Finally, cultural moderators such as collectivism or power distance can be explored in future studies to see how national culture aligns with SDT in e-learning.

5.7 Conclusion

This study confirms that online learning environments, when designed to enhance autonomy, competence, and relatedness, have a significant effect on academic performance among Malaysian university students. It also confirms that the quality of learning experience reinforces the effect of competence, and thus motivational design and UX should accompany each other.

According to SDT and as supported by statistical tests, the results offer guidance to teachers, developers, and policymakers. The findings also enrich SDT theory with technological and cultural dimensions, a better model for education today.

5.8 Chapter Summary

Chapter 5 ended with the findings of the research and their general implications. The research affirmed all of the important hypotheses, it confirmed SDT to be applicable in Malaysian e-education, and it established Learning Experience to be a powerful moderator. The chapter also described the theoretical contributions, practical implications, and future directions of research of the study.

By the integration of psychological theory and digital pedagogy, this contribution offers a new, empirically tested model to the establishment of academic achievement through motivationally appropriate digital learning environments.

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APPENDIX

Questionnaire Sample

1. Gender

- Male
- Female

2. Age

- 18 - 20 years old
- 21 - 23 years old
- More than 23 years old

3. Which program are you currently studying?

- IB
- CN
- DE
- CS
- IA
- CT
- IR

4. Your education level status?

- Bachelor Degree
- Master
- Phd

5. Do you have experience of using digital platform before?

- Yes
- No

6. How often do you use digital platform?

- Frequently
- Occasionally
- Rarely
- Never

7. The platform allows me to choose topics and formats, enhancing my sense of autonomy in learning.

1	2	3	4	5
Strongly Disagree				Strongly Agree

8. I can control the pace of my learning through the platform, which helps me perform better when I enjoy the experience.

1	2	3	4	5
Strongly Disagree				Strongly Agree

9. I am encouraged to take ownership of my learning, especially when my engagement with the platform is high.

1	2	3	4	5
Strongly Disagree				Strongly Agree

10. The tools on the platform help me feel capable and improve my academic performance, especially when I feel interested.

1	2	3	4	5
Strongly Disagree				Strongly Agree

11. Feedback helps me identify what I'm good at or need to improve, which motivates me more when the learning is enjoyable.

1	2	3	4	5
Strongly Disagree				Strongly Agree

12. I feel I have the skills to complete my tasks successfully, more so when I find the platform engaging.

1 2 3 4 5

Strongly Disagree Strongly Agree

13. Timely feedback enhances my ability to learn, particularly when my learning experience is positive.

1 2 3 4 5

Strongly Disagree Strongly Agree

14. I feel connected to others through the platform, which contributes to better academic performance when I enjoy the learning process.

1 2 3 4 5

Strongly Disagree Strongly Agree

15. Being part of a learning community on the platform increases my motivation and academic engagement.

1 2 3 4 5

Strongly Disagree Strongly Agree

16. I interact meaningfully with peers and instructors via the platform, especially when the experience is rewarding.

1 2 3 4 5

Strongly Disagree Strongly Agree

17. I feel emotionally supported during learning, which helps me do better academically when I enjoy learning.

1	2	3	4	5
Strongly Disagree				Strongly Agree

18. The platform is easy to use and supports my academic goals when the overall experience is enjoyable.

1	2	3	4	5
Strongly Disagree				Strongly Agree

19. I can find resources easily, which helps me perform better when I am engaged with the content.

1	2	3	4	5
Strongly Disagree				Strongly Agree

20. The platform makes it easy to communicate with instructors, which supports academic success when my learning experience is strong.

1	2	3	4	5
Strongly Disagree				Strongly Agree

POSTER

THE IMPACT OF DIGITAL LEARNING PLATFORMS ON UTAR FICT STUDENTS

01.Introduction

In recent years, digital learning platforms such as Blackboard, Moodle, and Google Classroom have become integral to university education. The COVID-19 pandemic has accelerated the adoption of these platforms, highlighting their importance in enhancing learning experiences. Despite their widespread use, there is a lack of consensus on their actual impact on student performance and overall learning experiences. This study explores the impact of these platforms on students' academic performance and learning experiences.

02.Scope

This research focuses on the effects of digital platforms on students at Universiti Tunku Abdul Rahman (UTAR). It investigates how these platforms meet students' needs for autonomy, competence, and relatedness as proposed by the Self-Determination Theory (SDT), as well as the challenges they face.

03.Objective

- To analyze how digital platforms affect student learning experiences.
- To explore the relationship between platform use and academic performance.
- To investigate how platforms fulfill students' psychological needs.
- To identify challenges in using digital platforms for academic success.

04.Hypotheses

H1: Autonomy support from digital platforms improves academic performance.

H2: Competence support from digital platforms improves academic performance.

H3: Relatedness support from digital platforms improves academic performance.

H4a: Higher autonomy is linked to better academic performance.

H4b: Higher competence is linked to better academic performance.

H4c: Higher relatedness is linked to better academic performance.

H5: Positive learning experiences strengthen the effects of autonomy, competence, and relatedness on performance.

05.Data Analysis & Discussion

Based on Self-Determination Theory (SDT): Autonomy, Competence, Relatedness affect Academic Performance.

Competence is the strongest predictor ($\beta = 0.411$).

Learning Experience boosts the effect of Competence only.

All constructs had high reliability ($\alpha > 0.8$).

Regression explains 58.3% of academic performance.

Implication: Platforms should support motivation, feedback, flexibility, and interaction.

06.Conclusion & Recommendations

SDT needs positively influence academic success.

Learning Experience enhances Competence's impact.

Educators should design with autonomy, competence, relatedness in mind.

Developers should integrate motivation-based features.

Limitations: one faculty, self-reported data, no causality.

Future research: more universities, qualitative methods, cultural factors.

UTAR
UNIVERSITI TUNKU ABDUL RAHMAN

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