CHAPTER 1 INTRODUCTION

1.1 Rationale of Study

Rapid advancements in technology have transformed educational delivery methods, leading to a significant shift from traditional face-to-face instruction to online learning environments. While online learning expands access to education, recent studies highlight that a key challenge is maintaining high levels of student engagement, which directly influences academic achievement and learning persistence [1], [2].

Low engagement in online learning is frequently linked to reduced participation, limited peer–instructor interaction, excessive workload, and technological constraints [1], [2]. For example, a 2022 survey of Indonesian university students reported that although flexible schedules were appreciated, many learners diverted study time to unrelated activities, resulting in decreased focus and class participation [1]. Similar patterns have been observed in Southeast Asian universities, where lack of interactive design in online courses contributed to diminished motivation and active involvement [2].

Recent studies in Indonesia highlight persistent challenges in maintaining student engagement in online higher education. Kristiana et al. (2023) [3], conducted a mixed-method study with 775 university students and reported that 94.45% of participants exhibited low engagement in online learning environments, underlining the critical role of self-regulation in supporting active participation. Similarly, Taufik and Zulkarnaen (2025) [4], found that well-designed virtual learning spaces significantly improve student engagement and academic performance among Indonesian learners.

To address these challenges, innovative instructional strategies are required to foster interactivity, collaboration, and meaningful learning experiences. The CoI framework has been shown to effectively enhance engagement by integrating three interconnected element cognitive presence, social presence, and teaching presence to support deep and collaborative learning [5], [6], [2]. Therefore, this research focuses not only on the CoI but also on the application of pedagogical agents using

the CoI. Pedagogical agents are virtual characters in a digital environment that are used to enhance learning in an educational environment by using instructional strategies [7]. Pedagogical agents designed to guide, motivate, and interact with students by offering the potential to strengthen cognitive, social, and emotional support in online environments, reducing barriers to interaction and improving learning outcomes [7], [8], [9].

Studies on pedagogical agents show that well designed agents, combining appearance and role, significantly enhance students' learning outcomes, engagement, and motivation compared to learning without agents [7]. On the other hand, the implementation of pedagogical agents has several limitations, such as inconsistency in increasing motivation and interaction, difficulty in managing cognitive load, lack of emphasis on important points, unrealistic visuals, and weak emotional involvement [8]. These limitations of pedagogical agents make the CoI an appropriate approach to strengthen social presence, cognitive presence, and teaching presence through dynamic and collaborative interactions in the learning environment, to create a more deep and relevant learning experience for students, and reducing interaction barriers and improving learning outcomes

1.2 Theoretical and Conceptual Framework

The CoI framework, introduced by Garrison, Anderson, and Archer [10], provides a model for creating meaningful online and blended learning experiences through the integration of three interdependent elements: cognitive presence, social presence, and teaching presence. Cognitive presence refers to the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse. Social presence is the ability of learners to project themselves socially and emotionally in a CoI, fostering a sense of belonging and collaboration. Teaching presence encompasses the design, facilitation, and direction of cognitive and social processes to achieve meaningful educational outcomes [5], [6], [2].

In computer-supported learning environments, the CoI framework can be operationalized through specific techniques that leverage digital tools to enhance each presence. For example, cognitive presence can be promoted using asynchronous discussion boards, adaptive quizzes, and problem-based learning

scenarios supported by intelligent tutoring systems. Social presence may be fostered via video conferencing, collaborative document editing, gamified interaction, and social annotation tools that encourage peer feedback. Teaching presence can be strengthened by automated feedback systems, structured learning paths, and analytics dashboards that allow instructors to monitor participation and adapt instructional strategies in real time [11], [2]. These technology-mediated strategies enable CoI to move beyond traditional discussion formats and incorporate scalable, interactive methods supported by advances in computer science.

In addition to implementing CoI in improving interaction and understanding in online learning, this study also uses pedagogical agents, which are virtual characters designed to assist students in the learning process and apply various teaching strategies in the learning environment [7]. As described by Martha and Santoso [7], pedagogical agents can serve as tutors, motivators, or peers, providing scaffolding, personalized feedback, and affective support. When designed effectively, pedagogical agents can guide learners through inquiry cycles, encourage participation, and reduce cognitive load by delivering targeted prompts and explanations [8], [9].

This study aims to explore the effectiveness of the method approach used to increase student engagement and learning outcomes in online learning, by comparing the application of pedagogical by CoI accompanied and online learning process. There are several variables that will be measured such as cognitive, social, and teaching engagement.

1.3 Problem Identification

The main issue with online learning is the persistently low level of student engagement, which negatively affects learning outcomes, motivation, and participation [1], [2], [3]. Prior studies have shown that factors such as limited peer–instructor interaction, excessive workload, and insufficiently interactive course design contribute to disengagement among learners [1], [2], particularly in English education. English is one of the subjects that we can easily study online, and it is a very important subject because it can open up opportunities for education, careers, and international experiences. However, in online English learning, low student

engagement was found to occur due to minimal interaction, high levels of insecurity, low motivation, and a lack of positive feedback and appreciation from teachers during the learning process [39].

To address this problem, the CoI framework has been widely applied, as it emphasizes the importance of creating collaborative and meaningful learning experiences through its three main components: Cognitive Presence (understanding and knowledge construction), Social Presence (social interaction and emotional involvement), and Teaching Presence (teacher presence in guiding learning) [5], [6]. However, the CoI framework alone does not provide direct mechanisms to sustain student attention and motivation in digital environments.

Pedagogical agents have been introduced as a complementary solution, serving as tutors, motivators, and facilitators that can guide students, clarify instructions, and support emotional involvement [7], [8], [9]. While previous studies demonstrate that well-designed pedagogical agents can improve engagement and learning outcomes, their implementation still faces several limitations, such as inconsistent motivational effects, difficulty in managing cognitive load, unrealistic visuals, and weak emotional involvement [8]. These shortcomings limit their effectiveness in addressing the broader challenges of online learning engagement.

To overcome these limitations, this study proposes integrating pedagogical agents with the CoI framework. By combining the CoI's structured approach to presence with the interactive and motivational support of pedagogical agents, it is expected that online learning environments can be made more engaging, interactive, and effective. To address this gap, this study seeks to answer the following research questions:

1. What are the effects on learning outcomes when pedagogical agents integrated with the CoI framework are applied in the learning process?
2. How does the use of pedagogical agents in the CoI framework for online learning with agents compare to online learning without agents in terms of

student engagement, as measured by survey responses and LMS activity data?

1.4 Objective and Hypotheses

Objective:

The main objective of this study is to compare the effectiveness of pedagogical agents supported by the CoI strategy with traditional online learning methods in improving student engagement and learning outcomes. The research is conducted in the context of the English for IT course for second-semester Informatics students at Telkom University. Specifically, the study aims to:

1. Evaluate the impact of integrating pedagogical agents with the CoI framework on students' learning outcomes.
2. Examine the differences in student engagement measured through CoI based surveys and LMS activity data between classes using CoI with pedagogical agents and those using traditional online learning.

This research is supported by the following premises:

1. Premise 1: Based on previous studies, pedagogical agents have been proven to enhance learning outcomes through their roles as tutors, motivators, and facilitators, helping with conceptual understanding, providing clear guidance, and maintaining students' focus [7],[8],[9]. Meanwhile, the CoI framework emphasizes the importance of cognitive presence, social presence, and teaching presence in creating deep and collaborative learning experiences [5],[6].
2. Premise 2: Student engagement in online learning is often low due to limited interaction, lack of motivation, and insufficiently interactive instructional design [1], [2], [3]. Pedagogical agents are designed to provide cognitive, social, and emotional support, while the CoI framework can enhance interactivity through teaching presence, social presence, and cognitive presence [5], [6], [7].

So, the hypotheses are:

1. H1: The application of pedagogical agents using the CoI framework in online learning will significantly improve course learning outcomes compared to online learning without agents.
2. H2: The implementation of pedagogical agents using the CoI framework will result in higher levels of student engagement both in survey scores and LMS activity metrics than traditional online learning.

1.5 Scope and Limitations

This study focuses on second-semester students in the Informatics program at Telkom University enrolled in the English for Information Technology (IT) course during the 2024/2025 academic year. The research compares two instructional approaches: (1) pedagogical agents supported by the CoI framework, and (2) traditional online learning without these enhancements. IT students were selected due to data limitations, as the researcher was granted access to collect data only from classes through Course Learning Outcomes (CLO) records at Telkom University, making this class the most feasible option for the study.

1. Measuring student engagement through CoI based surveys and LMS activity logs.
2. Assessing learning outcomes using post-test scores.
3. Applying pedagogical agents as implemented in a specific LMS platform with pre-defined interaction scripts.

The limitations include:

1. The study is conducted in a single university and course context, which may affect the generalizability of results to other subjects or institutions.
2. The research duration is limited to one academic semester, restricting the observation of long-term impacts.

1.6 Significance of the Study

This research can significantly influence educators in taking the right method in the teaching process in an online environment that is increasingly relevant to technological developments. The results of this study can also be used as a reference for other educational institutions to develop and implement learning methods that enhance students' active participation, and make learning more effective and enjoyable.