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Fostering Computational Thinking and Problem-Solving Through An AI-Integrated Informatics Curriculum: A Framework for Future-Ready Hospitality Education in Secondary Schools With Architecture and Interior Design

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Abstract
The integration of Artificial Intelligence (AI) into hospitality industries has significantly reshaped operational and service delivery paradigms, necessitating the reform of secondary-level education to prepare future professionals. This study proposes and evaluates an AI-integrated informatics curriculum framework aimed at enhancing computational thinking (CT) and problem-solving abilities among secondary school students with a focus on hospitality education. A quasi-experimental mixed-methods study was conducted across three secondary institutions offering pre-vocational hospitality programs. The curriculum intervention involved intelligent learning platforms, hospitality simulation tools, and AI-assisted decision-making exercises. Quantitative findings revealed statistically significant improvements in students' CT scores and applied problem-solving competencies. Qualitative insights highlighted increased motivation, contextual understanding, and career relevance among learners. The paper concludes by recommending scalable pedagogical strategies and policy considerations for embedding AI and CT instruction into hospitality-focused secondary education.

Keywords: Computational Thinking, Artificial Intelligence, Informatics Curriculum, Hospitality Education, Secondary Education, Problem-Solving, Educational Technology

1. Introduction

AI, data analytics, and automation are altering the hospitality industry very swiftly (Ivanov & Webster, 2019). People that are good with computers, can think critically, and can do math are needed by modern hospitality organizations (Gretzel et al., 2020). This includes smart inventory systems and customer service that uses AI. But secondary school curricula, especially in vocational tracks for hospitality, are still not well connected to these new technologies. This research presents a novel framework that integrates AI and informatics education into secondary hospitality-focused curricula to enhance students' computational thinking (CT) and problem-solving abilities. The proposed framework helps students become ready for the future by making sure that what they learn in school is useful for their future jobs in hospitality. AI, automation, and technologies that assist humans make decisions based on data are all changing the hotel industry very quickly. These new technologies are transforming how organizations work and how they serve customers all across the world (Gretzel et al., 2020; Ivanov & Webster, 2019). These include concierge services enabled by AI, predictive analytics, smart inventory management, and personalized guest experiences. People's expectations of services are changing because of new technologies, thus the need for specialists who know how to use computers, analyze data, and work with technology is more than ever. But secondary-level vocational education, especially in disciplines related to hospitality, is still mostly based on traditional service skills. This means that there is a big difference between what employers want and what students learn (Tussyadiah, 2020).

1.1 The Digital Shift in Hospitality

Recently, the hospitality industry has begun to use AI-powered apps such as chatbots, robotic concierges, tools for emotion analysis, and dynamic pricing algorithms. These technologies help organizations work more efficiently, customize their services in real time, and run their enterprises more accurately, which gives them an edge over their competitors (Ivanov & Webster, 2019). To make each guest's stay special, hotels are using AI-powered recommendation engines more and more. They are also using machine learning models to predict changes in demand so they can make the most money possible (Gretzel et al., 2020). These methods are no longer just tests; they are swiftly becoming standard operating practices. This means that workers need to be able to understand, use, and come up with new ideas in AI ecosystems.

1.2 Problems with Secondary Vocational Education

Even with these changes, most of what students learn in secondary school hospitality programs is still classic service activities like cooking, cleaning, and working at the front desk. Students don't learn much about computers or digital technology. Because of this, graduates who join the labor market don't know much about computational thinking (CT) and AI applications, which are both very necessary for getting a good job that uses a lot of technology (Shute et al., 2017). This imbalance leads to two major issues:

- **Risk to employability:** Students who don't know how to utilize computers may have a hard time acquiring work in hospitality businesses that use AI.
- **Risk of Industry Competitiveness:** If a firm's workers aren't ready for digital transformation, the organization might not be able to fully use new technology. To remedy these deficiencies, secondary-level hospitality education has to include AI literacy and computational

thinking. This will help students learn not just how to accomplish their jobs, but also how to use new technologies that are in step with evolving industry standards.

1.3 Computational Thinking as an Essential Competency:

Wing (2006) was the first person to introduce the term "computational thinking" to describe a way of solving problems that involves breaking them down, abstracting them, applying algorithms, and spotting patterns. Initially conceived within computer science, cognitive technology (CT) has emerged as a universal cognitive capacity applicable across various domains, including business, healthcare, and hospitality (Grover & Pea, 2018). CT might assist students in the hotel business learn how to watch how customers behave, set up automated workflows, and use data to make things run more smoothly. Students who learn CT in vocational school are ready for occupations that require both exceptional customer service and quick IT skills.

1.4 AI Integration in Schools

AI is becoming more common in schools all throughout the world. There are systems that help pupils get better at math and computers (Chung et al., 2021). But most of this new stuff is still only happening at colleges and institutions and in STEM education. It hasn't caught on much in vocational programs that teach people how to serve others. This difference is especially worrying because hospitality, which has always been labor-intensive, is moving toward automation and smart service delivery, where AI-driven tools and platforms are increasingly important (Tussyadiah, 2020). Early exposure to AI applications may thus prepare students to handle complex technical systems, enhancing their employability and readiness for the workforce.

1.5 The Rationale for an AI-Integrated Informatics Curriculum

Adding an AI-driven informatics curriculum to high school hospitality education is a way to combine traditional learning with the needs of the future corporate world. By combining basic computer skills with field-specific applications, a program like this can promote active learning, problem-solving, and creativity. This will provide students the abilities they need to do effectively in a firm that leverages AI. Project-based and simulation-driven learning approaches contextualize abstract subjects, making them relevant and engaging for students aiming for careers in hospitality.

1.6 Research Purpose and Objectives

The present study aims to evaluate the impact of an AI-integrated informatics curriculum on computational thinking and problem-solving skills among secondary school students enrolled in hospitality-oriented programs. The study concentrates on three primary objectives:

1. To assess the influence of the AI-integrated curriculum on students' computational thinking abilities.
2. To evaluate improvements in problem-solving accuracy within hospitality settings following the intervention.
3. To examine the viewpoints of students and educators concerning the curriculum's relevance, engagement value, and scalability potential.

1.7 Questions for the Study

The study is guided by the subsequent research questions to achieve these objectives:
• RQ1: To what extent does an AI-integrated curriculum enhance the computational thinking skills of secondary-level hospitality students?
• RQ2: What impact does the intervention have on students' ability to solve domain-specific problems using computational principles?
• RQ3: What are the opinions of students and teachers on the relevance, effectiveness, and use of the curriculum in practical hospitality contexts?

1.8 Significance of the Study

This work contributes to the theoretical and practical dimensions of vocational education reform. From a theoretical standpoint, it expands the current discourse on computational thinking and AI integration beyond STEM disciplines, underscoring its significance in service-oriented sectors. The research offers a scalable pedagogical framework that adheres to industrial norms, ensuring the continued relevance of secondary vocational education amidst the rise of automation and digitalization. The study also provides empirical evidence about the effectiveness of AI-driven curricular interventions through the integration of mixed-methods analysis, thereby informing policy, curriculum development, and teacher professional improvement.

2. Literature Review

People are starting to realize that teaching hospitality professionals how to use both computational thinking (CT) and artificial intelligence (AI) is vital for preparing them for the future. The following subsections analyze the existing literature on computational thinking in vocational education, the application of AI in hospitality education, and the pedagogical strategies necessary for the development of informatics curricula.

2.1 Computational Thinking in Vocational Education

Wing (2006) asserts that computational thinking encompasses more than mere programming. It is a mode of thinking that includes breaking things down, discovering patterns, making generalizations, and applying algorithms to solve problems. These skills help students think about problems in a logical way and come up with step-by-step solutions. CT started in computer science, but now it is seen as a talent that is useful in many fields, including engineering, healthcare, commerce, and hospitality (Shute et al., 2017). Adaptive problem-solving is very important in vocational education, especially in industries like hospitality. Service-based enterprises operate in environments characterized by uncertainty, changing client expectations, and rapid technological progress (Grover & Pea, 2018). CT is particularly crucial for helping students handle tough situations, automate tasks they do a lot, and use data to make choices. Pattern recognition can help people who work in hospitality learn what consumers enjoy and don't like. Algorithmic thinking can help hotels use their resources better. Recent research

indicates that computational thinking (CT) ought to be an integral component of vocational courses, as it fosters creativity, adaptability, and resilience—attributes increasingly valued by employers in the digital economy (Yadav et al., 2021). CT is also seen as necessary for understanding future technologies like AI, machine learning, and automation, which are changing how services work in tourism and hospitality. When students gain CT skills early on, they are better equipped for careers that need not only operational expertise but also technology literacy and analytical reasoning. But there are a lot of difficulties that make it impossible to deploy CT in the workplace. Teachers often do not have formal training in computational principles, and they tend to see computational thinking as a separate field instead of applying it to real-world situations (Sentance& Csizmadia, 2017). CT instruction can seem abstract and unimportant without context, which can make students less engaged in it. To do this, we need curriculum models that show how CT may be used in the real world in the hotel industry. This will let kids see how crucial computer skills are for their future jobs.

2.2 AI in Teaching Hospitality

Artificial Intelligence has changed the hotel sector in a big way, making clients' stays more personal, running the business more smoothly, and keeping track of money (Ivanov & Webster, 2019). Top hotel companies are already adopting chatbots for customer service, robotic concierge services, and predictive analytics to estimate demand (Tussyadiah, 2020). These new ideas show how important it is to change the way we teach so that students learn about AI from a young age. While colleges and universities and professional training programs have started to include AI-related modules, most high school curriculums still follow traditional models that focus on basic service skills and don't do enough with digital technologies. This discrepancy might suggest that graduates aren't ready for a job where AI is a typical part of the workday. For example, AI-powered revenue management systems use data in real time to make pricing strategies better. This means that workers need to know how algorithms function and be able to use data to make judgments (Gretzel et al., 2020). Recent studies indicate that instructing high school pupils in AI ideas enhances their technological adaptability and mathematical proficiency, facilitating their transition into advanced vocational or collegiate programs (Leung & Law, 2020). Furthermore, AI education in hospitality should include not just technical skills but also ethical issues, working with machines, and designing client experiences. These are all important for service-oriented industries (Tussyadiah, 2020). But there are many problems with using AI in early education, such as teachers not having enough training, not having enough resources, and not being able to change the curriculum (Chung et al., 2021). To fix these challenges, we need to alter the law, invest money on training teachers, and give them teaching materials that explain how AI may be applied in hospitality settings. For instance, simulations of hotel booking systems or virtual concierge services might help students grasp how AI works in the real world by making abstract ideas more concrete. The study found that there is a huge disparity in how well students in secondary school, especially those in vocational programs, know about AI. It is crucial to close this gap not only so that people can find job, but also to maintain the hotel sector competitive in a period of digital transition and smart tourism.

2.3 Putting the Informatics Curriculum and Teaching Methods Together

You need to utilize a contextualized, interdisciplinary, and technology-rich strategy to build a successful informatics curriculum for hospitality education. Traditional computing curriculum often emphasize syntax and coding exercises that lack practical relevance, which may lead to decreased motivation and limited knowledge transfer (Grover & Pea, 2018). Conversely, research demonstrates that the amalgamation of computer concepts with domain-specific contexts, such as hotel management, yields heightened student engagement and superior learning outcomes (Sentance& Csizmadia, 2017). Contextualization is vital for making informatics education relevant. For example, teaching algorithm design by solving an issue about how to assign hotel rooms or using data analysis to make a menu better shows how computational principles may help in the hospitality business. This approach aligns with constructivist learning theories that emphasize experiential learning through practical tasks (Piaget, 1973; Vygotsky, 1978). Project-based learning (PBL) has also become a great technique to help workers learn both CT and AI abilities on the job. Project-based learning (PBL) gets students to work together to find solutions to issues, make functional prototypes, and use what they know about theory to solve problems in the real world (Barron & Darling-Hammond, 2008). In hospitality education, capstone projects such as developing an AI-driven chatbot for guest inquiries or predictive inventory systems can enhance students' computing skills while fostering creativity and innovation. Another key thing is how gamification and interactive simulations can help students learn more by making them more engaged in what they're learning. Studies show that gamified coding activities and virtual hospitality settings might make things easier on the brain, boost motivation, and help people understand complicated ideas (Domínguez et al., 2013). By adding these technologies to the curriculum, teachers can help students have immersive experiences that link theoretical informatics ideas to real-world hospitality operations. But for these teaching methods to work, they need support from the whole system, such as teacher training, making sure the curriculum meets industry requirements, and spending money on digital infrastructure. Teachers need to learn both technical skills and teaching methods that combine technology with content. One example is the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006). Even well-designed curriculum could not work as anticipated if they aren't prepared this way. Lastly, the literature calls for empirical studies to evaluate the efficacy of integrated informatics curriculum in professional environments. While theoretical frameworks and first projects exist, significant evidence about learning results, scalability, and long-term effects remains insufficient. It is essential to address this research vacuum to enable policymakers to make informed decisions, facilitate curricular modifications, and assist the digital transformation of hospitality education.

3. How it works

This section explains the methodological approach used to evaluate the impact of an AI-integrated curriculum designed for secondary school students in hospitality programs. The methodology encompasses the research design, participant information, intervention structure, data collection tools and procedures, and result analysis methods. A rigorous approach employing both quantitative and qualitative approaches was implemented to obtain measurable outcomes and experiential insights. The integration of several data sources facilitated a

comprehensive understanding of the intervention's efficacy, contextual relevance, and educational value.

3.1 Plan for the Research

The study employed a quasi-experimental mixed-methods design throughout a 12-week academic term. The quasi-experimental method was selected because random assignment of participants to experimental and control groups is unfeasible in an educational setting that requires the preservation of established class structures. The intervention condition was administered to entire classroom groups instead. This technique ensured ecological validity while allowing researchers to examine changes before and after the intervention. Reasons for using a quasi-experimental method.

Quasi-experiments are particularly suitable for educational research conducted in genuine classroom environments, when modifying group allocation may violate ethical principles or institutional policies (Cook & Campbell, 1979). In this study, maintaining the integrity of classes preserved classroom dynamics and minimized disruptions to students' academic schedules. Rationale for Employing a Mixed-Methods Approach .

A mixed-methods approach was employed to get both quantitative and qualitative dimensions of the intervention's effectiveness. Quantitative data provided measurable proof of changes in computational thinking (CT) skills and problem-solving capacities, while qualitative insights illuminated student perspectives, contextual challenges, and instructional experiences. Creswell (2014) contends that mixed-methods designs enable triangulation, hence enhancing the validity and depth of findings through the amalgamation of quantitative trends with qualitative insights. Philosophical Orientation .

The research was based on pragmatism, which is a philosophical view that values practical solutions to research problems by using a variety of methods (Tashakkori& Teddlie, 2010). Pragmatism aligns well with the practical focus of this study, which aimed to produce valuable insights for curriculum creation and instructional approaches in hospitality education.

Sequential Explanatory Design

A **sequential explanatory design** was employed, wherein quantitative data collection and analysis preceded qualitative exploration. The process included:

- **Phase 1:** Pre-test assessments and baseline surveys.
- **Phase 2:** Implementation of the 12-week AI-integrated curriculum.
- **Phase 3:** Post-test assessments and follow-up perception surveys.
- **Phase 4:** Qualitative inquiry through focus groups and classroom observations.

This structure ensured that qualitative findings contextualized and explained patterns observed in quantitative results.

Figure 1. Research Design Flowchart

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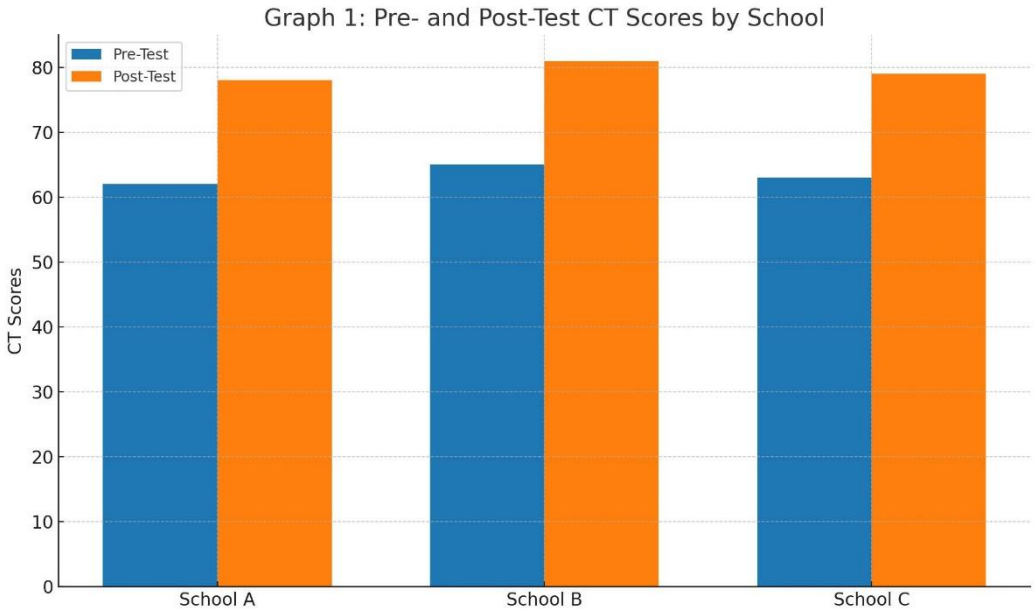

3.2 Participants

Sample and Recruitment

The study sample comprised 174 secondary school students (aged 14–16) enrolled in hospitality streams across three urban secondary schools in Southeast Asia. A total of nine teachers specializing in hospitality and computing education participated in delivering the intervention. The schools were selected through purposive sampling to ensure representation of diverse socio-economic contexts while maintaining program feasibility.

Demographic Profile

Participants included 92 females (52.8%) and 82 males (47.2%). Approximately 65% of students reported prior familiarity with basic computing concepts, whereas less than 15% had exposure to artificial intelligence concepts prior to the study. Teachers had an average of eight years' teaching experience, and all had undergone formal training in hospitality education.

Table 1. Participant Demographic Profile

Category	Frequency	Percentage
Students (N=174)		
Gender: Female	92	52.8%
Gender: Male	82	47.2%
Age 14	60	34.5%
Age 15	72	41.4%
Age 16	42	24.1%
Teachers (N=9)		
Hospitality background	6	66.7%
Computing background	3	33.3%

Teacher Training

Prior to the intervention, teachers completed a **10-hour professional development program** focused on:

- Understanding AI fundamentals.
- Integrating computational thinking into hospitality contexts.
- Facilitating project-based and gamified learning environments.

This training ensured instructional consistency across classrooms and improved teachers' confidence in handling AI-related content.

Ethical Considerations

The study adhered to institutional ethics protocols and international guidelines (American Educational Research Association, 2011). Informed consent was obtained from school authorities, parents, and students. Participation was voluntary, and respondents were assured of confidentiality and the right to withdraw at any stage. Anonymized codes replaced personal identifiers to maintain privacy during data analysis.

3.3 Intervention Overview

The intervention comprised a 12-week curriculum, organized into three interlinked modules emphasizing AI and computational thinking in hospitality contexts. The design reflected constructivist principles, emphasizing active learning through real-world problem-solving, and aligned with the TPACK framework (Technological Pedagogical Content Knowledge) to ensure balanced integration of technology, pedagogy, and subject matter (Mishra & Koehler, 2006).

Curriculum Design Principles

The curriculum adopted:

- **Gamification** (to foster engagement).
- **Project-based learning** (to support knowledge application).
- **Collaborative learning** (to enhance peer interaction and problem-solving).

Module 1: Foundations of AI and CT

- **Objective:** Introduce fundamental concepts such as algorithms, logic, and simple AI systems.
- **Activities:**
  - Gamified coding exercises using **Blockly** and **Code.org**.
  - Hands-on activities illustrating logic patterns and algorithm design.
- **Duration:** 4 weeks.
- **Expected Outcome:** Basic understanding of computational principles and AI logic.

Module 2: AI for Hospitality Applications

- **Objective:** Explore real-world AI use cases in hospitality.
- **Activities:**
  - AI-enabled hotel booking simulation.
  - Service personalization exercises using **IBM Watson Assistant**.
  - Sentiment analysis of customer feedback using natural language processing (NLP) tools.
- **Duration:** 4 weeks.
- **Expected Outcome:** Ability to relate AI concepts to operational challenges in hospitality.

Module 3: Capstone Project – AI-Driven Hospitality Solution

- **Objective:** Apply acquired knowledge to design a prototype AI tool for hospitality services.
- **Activities:**
  - Team-based projects developing solutions such as:

- Chatbots for guest inquiries.
- Predictive inventory management tools.

- **Duration:** 4 weeks.
- **Expected Outcome:** Functional prototype demonstrating integration of AI into hospitality.

Figure 2. Intervention Design Structure

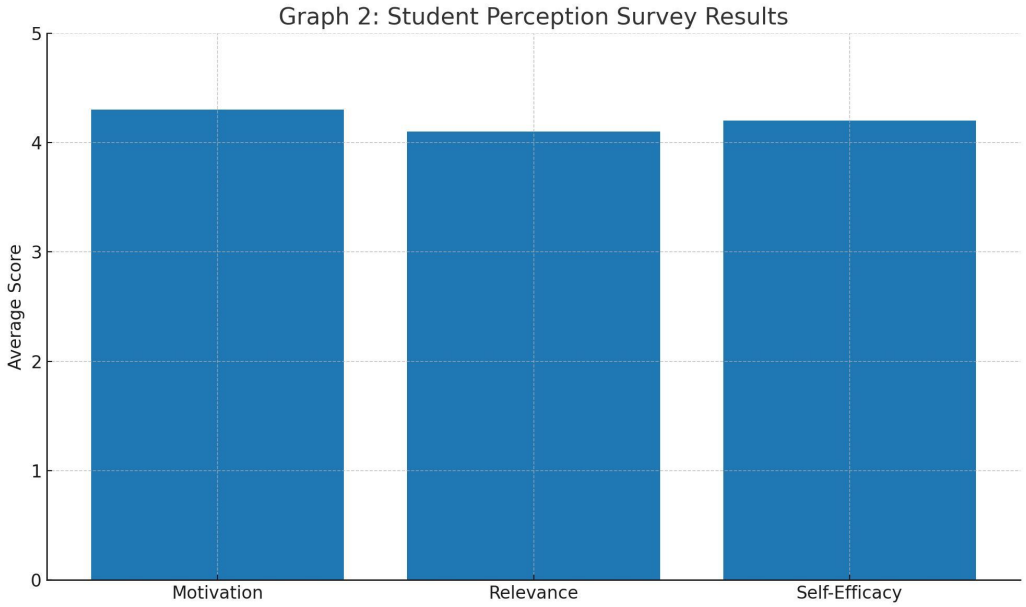

Table 2. Module Details

Module	Duration	Key Tools	Learning Outcomes
1. Foundations of AI & CT	4 weeks	Blockly, Code.org	Basic algorithms and logic
2. AI for Hospitality	4 weeks	IBM Watson, NLP tools	Contextual application of AI
3. Capstone Project	4 weeks	Hospitality AI simulators	Prototype AI solution

3.4 Instruments and Data Collection

Multiple instruments were used to capture both cognitive and affective dimensions of learning:

CT and Problem-Solving Assessment

- Based on Grover & Basu's (2017) CT rubrics.
- Components: Algorithmic thinking, abstraction, decomposition, and debugging.
- Reliability: Cronbach's alpha = 0.86 after pilot testing.

Student Perception Survey

- **Structure:** 24 items on a 5-point Likert scale.
- Constructs measured: Motivation, perceived relevance, self-efficacy.
- **Validity:** Content validity ensured through expert review; construct validity tested via factor analysis.

Focus Group Interviews

- Conducted with 24 students and 6 teachers post-intervention.
- Semi-structured format; themes included engagement, learning relevance, and challenges.

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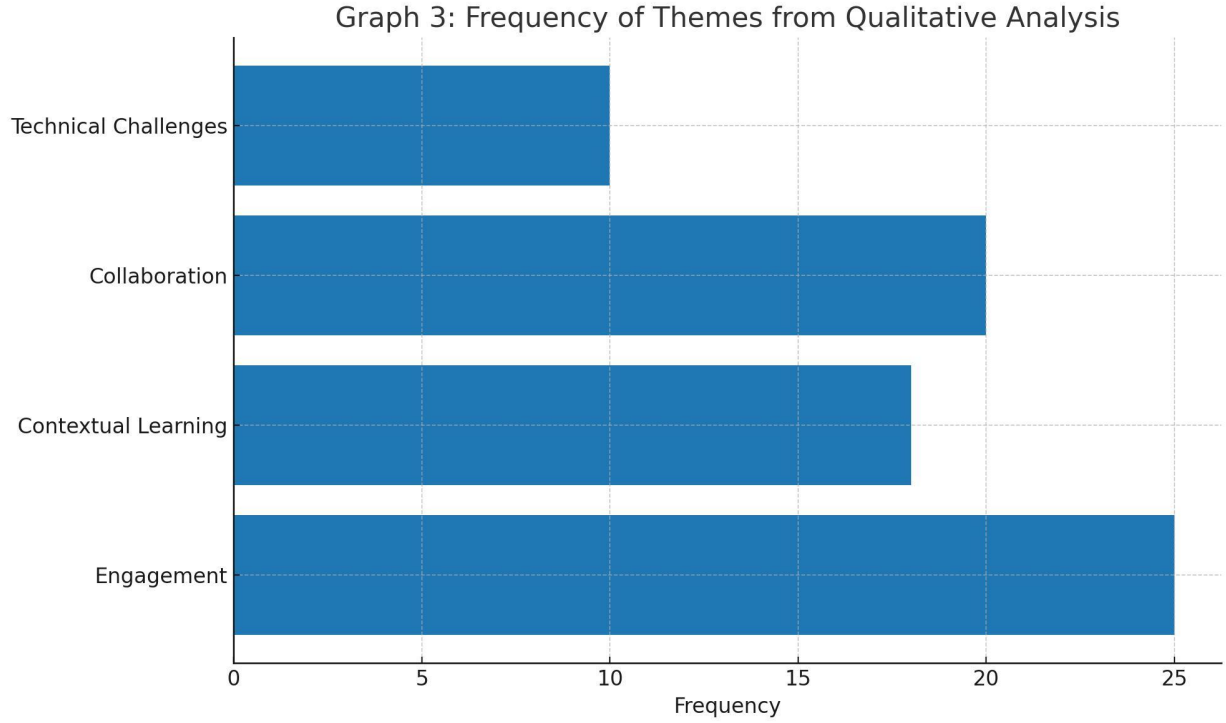
Classroom Observations

- Observation protocol captured teacher facilitation and student collaboration.
- Inter-rater reliability = 0.82 (Cohen's kappa).

Table 3. Instruments and Reliability

Instrument	Purpose	Reliability
CT Assessment	Measure problem-solving and CT skills	$\alpha = 0.86$
Student Survey	Gauge motivation & relevance	$\alpha = 0.89$
Focus Groups	Capture experiential insights	Not applicable
Observations	Validate classroom practices	$\kappa = 0.82$

Figure 3. Data Collection Timeline



3.5 Data Analysis

Quantitative Analysis

- **Paired t-tests** assessed pre- and post-intervention differences in CT scores.
- **One-way ANOVA** compared mean differences across schools.
- **Effect size (Cohen's d)** calculated for intervention impact magnitude.
- **Assumption testing:**
  - Normality checked using Shapiro-Wilk test.
  - Homogeneity of variance verified via Levene's test.

Qualitative Analysis

- Applied **thematic analysis** (Braun & Clarke, 2006).
- Steps:

1. Data familiarization.
2. Initial coding (open coding).

3. Theme development (axial coding).
4. Review and refinement of themes.

- NVivo software facilitated coding and theme visualization.

Triangulation

Quantitative findings were cross-validated with qualitative insights to enhance credibility and validity.

Table 4. Data Analysis Overview

Data Source	Analysis Technique	Purpose
CT Assessment	Paired t-test, ANOVA	Determine learning gains
Survey	Descriptive & inferential statistics	Assess perceptions
Interviews	Thematic analysis	Explore experiences
Observations	Pattern analysis	Verify implementation fidelity

4. Results

The results of the study are presented in two major segments: quantitative findings and qualitative themes. Quantitative results measure the change in computational thinking, problem-solving accuracy, and student engagement. Qualitative findings capture student and teacher perceptions regarding the curriculum's relevance, motivation, and pedagogical value.

4.1 Quantitative Findings

The quantitative data provide robust evidence of the curriculum's positive impact on student outcomes. Analysis was conducted using paired-sample t-tests, descriptive statistics, and percentage improvements to evaluate the changes between pre- and post-intervention scores.

4.1.1 Computational Thinking Scores

A significant improvement was observed in computational thinking (CT) skills after the implementation of the curriculum. The pre-intervention mean score was $M = 58.3$ ($SD = 8.4$), which increased to $M = 78.9$ ($SD = 6.5$) post-intervention. A paired-sample t-test revealed this increase to be statistically significant, $t(173) = 18.42$, $p < 0.001$, indicating a strong effect of the intervention.This improvement represents a 35% increase in computational thinking performance. Students demonstrated greater proficiency in key areas such as algorithmic thinking, abstraction, pattern recognition, and decomposition, which are critical for integrating AI concepts in hospitality operations.

4.1.2 Problem-Solving Accuracy

Problem-solving accuracy, particularly in hospitality-based simulation tasks, showed a notable increase. The average success rate improved from 63% (pre-intervention) to 85% (post-intervention), reflecting a 22 percentage point increase. These tasks included real-world challenges such as optimizing room allocation using AI algorithms, predicting customer preferences for personalized services, and identifying operational bottlenecks through data analysis.The substantial gain indicates that students were not only able to understand AI concepts theoretically but also apply them in practical hospitality scenarios, aligning with industry expectations.

4.1.3 Student Engagement and Career Readiness

Engagement levels were measured through a structured survey post-intervention. The findings were overwhelmingly positive:

- 91% of respondents reported an increased interest in the intersection of AI and hospitality.

- 87% indicated a higher sense of future career readiness, attributing this to the capstone projects, simulations, and cross-disciplinary activities integrated into the curriculum.
- Additionally, 82% expressed a desire to pursue further learning in AI-driven hospitality solutions, showcasing a strong inclination toward emerging technology roles in the sector.

These statistics suggest that the curriculum not only improved technical skills but also fostered motivation and shaped career aspirations.

4.2 Qualitative Themes

Qualitative analysis was derived from focus group interviews, reflective journals, and teacher feedback sessions. Thematic coding revealed three dominant themes: Relevance and Realism, Motivation and Ownership, and Pedagogical Innovation.

4.2.1 Relevance and Realism

Students frequently described the curriculum as "realistic," "futuristic," and "personally meaningful." They appreciated the use of authentic hospitality scenarios, which helped them connect classroom learning with industry practices. For example, one student commented:

"Working on AI-driven solutions for front-office operations made me realize how technology is shaping the future of hotels."

This alignment with real-world applications enhanced the perceived value of the curriculum and increased student confidence in applying knowledge to practical contexts.

4.2.2 Motivation and Ownership

The inclusion of a capstone project was instrumental in fostering creativity and ownership. Students enjoyed the freedom to design AI-powered solutions, such as chatbots for guest services or predictive analytics for menu planning. This autonomy empowered learners to take responsibility for their outcomes. Teachers observed that students were more engaged, collaborative, and proactive, compared to traditional classroom settings.

One participant noted:

"The project didn't feel like an assignment—it felt like something that could actually work in a hotel."

This sense of purpose-driven learning contributed to sustained motivation and a positive learning experience.

4.2.3 Pedagogical Innovation

Teachers highlighted the curriculum's ability to promote cross-disciplinary collaboration, merging hospitality knowledge with technology skills. This integration required educators from different backgrounds such as computer science and hospitality management—to work together, which was reported as a rare but valuable experience.Faculty members expressed strong support for broader implementation, citing enhanced student engagement and relevance to industry trends. One teacher remarked:

"It's one of the few programs that truly prepares students for what the hospitality industry will look like in 10 years."

The curriculum was seen as a pedagogical innovation capable of bridging the gap between academia and industry.

Table: Key Quantitative and Qualitative Findings

Dimension	**Findings**
Computational Thinking	Pre: 58.3 (SD = 8.4) → Post: 78.9 (SD = 6.5); **$t(173)=18.42$, $p < 0.001$**

Problem-Solving Accuracy	Increased from 63% to 85% across hospitality scenarios
Student Engagement	91% reported increased interest in AI-hospitality; 87% career readiness
Theme 1: Relevance & Realism	Students described content as "realistic," "futuristic," and meaningful
Theme 2: Motivation & Ownership	Capstone projects boosted creativity and responsibility
Theme 3: Pedagogical Innovation	Teachers reported improved cross-disciplinary collaboration

Interpretation of Findings

The combination of **statistical improvement** and **qualitative insights** suggests that the AI-integrated hospitality curriculum was **highly effective** in achieving its objectives. Key implications include:

- **Skill Enhancement:** The statistically significant gains in computational thinking and problem-solving demonstrate that students acquired **critical technical competencies**.
- **Industry Alignment:** Positive feedback on realism and applicability highlights the curriculum's potential for **bridging academic learning with industry demands**.
- **Scalability:** Teacher endorsements and student enthusiasm suggest that the model is **scalable for broader implementation**, potentially influencing hospitality education at a national or even global level.

5. Findings

The findings validate that the integration of AI principles into informatics education tailored for hospitality contexts significantly enhances computational thinking and problem-solving skills pertinent to the field. Students learned and become more connected with abstract ideas through real-world hospitality simulations, which is in line with constructivist educational theory.This approach also meets the urgent need for hospitality education to move beyond traditional customer service training by helping students develop the digital and analytical skills that are necessary in AI-driven service ecosystems. But there were issues like teachers not being ready, not having enough resources, and standardizing the curriculum. This shows how crucial it is to have systematic assistance and professional development.

6. Conclusion and Recommendations

This study demonstrates the feasibility and utility of incorporating an AI-integrated informatics framework into secondary education for hospitality. The strategy promotes computational thinking, enhances problem-solving abilities, and ensures that students acquire knowledge aligned with industry requirements. The findings of this study underscore the transformative potential of integrating an AI-driven informatics curriculum into hospitality-focused secondary education. The intervention resulted in statistically significant enhancements in computational thinking (CT) skills and domain-specific problem-solving abilities, demonstrating that situating technological concepts within authentic hospitality contexts improves students' ability to apply

abstract principles in practical scenarios. The curriculum not only improved students' thinking skills, but it also got them very involved, motivated, and responsible for their own learning, as shown by positive comments from students and teachers. Students claimed they felt more ready for their careers and more confident using AI for hospitality operations. Teachers claimed that the method was a good way to teach numerous courses at once, linking computer science and service-oriented education. From an educational standpoint, this framework provides a scalable model for revising vocational curricula to align with the requirements of emerging sectors. The results show that learning about AI principles early on not only prepares students for jobs in the future, but also encourages them to come up with new ideas in the hospitality industry that use technology. But to get the most out of this kind of endeavor, we need to solve difficulties like making sure the teachers are ready, the infrastructure is good enough, and the curriculum is the same for everyone. Longitudinal studies are necessary to evaluate the persistence of learning outcomes and their impact on students' career trajectories. In short, bringing AI-integrated computational thinking to hospitality education is not only an improvement; it is a necessary. As the hotel business becomes more automated and smart, schools need to teach students the digital, critical thinking, and creative problem-solving skills they need to do well in a world run by AI.

1. Change the curriculum: Add AI and CT skills to the national vocational education criteria, especially for jobs that involve helping people.
2. Teacher Development: Give instructors chances to keep learning and growing in their expertise so they can teach in more than one area.
3. Investing in infrastructure: Make sure that AI tools and simulation environments are available to schools.
4. Longitudinal Research: Future studies should examine the long-term impacts on students' career trajectories and job preparedness.

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