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Exploring Mediating Effect of Technology Readiness between Community of Inquiry and Student Digital Competence among Students

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Abstract

As office software becomes increasingly integral to academic and professional success in a globalised world. This study investigates the mediating effect of technology readiness between Community of Inquiry (CoI) and student digital competence among students at UiTMCT and seeks the most influential CoI factors towards student digital competence through data collection using questionnaires. Seven hypotheses were developed, and two hypotheses were supported. The mediating variable did not influence the relationship. Researchers suggested using the same variable with different items adapted from other authors for future research. Thus, improving global office software learning experiences would boost students' digital abilities.

Keywords: Global Learning, Office Software, Proficiency, Student Digital Competence

DOI: https://doi.org/10.21834/e-bpj.v9iSI21.6083

1.0 Introduction

Digital technologies have revolutionised global education through learning platforms like MOOCs and LMS, enabling global knowledge dissemination and skill acquisition. However, challenges like digital equity, privacy, and data security remain. Moreover, the literature suggests a need for ongoing research into improving pedagogical approaches, enhancing accessibility for marginalised populations, and addressing the digital (Adedoyin & Soykan, 2020; Maatuk et al., 2022; Rusly et al., 2021). This study proposes a new model to assess the impact of technological readiness on the correlation between the CoI (teaching presence, social presence, and cognitive presence) and student digital competence among UiTMCT students.

1.1 Research Question

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1. What is the relationship between CoI and student digital competence?
2. Is technology readiness influencing the relationship between CoI and student digital competence?
3. What is the most influential factor of CoI towards student digital competence?
4. What are elements lacking among students in student digital competence?

2.0 Literature Review

2.1 Student Digital Competence (SDC)

Digital competence among students refers to their ability to use digital technologies effectively and responsibly for various purposes, including learning, communication, collaboration, and problem-solving (Khan & Vuopala, 2019). SDC encompasses a range of abilities and knowledge related to effectively and responsibly using digital technologies for academic, professional, and personal purposes (Löfving, 2023). SDC is a multidimensional skill set fundamental for academic success, career readiness, responsible citizenship, and lifelong learning (Sillat et al., 2021). Research and initiatives should focus on addressing the factors that influence digital competence to ensure equitable access and opportunities for all students (Ávila Sánchez et al., 2022; Barboutidis & Stiakakis, 2023; Khan & Vuopala, 2019). Educators play a crucial role in fostering digital competence among students by integrating technology into the curriculum, providing guidance on responsible technology use, and creating opportunities for students to develop and practice their digital skills (Fernández-Batanero et al., 2022; Tsvere et al., 2013).

2.2 Community of Inquiry (CoI)

The Community of Inquiry (CoI) model describes how learning takes place for a group of individual learners through the educational experience at the intersection of social, cognitive, and teaching presence. CoI framework presupposes that through the interaction of three elements: social presence, cognitive presence, and teaching presence, student learning occurs (Burgess et al., 2010)

2.2.1 Social Presence

Social presence is "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop interpersonal relationships by way of protecting their personalities."(Garrison et al., 2010).Social Presence is the second construct and is also identifiable through examining online discourse among learners (i.e., emotions, expressions, collaborations, and group cohesion) (Burgess et al., 2010).

2.2.2 Teaching Presence

Teaching presence is seen "as a significant determinant of student satisfaction, perceived learning, and sense of community" (Garrison et al., 2010). It can be described as the "methods" that instructors use to create quality online instructional experiences that support and sustain productive communities of inquiry" (Burgess et al., 2010).

2.2.3 Cognitive Presence

Cognitive Presence is the extent to which learners can construct and confirm meaning through sustained reflection and discourse. Cognitive Presence is the first construct of the CoI model. It can be identified through an examination of online discourse (i.e., connection of ideas, sharing of related experiences, curiosity, and application of new ideas) (Burgess et al., 2010).

2.3 Technology Readiness

Technology readiness is the readiness of individuals or organizations to adopt and effectively use technology. It encompasses the behavior process behind the adoption of technological products and services. Information and communication technology is a fundamental tool widely integrated in the teaching and learning process at all levels (Kihoza et al., 2016).

2.3.1 Global Learning Platform

A global learning platform has been developed to enhance student digital competence (Lang-Wojtasik et al., 2020). The platform offers online learning opportunities for students in different countries, allowing them to address the challenges of globalization and digital media (Sobodić et al., 2022). It combines educational approaches of global learning and media competence, providing students with the necessary skills to navigate the digital world (Schneider et al., 2022). The platform has been evaluated and found to contribute to students' satisfaction and perceived success in their learning processes (Li, 2013). The platform's usage has a more significant impact on students' learning outcomes than on their satisfaction (Ospankulov et al., 2022).

2.3.2 Online Distance Learning

Distance learning is a form of education that provides education to students who are not physically present in a traditional classroom setting. It brings students, teachers and learning content together online while physically separated by time and space (Abdullah & Kauser, 2022; Adedoyin & Soykan, 2020; Chet et al., 2022). Most researchers agreed that among various possible factors, human-

related factors were the leading cause to create substantial negative impacts on the learners' progress (Chet et al., 2022; Thandevaraj et al., 2021). However, in pro findings, the primary outcome of the study was students' academic performance whereby the results demonstrated that online platform-based self-learning was conducive to students' grades, and school self-developed e-learning platforms was more effective in improving student achievement than other non-school self-developed ones (Rusly et al., 2021; Thandevaraj et al., 2021; Yahaya et al., 2020).

2.3.3 Challenges in learning Office Software

Diploma students face challenges in learning office software that include the need to understand and recognise different learning styles, such as visual, kinesthetic, and auditory, in the context of online learning (Puspitasari & Setiawan, 2022). Additionally, implementing project-based learning in online learning can present challenges, requiring autonomous learning methods and the mastery of language skills, knowledge, and IT skills (Abdamia et al., 2023). Collaborative skills development is also a challenge for students, as they may face difficulties in teamwork and collaboration during software engineering projects (Dorić et al., 2023).

2.4 Student Digital Competence and Community of Inquiry and Technology Readiness

The impact of CoI on SDC in global learning platforms has been investigated in several studies. One study found that higher levels of teaching presence and social presence in remote learning environments were associated with higher levels of self-efficacy, which predicted positive attitudes towards remote learning (Burbage et al., 2023). Another study revealed that digital competencies significantly positively impacted perceived learning outcomes and learning agility among higher education students (Ananda & Usmeldi, 2023). Additionally, the revised CoI instrument has been used to create more supportive online learning environments for individuals with varying levels of English language proficiency in global courses (Logan, 2022). The CoI framework can improve online learning environments and student development on global platforms, but understanding the relationship between technology readiness, CoI components, and student digital competence remains challenging. Thus, proposing the following hypothesis to identify the issue in this study.

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H1: Technology readiness is positively related to student digital competence.
H2: The greater teaching presence in learning experience, the higher student digital competence.
H3: The greater social presence in learning experience, the higher student digital competence.
H4: The greater cognitive presence in the learning experience, the higher the student's digital competence.
H5: Teaching presence is positively related to student digital competence mediated by technology readiness.
H6: Social presence is positively related to student digital competence mediated by technology readiness.
H7: Cognitive presence is positively related to student digital competence mediated by technology readiness.

2.5 Conceptual Framework

This research supports the Malaysia Education Blueprint 2015-2025 and the National Fiberisation and Connectivity Plan by proposing a model for achieving Talent Excellence. This model enables higher learning institutions to select strategies for teaching and learning mechanisms.

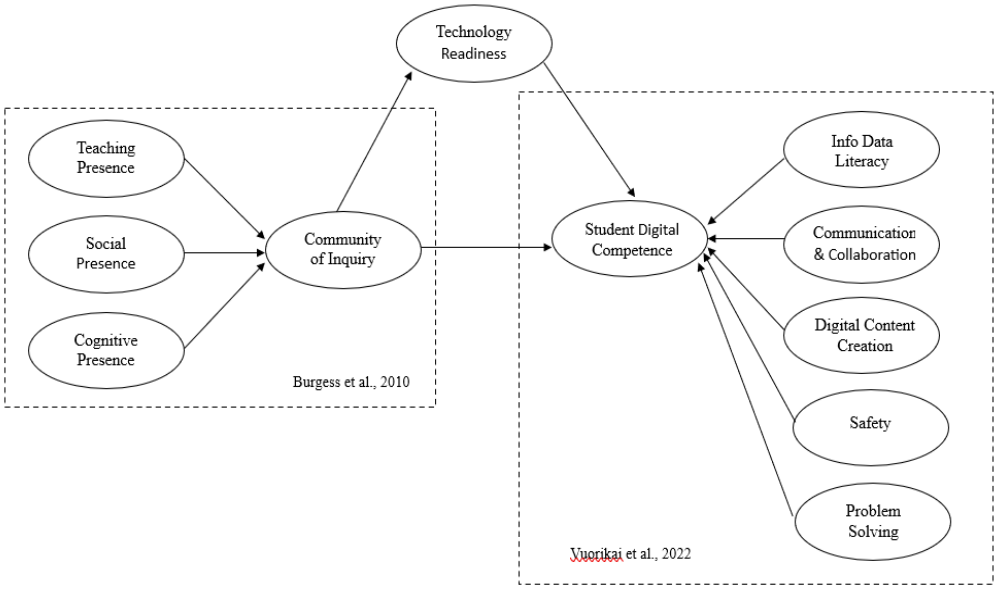

Fig. 1: Conceptual Framework

3.0 Methodology

The fuzzy Delphi technique is used to validate expertise in Malaysia's higher education institutions, focusing on Phase 1: Need Analysis. This approach, combining traditional Delphi with fuzzy logic, has been approved for its robustness in gathering expert opinions and achieving consensus on complex issues (Gengatharan et al., 2023; Saffie et al., 2016). This method aims to identify parameters for an Online Personalization Learning framework, supporting Malaysia's Education Blueprint 2016-2025 and The National Fiberisation and Connectivity Plan. The study uses a case study approach and SMART-PLS for the prediction formula, focusing on the first research design phases.

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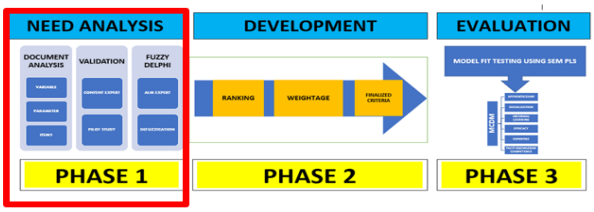

Fig. 2: Research Design

2.6 Structure

This study utilized a close-ended questionnaire for data collection that consisted of multiple-choice questions. The questionnaire has two major sections. Section A was demographic information which is gender. Section B was divided into three subsections, which were B1: Technology Readiness, B2: Community of Inquiry and B3: Student Digital Competence (refer to Table 1- Table 4). Items in B2 were divided into three subsections: teacher presence, social presence, and cognitive presence. Items in B3 were divided into five subsections, including information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. All items were adapted from the literature and studies of previous researchers.

2.7 Data Collection and Analysis Method

The study aims to study the Office Management & Technology program at UiTMCT, focusing on students who have completed at least one online course. The population for this study was 96 students, and the sample size required was 35 based on GPower (Kang, 2021). A sample of 72 students was selected using purposive sampling, and a briefing session was conducted before distribution. The questionnaire was distributed via Telegram to ensure accessibility. Data was collected and analyzed using PLS4.0 and SPSS 23 for comprehensive examination. Participants were briefed about the study's purpose to ensure a clear understanding and prevent bias. The survey instrument was adapted from the CoI model that measured the teaching presence, social presence, and cognitive presence (Burgess et al., 2010) and used the five-point Likert scale. In addition, SDC was measured with five dimensions, included information data literacy, communication and collaboration, digital content creation, safety and problem-solving that adapted from Vuorikei (2022) using the five-point Likert scale. Furthermore, using the five-point Likert scale, teaching readiness was measured and adapted from Kihoza et al. (2016). Otherwise, technology readiness was divided into two parts: the scale and the rest of the items under the technology readiness were analysed using SPSS 23.

4.0 Findings

The study focuses on Office Software course students at UiTMCT, with 72 respondents participating in an online questionnaire using purposive sampling and a five-point Likert scale to gather information on independent and dependent variables, including participants' demographic profiles. Pilot testing was conducted with a sample size of 72 to assess instrument constructs and item impact.

4.1 Respondent Demographic Profile

The demographic profile used in this study was gender, which significantly impacted the research objective. The item was measured and analysed using SPSS Version 23. Of the 72 respondents, 64.7% were female, and 15.3% were male.

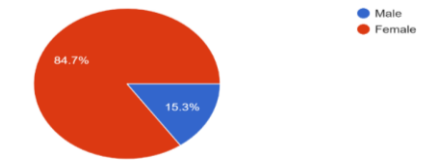

Fig. 3: Gender

Based on the data in Table 1, students appear generally well-prepared to utilize a Global Learning Platform (GLP) via Online Distance Learning (ODL).

Table 1: Technology / Readiness

Descriptive Statistics										
	N	Minimum	Maximum	Sum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
USG_GLP	66	1	1	66	1.00	0.000				
ODL_GMAIL	66	1	1	66	1.00	0.000				
ODL_365	66	1	2	67	1.02	0.123	8.124	0.295	66.000	0.582
DATA_PLAN	66	1	5	99	1.50	1.071	2.056	0.295	3.087	0.582
SHARING	66	2	2	132	2.00	0.000				
WEBCAMERA	66	2	2	132	2.00	0.000				
DEVICES_READY	66	2	2	132	2.00	0.000				
INTERNET_ACCESS	66	2	2	132	2.00	0.000				
FREQ_USGGMAIL	66	2	5	306	4.64	0.694	-1.935	0.295	3.185	0.582
FREQ_365	66	1	5	263	3.98	0.920	-0.826	0.295	0.640	0.582
FREQ_LAB	66	1	5	208	3.15	0.916	0.310	0.295	-0.181	0.582
FREQ_WIFI	66	1	5	286	4.33	1.100	-1.777	0.295	2.427	0.582
A_WA	66	1	4	246	3.73	0.570	-2.524	0.295	7.777	0.582
A_SMS	66	1	4	165	2.50	1.085	0.075	0.295	-1.266	0.582
A_YTB	66	1	4	233	3.53	0.706	-1.460	0.295	1.726	0.582
A_ZOOM	66	1	4	184	2.79	0.851	-0.347	0.295	-0.379	0.582
A_GM	66	1	4	234	3.55	0.661	-1.493	0.295	2.413	0.582
A_GC	66	1	4	242	3.67	0.591	-2.072	0.295	5.490	0.582
A_GD	66	1	4	224	3.39	0.677	-0.984	0.295	1.120	0.582
A_MT	66	1	4	212	3.21	0.775	-0.800	0.295	0.377	0.582
A_FB	66	1	4	176	2.67	1.043	-0.208	0.295	-1.113	0.582
A_TELE	66	1	4	244	3.70	0.581	-2.283	0.295	6.505	0.582
A_UFUTURE	66	1	4	233	3.53	0.749	-1.921	0.295	3.948	0.582
Valid N (listwise)	66									

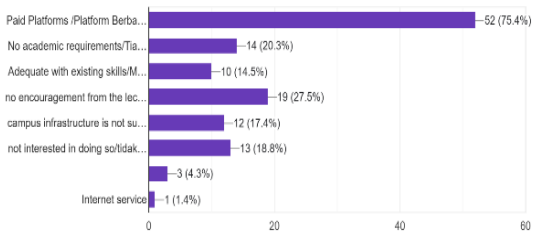

Fig. 4: Source of Global Learning Platform

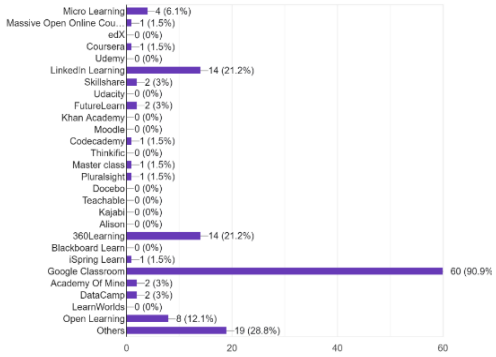

Fig. 5: Factor of not using Global Learning Platform in learning Office Software

Figure 4 shows The Global Learning Platform's majority of Office Software users are in Google Classroom, with the slightest interest in edX, Udemy, Udacity, Moodle, and Khan Academy. Reluctance to use the platform is primarily due to the cost (75.4%), lack of encouragement from lecturers (25.5%), lack of interest (18.8%), and lack of academic requirements (20.3%), which discourage students from expanding their skills and learning progress.

4.2 Student Digital Competence

The data in Table 2 represents the scores for five different variables (ScoreAVG_IDL, ScoreAVG_CC, ScoreAVG_DCC, ScoreAVG_SF, and ScoreAVG_PS) based on a sample of 66 observations. Central Tendency: The data for the variables is symmetrically distributed around central values, with mean scores ranging from 3.7689 to 4.0278. The mode is 4.00, and the skewness values are close to zero, indicating a slight tendency towards lower scores. The kurtosis values are generally close to zero, with the positive kurtosis for ScoreAVG_SF suggesting slightly heavier tails. The sum of scores for each variable falls within a similar range, providing insights into the distribution and central tendency of the scores.

Table 2: Means Score for Student Digital Competence

Statistics						
		ScoreAVG_IDL	ScoreAVG_CC	ScoreAVG_DCC	ScoreAVG_SF	ScoreAVG_PS
N	Valid	66	66	66	66	66
Mean		3.8182	3.9773	3.7689	4.0278	3.9015
Median		3.9127a	3.9744a	3.8707a	3.9948a	3.9500a
Mode		4.00	4.00	4.00	4.00	4.00
Skewness		-0.143	-0.122	-0.262	-0.334	-0.137
Std. Error of Skewness		0.295	0.295	0.295	0.295	0.295
Kurtosis		-0.260	-0.133	-0.301	0.739	-0.065
Std. Error of Kurtosis		0.582	0.582	0.582	0.582	0.582
Sum		252.00	262.50	248.75	265.83	257.50
a. Calculated from grouped data.						

4.3 Measurement Development

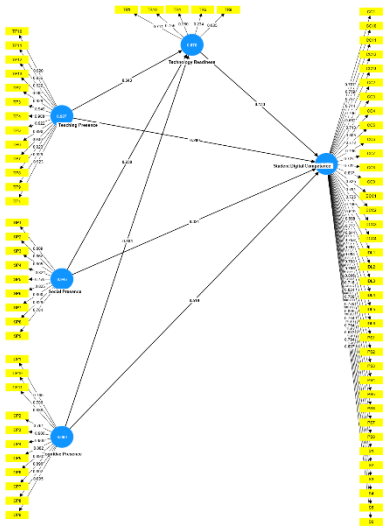

Fig. 6: PLS-SEM

This research ensures content validity through pre-testing, expert evaluation, and language suitability, assessing questions and variations, and selecting criteria for content validity. A pilot study plays a crucial role in research as Ashraf (2017) stated that the research design appropriate and accurate was necessary for high-quality results and can detect unforeseen matters which might lead to any negative impact on the quality of research. 72 respondents answered the tested sample size used in this study. Purposive sampling was used because it was faster, easier, and easier for the respondents to answer. The result from the pilot study was used to determine the reliability and validity of the questionnaire.

Convergent Validity

Table 3: Convergent Validity

Construct	Item	Loading	CR	AVE
Teaching Presence	TP1	0.923	0.985	0.85
	TP10	0.920		
	TP11	0.936		
	TP12	0.922		
	TP13	0.902		
	TP2	0.929		
	TP3	0.949		
	TP4	0.908		

	TP5	0.922		
	TP6	0.890		
	TP7	0.930		
	TP8	0.923		
	TP9	0.929		
Social Presence	SP1	0.809	0.936	0.661
	SP2	0.862		
	SP3	0.805		
	SP4	0.824		
	SP5	0.776		
	SP6	0.825		
	SP7	0.800		
	SP8	0.829		
	SP9	0.784		
Cognitive Presence	CP1	0.760	0.965	0.742
	CP10	0.786		
	CP11	0.888		
	CP2	0.761		
	CP3	0.900		
	CP4	0.900		
	CP5	0.882		
	CP6	0.893		
	CP7	0.896		
	CP8	0.892		
	CP9	0.895		
Student Digital Competence	IDL1	0.619	0.979	0.571
	IDL2	0.698		
	IDL3	0.777		
	IDL4	0.841		
	IDL5	0.753		
	IDL6	0.767		
	CC1	0.707		
	CC10	0.759		
	CC11	0.787		
	CC12	0.744		
	CC13	0.796		
	CC2	0.652		
	CC3	0.713		
	CC4	0.805		
	CC5	0.772		
	CC6	0.796		
	CC7	0.727		
	CC8	0.722		
	CC9	0.837		
	DCC1	0.825		

	DCC2	0.791		
	DCC3	0.725		
	DCC4	0.790		
	S1	0.805		
	S2	0.764		
	S3	0.754		
	S4	0.683		
	S5	0.794		
	S6	0.607		
	PS1	0.694		
	PS2	0.708		
	PS3	0.766		
	PS4	0.806		
	PS5	0.716		
	PS6	0.824		
	PS7	0.789		
	PS8	0.779		
Technology Readiness	TR1	0.711	0.474	0.334
	TR10	0.756		
	TR4	0.260		
	TR6	0.234		
	TR9	0.685		

In Table 4, the exogenous variables data were the teaching presence, social presence, and cognitive presence. Meanwhile, the endogenous variables data were the technology readiness and SDC. Apart from the dataset, Table 2 presents the reliability and validity of the study. The composite reliability (CR) values >0.70 indicated that these constructs have an adequate level of internal consistency except for the construct of technology readiness. Besides, the average variance extracted (AVE) values have met the satisfactory level of AVE with the result of >0.50. The results showed that the items in each construct explained more than 50% of the construct variances (Hair et al., 2017). Item loading higher than 0.5 for indicator reliability is necessary (Kim, 2010). Thus, five items were eliminated under the technology readiness because the item loadings have values below 0.50.

Discriminant Validity

Table 4: Discriminant Validity

	Construct	**1**	**2**	**3**	**4**
1	Cognitive Presence				
2	Social Presence	0.752			
3	Student Digital Competence	0.509	0.438		
4	Teaching Presence	0.761	0.745	0.274	
5	Technology Readiness	0.318	0.446	0.278	0.433

To establish discriminant validity, the HTMT values should be less than a certain threshold (e.g., 0.85 or 0.90, depending on the chosen criterion). Based on these HTMT values, the relationships between CP and SDC, CP and SP, CP, and TP, SDC and SP, and SP and TP demonstrate good discriminant validity, as their values were below the threshold. However, the relationship between SDC and TP has an HTMT value slightly above the threshold, which may warrant further investigation to ensure discriminant validity between these two constructs.

Path Coefficient and Hypothesis Testing

Table 5: Path Coefficient and Hypothesis Testing

Relationship	Beta	Std Dev	T Value	P Value	LL	UL	Decision

Cognitive Presence -> Student Digital Competence	0.519	0.165	3.147	0.002	0.191	0.856	Supported
Cognitive Presence -> Technology Readiness	-0.184	0.215	0.857	0.392	-0.549	0.291	Rejected
Social Presence -> Student Digital Competence	0.321	0.142	2.271	0.023	0.020	0.590	Supported
Social Presence -> Technology Readiness	0.230	0.254	0.906	0.365	-0.352	0.660	Rejected
Teaching Presence -> Student Digital Competence	-0.290	0.180	1.610	0.107	-0.651	0.059	Rejected
Teaching Presence -> Technology Readiness	0.343	0.292	1.175	0.240	-0.401	0.768	Rejected
Technology Readiness -> Student Digital Competence	-0.133	0.172	0.773	0.440	-0.391	0.274	Rejected

The study used bootstrapping to test hypotheses and found a positive relationship between cognitive presence and SDC, as well as between social presence and SDC. However, teaching presence was rejected due to a P-value over 0.05. Both the relationship between cognitive presence and technology readiness and the relationship between teaching presence and SDC were negative. It suggested that cognitive presence plays a crucial role in influencing SDC.

Table 6: Path Coefficient and Hypothesis Testing for Mediating Variable

Relationship	Beta	Std Dev	T Value	P Value	LL	UL	Decision
Cognitive Presence -> Student Digital Competence	0.025	0.046	0.528	0.597	-0.060	0.134	Rejected
Social Presence -> Student Digital Competence	-0.031	0.065	0.472	0.637	-0.133	0.139	Rejected
Teaching Presence -> Student Digital Competence	-0.046	0.069	0.667	0.505	-0.220	0.049	Rejected

The indirect path relationship between CoI (social presence and cognitive presence) and SDC, mediated by technology readiness, was negatively related, ß=-0.031, p>0.05 at the 95% confidence level and ß=-0.046, p>0.05 at the 95% confidence level. The path relationship between teaching presence and SDC mediated by technology readiness was rejected, ß=0.025, p>0.05 at the 95% confidence level. Therefore, technology readiness as a mediating variable did not have any effect on the relationship between CoI and SDC.

Effect Size

Table 7: Effect Size

Construct	R2	Student Digital Competence	Decision	Teaching Readiness	Decision
Teaching Presence		0.044	Small	0.054	Small
Social Presence		0.054	Small	0.025	Small
Cognitive Presence		0.158	Medium	0.015	Small
Student Digital Competence	0.332				
Teaching Readiness	0.165	0.026	Small		

Table 7 shows the coefficient of determination (R2) and effect size (f2) of exogenous constructs on endogenous constructs. The R2 value of 0.165 indicates substantial explanatory capacity, explaining a 16.5% variance in technology readiness. The f2 effect size values show the importance of each exogenous construct to endogenous constructs. The effect size of technology readiness on SDC is small compared to the cognitive presence on SDC, which has a medium effect size.

5.0 Discussion

The study found that social and cognitive presence positively affect Social Discipline (SDC), while teaching presence negatively affects SDC. Cognitive presence was the most influential factor in CoI towards SDC. Higher mean scores indicate higher competence, while lower scores indicate lower competence in Digital Content Creation. The study suggests longitudinal studies to evaluate long-term effects of digital competence on academic and professional success and calls for interdisciplinary research to understand its implications.

6.0 Conclusion & Recommendations

The study highlights the importance of understanding the relationship between CoI and SDC in enhancing students' digital competence. Factors like resource quality, student engagement, and support systems are crucial for an optimal online learning experience. Strategies include specialised modules, regular assessments, collaborative learning, online communities, software accessibility, and continuous

improvement. Future studies should use qualitative methods, expand sample sizes, conduct longitudinal studies, and conduct regular needs analyses.

Acknowledgement

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Paper Contribution to Related Field of Study

The paper provides empirical evidence, practical insights, and context-specific recommendations for improving students' digital competence in online learning environments, especially in Malaysian higher education.

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