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Exploring AI in English Medium Instruction Through Q-methodology Analysis

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Abstract

This study explores the transformative role of artificial intelligence (AI) in addressing challenges in English Medium Instruction (EMI) in higher education in Japan, such as limited teacher availability and diverse English proficiency levels among students. By incorporating AI tools like ChatGPT, DeepL, and Grammarly into an EMI course, the research examines AI's potential to enhance student engagement, and collaboration, and bridge language proficiency gaps. Using Q-methodology to capture subjective viewpoints, the study involved 32 Japanese students. Participants sorted 16 statements about AI's role in education on a scale from –3 to +3. Principal component analysis (PCA) revealed three principal components explaining 72% of the variance: *The Isolated User*: This group acknowledges AI's benefits for critical thinking and personalization but expresses concerns about over-reliance and reduced engagement. *The Collaborator*: This perspective emphasizes AI's role in enhancing active learning and addressing diverse needs while noting challenges in cultural sensitivity and personalization. *The Optimist Challenger*: This viewpoint is largely positive, seeing AI as crucial for boosting engagement and preparing students for global markets, though it also highlights concerns about AI replacing traditional teaching methods and increasing technological divides. The study concludes that AI can significantly enhance learning experiences by personalizing education and overcoming language barriers. However, potential drawbacks include student dependency on technology, reduced engagement, and cultural insensitivity. Effective AI integration in EMI necessitates robust training for both students

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and teachers and ongoing research to refine AI applications. Future research should focus on longitudinal studies to monitor AI's impact and conduct additional Q-sorts to capture changes in student attitudes, providing deeper insights into the effectiveness of educational strategies.

Keywords: English Medium Instruction (EMI), AI, Q-methodology, SAMR model, Connectivist

This pilot study explores how AI addresses the evolving challenges of English Medium Instruction (EMI) in higher education in Japan. These challenges include limited teacher availability (Lasagabaster, 2022) and the diverse English proficiency levels among students, including international attendees (Tang, 2020). By introducing generative AI, such as ChatGPT, DeepL, and Grammarly into an EMI course, this research examines the potential of AI to mitigate these challenges. While these AI tools differ in their operational possibilities and purposes, this study focused on how the participants utilized them. For example, ChatGPT could potentially be employed exclusively for translation or editing tasks, without utilizing its interactive functions. Prior studies have concentrated on the role of human teachers, such as collaboration between content and language teachers (Wallace et al., 2019). However, the effectiveness of such collaboration often hinges on several factors, including the quality of the collaboration, the content of the classes, and the school's structure (McKinley et al., 2022). This study ventures beyond established research by scrutinizing how AI can bolster engagement and collaboration among students, and bridge disparities in language proficiency and content comprehension. To investigate the effective use AI, Q-methodology was utilized due to its ability to unearth the spectrum of subjective viewpoints held by small, yet diverse groups of students. Unlike the traditional quantitative approach, Q-methodology attempts to identify and quantify the range of views within a group, providing a structured approach to understanding subjectivity (Watts & Stenner, 2005).

The study included 32 third-year Japanese students enrolled in an EMI course on semiotics, a discipline that focuses on the study of signs and symbols within language and communication. Although the course included 22% international students, all the participants in this study were Japanese. The participant group consisted of 37.5% males and 62.5% females. For the Q-sort procedure, participants were provided with 16 statements that were designed to reflect diverse perspectives on the role of AI in education (Appendix 1). These statements were developed by a focus group consisting of two EMI educators and three advanced students. The focus group discussions were guided by the SAMR model (Puentedura, 2010) and Connectivist theories (Downes, 2012; Siemens, 2004), which provided a structured approach to exploring the continuum of technology integration from substitution to redefinition, as well as the enhancement of networked and collaborative learning environments. This theoretical underpinning not only influenced the content of the statements but also ensured that they encompassed a comprehensive view of AI's potential roles in education. The focus group played a crucial role in validating that the statements were comprehensive and relevant, aligning with these theoretical constructs to capture the multifaceted impact of AI effectively.

Participants were asked in English to complete a Q-sort by arranging the statements, using Google Forms, according to their level of agreement, ranging from "most disagree" to "most agree." The sorting was organized into a quasi-normal distribution on a scale from −3 to +3 (Appendix 2). The data were analyzed using PCA and subsequent manual rotation of factors to identify common patterns in statement rankings, by using Q-methodology software tools, PQMethod (Schmolck, 2014) and KenQ Analysis (Banasick, 2023).

The factor analysis identified three principal components, which explained 72% of the variance, suggesting a robust solution for analysis (Table 1). The decision to retain these three factors was supported by the scree plot (Figure 1), which showed a distinct "elbow" indicating a natural cutoff point after the third factor. The detailed reliability metrics for each factor demonstrated strong internal consistency and reliability, crucial for interpreting the perspectives on AI among the participants:

Table 1. Factor analysis eigenvalues and explained variances

Factor	Eigenvalues	% of Variance	Cumulative %
1	12.0692	37.7163	37.7163
2	7.6811	24.0036	61.7199
3	3.3674	10.5231	72.243
4	2.1278	6.6493	78.8923
5	1.1886	3.7144	82.6067
6	1.0799	3.3746	85.9813
7	0.8839	2.7623	88.7435
8	0.8222	2.5694	91.3129

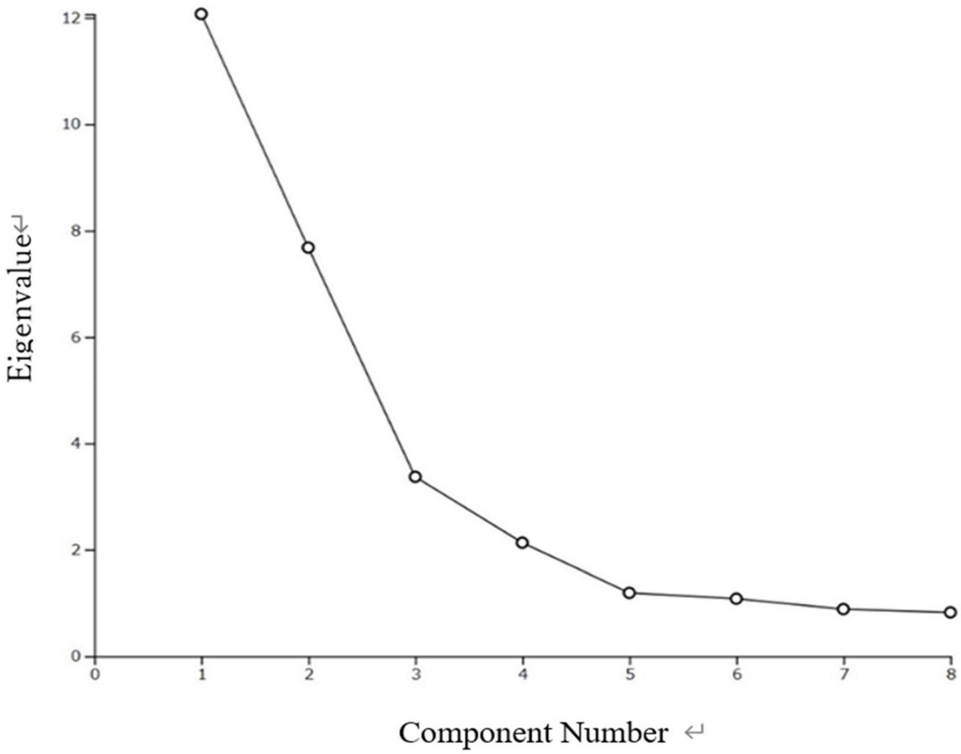

Figure 1. Scree plot of eigenvalues for determining factor retention.

Each factor derived from the analysis was named based on the aggregation of positive and negative *z*-scores (Appendix 3): Factor 1 as The Isolated User, Factor 2 as The Collaborator, and Factor 3 as The Optimist Challenger.

Factor 1: The Isolated User reveals mixed views on AI. While participants recognize AI's benefits for enhancing critical thinking and personalization, they also voice concerns about potential over-reliance and reduced engagement. Critics note AI's limitations in equalizing educational opportunities and its predominance in administrative roles, echoing broader doubts about its effectiveness in language support and general applicability in education.

Factor 2: The Collaborator highlights AI's role in enhancing active learning and addressing diverse needs yet points out challenges in cultural sensitivity. This factor portrays AI as a collaborative tool in educational environments but notes its shortcomings in personalization and cultural adaptation.

Factor 3: The Optimist Challenger is predominantly positive, seeing AI as an essential tool for boosting engagement and preparing students for global markets. Nonetheless, concerns persist about AI's potential to replace traditional teaching methods and to deepen technological divides among students.

Each factor represents a distinct perspective on AI's integration into education, ranging from cautious critiques about isolation and dependency to collaborative benefits and optimistic endorsements of its transformative capabilities. These classifications facilitate a deeper understanding of the various attitudes towards AI, highlighting the complex dynamics at play in EMI settings.

In conclusion, this study employed Q-methodology to explore diverse student attitudes towards AI in EMI settings, uncovering a complex landscape where AI's application in education presented both opportunities and challenges. In particular, among the identified three perspectives, cultural factors might play a role in collaboration and engagement. For example, preferences for group harmony and indirect communication, common in Japan as outlined by Hofstede (2001), might influence the acceptance and integration of AI technologies differently among Japanese and international students. These cultural dynamics were considered in interpreting the varying responses to AI implementation, suggesting that tailored approaches could be beneficial to accommodate diverse cultural backgrounds in the EMI setting. Future research should delve deeper into how these cultural factors affect AI integration across different student demographics to ensure the effective and sensitive application of technology. Additional studies are also needed to develop robust training programs for both students and teachers to ensure the effective use and integration of AI in EMI settings. By fostering a critical understanding and strategic implementation of AI, educators could harness its potential to enhance learning while conscientiously addressing ethical considerations, such as privacy, data security, and fairness. It is essential to develop operational strategies that ensure these technologies are used in a way that upholds ethical standards and promotes fairness in educational settings, particularly in diverse environments like EMI courses.

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Appendix

1	AI tools make it easier for me to understand course content in English.
2	I find that AI enhances my engagement during class more effectively than traditional methods.
3	AI provides personalized help that suits my learning pace and style in EMI courses.
4	Relying on AI for language assistance makes me less motivated to improve my English skills.
5	AI helps level the playing field among students with different levels of English proficiency.
6	I prefer AI to handle only administrative tasks so that learning remains a human-centered activity.
7	AI-driven tools encourage more critical thinking and collaboration than traditional learning methods.
8	The use of AI in classrooms makes me feel divided from students who are more tech-savvy.
9	AI tools adapt to my learning needs, providing feedback that helps me learn more effectively.
10	The benefits of AI in learning depend a lot on the quality of the school's technology.
11	Using AI in classes supports a learning environment where I can actively participate and learn from others.
12	Sometimes it feels like AI in education focuses more on using new tools than actually improving our learning.
13	Learning with AI tools better prepares me for the challenges of the global job market.
14	AI connects me with students from other cultures, enhancing my learning experience in EMI.
15	I worry that over time, AI might replace the need for teachers in some areas of learning.
16	I'm sceptical about AI's ability to truly understand and address cultural differences in class.

Appendix 1. Statements.

-3	-2	-1	0	1	2	3
4	6	11	2	8	1	3
	15	12	5	9	7	
		16	10	14		
			13			

Appendix 2. Example Q-Sort grid for participant response.

	Statement No.	QS-V	z-score		QS-V	z-score		QS-V	z-score	
Factor 1	7	3	1.47	*	0	-0.186		1	0.543	
	3	2	1.37	*	-2	-1.237		0	0.478	
	4	0	0.4	*	1	1.055		-1	-0.947	
	5	0	-0.13	*	3	1.139		2	1.18	
	2	0	-0.18	*	-1	-0.756		3	1.472	
	6	0	-0.36	*	2	1.062		-3	-1.503	
	11	-1	-0.49	*	2	1.136		0	0.484	
	16	-1	-0.58		0	0.726		0	-0.173	
Factor 2	11	-1	-0.49		2	1.14	*	0	0.484	
	4	0	0.4		1	1.06	*	-1	-0.947	
	6	0	-0.36		2	1.06	*	-3	-1.503	
	12	-2	-1.17		1	0.96	*	-2	-1.138	
	16	-1	-0.58		0	0.73	*	0	-0.173	
	1	1	1.05		0	0.13	*	2	0.998	
	7	3	1.47		0	-0.19	*	1	0.543	
	14	1	0.58		0	-0.28	*	0	0.35	
	9	2	1.06		-1	-0.42	*	1	0.955	
	2	0	-0.18		-1	-0.76	*	3	1.472	
	3	2	1.37		-2	-1.24	*	0	0.478	
Factor 3	2	0	-0.18		-1	-0.76		3	1.47	*
	13	-1	-0.68		-1	-1.05		1	0.64	*
	7	3	1.47		0	-0.19		1	0.54	*
	3	2	1.37		-2	-1.24		0	0.48	*
	11	-1	-0.49		2	1.14		0	0.48	*
	16	-1	-0.58		0	0.73		0	-0.17	
	4	0	0.4		1	1.06		-1	-0.95	*
	8	1	0.83		1	0.76		-1	-1	*
	15	-3	-1.64		-3	-1.64		-1	-1.06	*
	6	0	-0.36		2	1.06		-3	-1.5	*

Note: $p < 0.05$; An asterisk (*) indicates significance at $p < 0.01$. Both factor Q-sort values (Q-SV) and z-scores are displayed.

Appendix 3. Aggregated *Z*-scores.