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Juntendo Journal of Health Science and Nursing Vol.14
P.33–39 (2026)

Measuring Learner Development in VR-Based English Communication Classes Using BEVI Metrics

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Abstract

The present study is an empirical investigation measuring the impact of English communication lessons utilising virtual reality (VR) on students' psychological and affective changes, employing the BEVI (Beliefs, Events, and Values Inventory). Fifty-eight university students participated in a 16-week VR English course, with pre- and post-course comparisons of the four primary BEVI indicators (Basic Openness, Self-Awareness, Sociocultural Openness, and Emotional Empathy). The results showed significant improvements across all indicators, with particularly marked growth in “sociocultural openness”. This suggests the educational potential of VR environments to facilitate simulated cross-cultural dialogue experiences and promote learners' inner growth.

Keywords：VR space, English communication, BEVI, cross-cultural understanding, affective learning, non-cognitive skills

1. Introduction

Traditionally, the evaluation of English language learning has relied predominantly on cognitive abilities, typically quantified through measures such as intelligence quotient (IQ) scores or standardised academic achievement tests. Consequently, assessment practices in English communication courses have largely emphasised these cognitive dimensions. Since the early 21st century, however, increasing attention has been paid within educational science and psychology to the role of *non-cognitive skills* in capturing learner development and evaluating the outcomes of educational interventions. Seminal research by educational economist James Heckman and colleagues has demonstrated that non-cognitive attributes—such as perseverance, self-regulation, empathy, and cooperativeness—exert a substantial influence on labour market success, social integration, and overall life satisfaction (Heckman & Rubinstein, 2001; Heckman, 2006).

Despite their recognised importance, non-cognitive skills remain conceptually heterogeneous and lack universally accepted measurement frameworks, posing significant challenges for their assessment in educational contexts. In response to this methodological gap, the Beliefs, Events, and Values Inventory (BEVI) has attracted attention as a comprehensive psychological assessment tool. BEVI systematically evaluates individuals’ belief systems,

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(Received 24 December 2025) (Accepted 24 December 2025)

value orientations, emotional regulation, and openness to others. Originally developed within intercultural education and clinical psychology, the instrument has been widely employed to assess the effectiveness of international education programmes and to trace processes of psychological and identity transformation.

In contemporary English language education, the development of intercultural understanding and empathic competence is increasingly emphasised alongside communicative proficiency, necessitating pedagogical approaches that explicitly target these dimensions (Ministry of Education, Culture, Sports, Science and Technology, 2023). In communication-oriented instructional settings, conventional cognitive assessment instruments are often insufficient to capture such learning outcomes. Moreover, the physical constraints of traditional classrooms limit opportunities for authentic interaction with interlocutors from diverse cultural backgrounds. Recent advances in virtual reality (VR) technology have begun to address these limitations by enabling learners to engage in immersive, cross-cultural interactions within virtual environments (Lan & Li, 2022). Against this backdrop, the present study aims to quantitatively examine, using BEVI, the extent to which VR-based English communication instruction influences learners' psychological development, with particular attention to intercultural openness and emotional empathy.

2. The Theoretical Framework of BEVI

2.1. International and Domestic Research Trends

The BEVI was developed by Shealy (2016) based on Equilintegration (EI) theory and is designed to assess the formation and transformation of beliefs, values, and worldviews from a multidimensional psychological perspective. Internationally, the instrument has been widely employed in large-scale research initiatives, including the Forum BEVI Project, and is positioned as a robust tool for evaluating the effects of intercultural and transformative learning. Empirical studies using BEVI have demonstrated that both short-term and long-term study abroad programmes, as well as various forms of international and intercultural education, can significantly influence learners' worldviews and global identities. Additionally, demographic variables such as gender, nationality, and ethnic background have been shown to shape the trajectories of psychological transformation.

In Japan, the Japanese version of the BEVI (BEVI-j) was developed in 2011, primarily through the efforts of Hiroshima University, and has since been introduced into higher education and international exchange programmes. Ichimura (2023), for example, applied BEVI-j in a university-wide survey at a mid-sized institution, revealing distinctive patterns in students' beliefs and value orientations and demonstrating the instrument's effectiveness in visualising internal psychological change. Further studies conducted at Yamaguchi Prefectural University and Tamagawa University have utilised BEVI-j in COIL (Collaborative Online International Learning) and online intercultural courses, suggesting that even short-term virtual cross-cultural experiences can produce measurable changes in learners' beliefs and values.

2.2. Comparison with Other Measurement Instruments

The BEVI has frequently been compared with the Intercultural Development Inventory (IDI), a widely used instrument for assessing intercultural sensitivity and developmental orientation. Nagai (2019) examined the respective characteristics and validity of these two scales, concluding that while both are effective for intercultural assessment, BEVI captures beliefs and values in a more multidimensional manner. At the same time, BEVI includes

a substantially larger number of items and requires a longer administration time, highlighting the importance of selecting measurement instruments in accordance with specific research objectives.

Developed by psychologist Shealy, the BEVI is grounded in the premise that individuals' interpretations of experiences (Events) are inseparably linked to their belief systems (Beliefs) and value structures (Values). Although its theoretical roots lie in clinical psychology, the instrument has gained particular recognition for its capacity to measure the educational impact of intercultural learning and international experiences.

2.3. Structure of the BEVI

The BEVI consists of approximately 400 items, from which multiple subscales are derived through factor analysis. Its principal domains include the following:

1. **Self-related domains:** Self-Certainty, Self-Awareness
2. **Emotion-related domains:** Emotional Attunement, Meaning Quest
3. **Sociocultural domains:** Sociocultural Openness (Cross-Cultural Acceptance), Gender Traditionalism
4. **Values-related domains:** Environmental Concern, Religious Traditionalism
5. **Defensive tendencies:** Need for Closure, Fragility

These domains collectively capture emotional, social, and value-oriented dimensions of learner development that are difficult to assess using conventional cognitive ability measures and closely correspond to core components of non-cognitive skills.

2.4. Correspondence between BEVI and Non-Cognitive Skills

Although the BEVI does not directly measure non-cognitive skills, it provides a comprehensive visualisation of their constituent elements. Conceptually, BEVI domains align closely with non-cognitive abilities across the following five areas.

1. **Emotional Regulation and Self-Control**

   The Emotional Attunement scale assesses individuals' capacity to recognise and regulate emotions, corresponding to the non-cognitive skill of self-control. High levels of emotional regulation are associated with greater resilience to stress and sustained success in academic and professional contexts.

2. **Openness to Others and Empathy**

   Sociocultural Openness reflects receptiveness to cultural diversity and differing value systems, directly corresponding to empathy and cooperative orientation. In international education, cross-cultural acceptance forms a foundational component of global competence.

3. **Self-Concept and Agency**

   Self-Certainty and Self-Awareness capture aspects of self-understanding and identity formation, corresponding to agency and autonomous decision-making. These attributes exert a direct influence on learners' academic engagement and career development.

4. **Values and Social Responsibility**

   Scales such as Environmental Concern and Gender Traditionalism relate to ethical judgement and social responsibility, dimensions increasingly emphasised in the context of the Sustainable Development Goals (SDGs) and social coexistence.

5. **Defensive Tendencies and Self-Regulation**

   Need for Closure and Fragility assess rigidity and

Table1:BEVI and Non-Cognitive Ability Correspondence

BEVI Scale Domain	Corresponding Non-Cognitive Skill
Needs Closure	Perseverance, Flexibility, Problem-Solving
Emotional Attunement	Emotional Awareness, Empathy, Emotional Regulation
Self Access	Self-Understanding, Self-Expression, Introspection
Basic Openness	Curiosity, Inquiry, Diversity Acceptance
Sociocultural Openness	Empathy, Collaboration, Cross-Cultural Adaptability
Negative Life Events	Resilience, Stress Tolerance
Self Certitude	Self-Efficacy, Self-Affirmation
Meaning Quest	Meaning-Making, Sense of Purpose, Motivation
Dynamic Complexity	Critical Thinking, Cognitive Flexibility

psychological vulnerability, providing insight into areas where non-cognitive skills may be underdeveloped and require targeted educational support.

These relationships are briefly summarised in Table 1.

2.5. Educational Applicability

When applied in educational contexts, the BEVI serves as an effective instrument for examining how learners interpret experiences, construct meaning, and translate these processes into psychological growth. Non-cognitive skills—including self-regulation, motivation, empathy, and resilience—are increasingly recognised as foundational to academic achievement and lifelong learning. Linking these constructs through BEVI enables the quantitative visualisation of learners' internal development, thereby enhancing the evaluative power of educational research.

The BEVI is particularly well suited for assessing programmes designed to foster non-cognitive skills, such as intercultural exchange initiatives, project-based learning (PBL), and career education. Its capacity to present psychological growth as quantitative data enhances its credibility in educational evaluation and policy discourse. Importantly, framing international education outcomes in terms of non-cognitive skill development provides empirical evidence to support institutional internationalisation strategies.

Moreover, analysis of individual BEVI profiles allows for the early identification of learners who may face challenges in empathy or self-regulation, thereby enabling timely counselling and pedagogical intervention. Wandschneider et al. (2015), for example, conducted pre–post analyses using BEVI with U.S. university students participating in short-term study abroad programmes and reported significant gains in cultural receptivity and empathy. In Japan, similar BEVI-j–based studies have been conducted with participants in short-term international programmes at institutions such as Hiroshima University, Yokohama National University of Education, and Chiba University, further supporting the instrument's applicability in higher education.

3. Research Methodology

3.1. Participants

The participants were 20 second-year undergraduate students (3 males and 17 females) enrolled in the nursing department of a private university in Japan. All participants demonstrated English proficiency ranging from CEFR levels A1 to B2. The mean TOEFL ITP score was 431 (maximum score: 507), indicating basic to lower-intermediate proficiency overall.

3.2. Course Design

The VR-based English communication course was conducted using *Fynd Core*, a virtual interaction platform developed by the Norwegian company Fynd. Through the use of avatars, participants engaged in synchronous English communication with students from Weber State University (Utah, USA) and JAMK University of Applied Sciences (Finland). Course activities included interactive discussions and student presentations introducing aspects of the Japanese healthcare system.

The course comprised 13 weekly sessions, each lasting 90 minutes, and was structured into three phases:

- **Introduction Phase (Weeks 1–3):** Orientation to the VR environment and training in basic operations, followed by self-introductions in English.
- **Interaction Phase (Weeks 4–12):** Small-group English discussions conducted in VR breakout rooms on nursing- and healthcare-related topics, including:
  - ○ Roles and activities of public health nurses
  - ○ Nutrition for older adults
  - ○ The use of care robots in elderly care
  - ○ Japan's ageing society and the long-term care insurance system
- **Reflection Phase (Week 13):** Guided reflection on VR learning experiences, during which participants articulated perceived personal and attitudinal changes in English.

3.3. Measurement Method

The Japanese version of the Beliefs, Events, and Values Inventory (BEVI; Shealy, 2016) was administered before and after the course to assess changes in learners' psychological orientations. Mean scores for the four primary BEVI indicators were compared across the two time points. Paired-samples *t*-tests were employed for statistical analysis, with the significance level set at 5%.

3.4. Ethical Considerations

All procedures, including pre- and post-course BEVI

administration, were conducted in strict compliance with the research ethics guidelines of Juntendo University.

4. Results

Table 2. Pre-and Post-Course Comparison of BEVI Indicators (N = 20)

Indicator	Pre-course Mean	Post-course Mean	*t*-value	*p*-value
Basic Openness	61.8	70.5	4.22	< .01
Self-Awareness	59.3	66.9	3.89	< .01
Sociocultural Openness	60.1	73.4	4.85	< .001
Emotional Empathy	56.4	65.8	3.74	< .01

5. Discussion

The findings indicate that VR-based English communication instruction contributes to learners' psychological development, particularly in terms of emotional openness and intercultural receptivity. The following sections discuss the underlying mechanisms and educational implications of these outcomes.

5.1. Enhancement of Emotional Realism through Immersive Environments

VR environments enable learners to experience a strong sense of presence, or the subjective perception of "being there," despite the mediated nature of interaction. This immersive quality facilitates communicative exchanges accompanied by psychological tension and empathic engagement similar to those encountered in face-to-face interactions. Such emotionally engaging experiential learning is likely to promote deeper reflection and memory retention than conventional knowledge-based instruction, thereby enhancing emotional openness as measured by the BEVI.

Japanese learners of English often experience communication anxiety stemming from fear of failure and social embarrassment. In contrast, VR environments offer a psychologically safe space in which learners can engage in repeated trial and error with minimal perceived social risk. This reduction in anxiety may have contributed to increased confidence in self-expression.

5.2. Promotion of Cross-Cultural Empathy and Perspective-Taking

VR functions not only as a platform for English language use but also as a medium for immersive cultural experience. Communicating within virtual representations of overseas environments allows learners to develop a concrete understanding of non-verbal communicative elements, including eye contact, spatial orientation, and gesture use. These embodied experiences are likely to have contributed to gains in sociocultural openness.

Furthermore, the diversity of avatar appearances and expressions enables learners to engage in simulated perspective-taking, facilitating empathic understanding and culturally relativistic thinking through the experiential process of "standing in another's shoes."

5.3. BEVI as a Tool for Facilitating Introspective Learning

The BEVI proved effective in capturing subtle psychological

changes that are difficult to measure using traditional language proficiency assessments alone. In particular, the instrument enabled visualisation of changes in self-understanding and value flexibility, underscoring its educational relevance. From an assessment perspective, the use of BEVI allows for the simultaneous evaluation of behavioural outcomes and cognitive–affective transformations induced by VR-based instruction. Future English education research would benefit from adopting integrated assessment frameworks that combine linguistic performance measures (e.g., CEFR) with psychological instruments such as the BEVI.

5.4. Limitations and Future Directions

Several limitations should be acknowledged. First, the relatively small sample size and individual differences in prior VR experience or technological literacy may have influenced the results. Second, social interaction within VR environments does not fully replicate real-world communication, as certain non-verbal cues remain limited or stylised. Future studies should employ longitudinal designs to examine the sustained impact of VR-based instruction on learners' identity formation and intercultural competence, complemented by multimodal analyses incorporating speech data and behavioural logs.

6. Conclusion

This study demonstrated that VR-based English communication instruction can serve as an effective pedagogical approach for promoting intercultural understanding, as evidenced by significant improvements in BEVI indicators. In particular, enhanced sociocultural openness appears to play a central role in fostering practical global competence within English education.

Analysis of BEVI data revealed significant gains in learners' sociocultural openness and emotional empathy, likely attributable to the psychological realism afforded by immersive cross-cultural experiences that are difficult to achieve through conventional classroom discussion alone (Chen & Kent, 2021). Moreover, the ability of VR environments to visually convey non-verbal responses and situational context may have contributed to affective development (Schwienhorst, 2002). Overall, the observed increases in BEVI scores highlight the educational value of VR beyond linguistic proficiency gains, extending to enhanced self-awareness and expanded value systems.

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