**1. Operational definitions**

The operational definitions of the seven factors are:

* Subject-learners and their characteristics. This article includes some articles about teachers’ experiences across cultural teaching environments, so teachers’ characteristics also have been considered in this factor.
* Object-the initial/started purpose of the courses, learning tasks, or educational goals from teachers’ perspectives.
* Tools- information and communication technologies or learning management systems used in the courses.
* Community-in this article, this factor is related to disciplines, sometimes a project.
* Rules-content representation, including content organization, information sequencing and structure, and learning assistance (e.g., learning strategies scaffolding). This factor is directly related to pedagogical strategies.
* Division of labor- other stakeholders and their roles in the courses except for teachers and students in the courses.
* Outcomes-the measurement of learners’ performances, based on learning objectives but the measure/assessment has more clear instruction and the items are well constructed to be easy to interpret.

**2. Descriptive analysis**

Of 18 studies, 3 (Leh, Grau, and Guiseppe 2015; Arndt et al. 2021; Warren 2018) examined teachers’ education to enhance cross-cultural pedagogical awareness, 10 (Cheong and Martin 2009; Lin and Yang 2015; Rubin 2009; Stefanova and Jiménez 2019; Yang, Olesova, and Richardson 2010; Park and Wen 2016; Van Boeijen 2016; Quan and Gu 2018; King Ramirez 2020; Gu, Wang, and Mason 2017) experimental studies considered the cultural differences in instructional strategies to enhance learning performance in a cross-cultural learning environment, 4 (Kumi-Yeboah et al. 2020; Mohamad Nasri, Nasri, and Abd Talib 2021; Goold, Craig, and Coldwell 2007; Kumi-Yeboah 2018) discussed teachers’ experiences about how to enhance learning across cultural teaching, and 1 (Shamir‐Inbal and Blau 2021) explores cross-cultural project leaders perspectives about how to construct cross-cultural learning project. 17 articles adopted qualitative research methods, and 1 article adopted mixed research methods. Considering the coding scheme, only the first two kinds of the selected articles, 13 articles, were coded based on seven elements of AT. The articles about educators’ teaching experiences in diverse cultural environments and project leaders were considered supplementary to the details of the code item.

**3. Seven Tables**

Table 1. Subject

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Subject | Students | Ethnicity (Cheong and Martin 2009) |
| Nationality (Leh, Grau, and Guiseppe 2015; Park and Wen 2016; Quan and Gu 2018; Arndt et al. 2021; King Ramirez 2020; Gu, Wang, and Mason 2017) |
| Different subgroups (Lin and Yang 2015; Yang, Olesova, and Richardson 2010) |
| Teachers | Nationality (Arndt et al. 2021) |

Table 2. Community

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Community (disciplines or project) | Students | Business education course (Rubin 2009; Yang, Olesova, and Richardson 2010) |
| Foreign language learning course (Lin and Yang 2015; Park and Wen 2016) |
| Communication course (Cheong and Martin 2009; Stefanova and Jiménez 2019) |
| Product design course (Van Boeijen 2016; Gu, Wang, and Mason 2017; Quan and Gu 2018) |
| Digital literacies and consumption (King Ramirez 2020) |
| Teacher | Pedagogy of writing instruction for teachers’ course (Warren 2018) Education (Leh, Grau, and Guiseppe 2015) |

Table 3. Division of labour

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Division of labour (other stakeholders) | Teachers’ office and institutional helpdesk | Technical support, Pedagogical assistance, and E-learning quality control from the teachers’ office (Cheong and Martin 2009); Access problems support from the institutional helpdesk (Cheong and Martin 2009) |
| Researchers contact students directly | Record student groups’ operation and communication (Quan and Gu 2018); Student group interviews (Gu, Wang, and Mason 2017) |

Table 4. Objectives

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Objectives | Collaboration skills | Ability to have intercultural discussions and conversations (Cheong and Martin 2009; Stefanova and Jiménez 2019); |
| Smooth communication and mutual understanding (Quan and Gu 2018) |
| Cross-national systems building (Rubin 2009) |
| The need to internationalize the curriculum (King Ramirez 2020) |
| Collaboration in project-based learning (Gu, Wang, and Mason 2017) |
| Language skills | Reading and writing skills in business English through discussion (Yang, Olesova, and Richardson 2010) |
| foreign language vocabulary acquisition (Park and Wen 2016) |
| Cultural awareness | Stereotyping and misperceptions in organizational behavior (Rubin 2009) |
| the importance of diversity in education (Leh, Grau, and Guiseppe 2015); Teachers’ possibilities for implementing culturally appropriate writing practices (Warren 2018) |
| To share different thinking and life experience（Cheong and Martin 2009） |
| Intercultural competence | Components of intercultural competence can be understood and applied (for teachers) (Arndt et al. 2021) |
| Motivation | Learners’ interests in cultural diversity (Stefanova and Jiménez 2019); Foreign language learning motivation (Lin and Yang 2015) |
| Technology-based education is included by Higher education officials (Stefanova and Jiménez 2019) |
| Problem-solving skills | Introduction and simple application of design methods (Van Boeijen 2016) |

Table 5. Outcomes

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Outcomes (Learning outcomes) | Learning performance | Motivation (Lin and Yang 2015); Cross-cultural competence (Lin and Yang 2015; Arndt et al. 2021); Team cohesion (Rubin 2009; Stefanova and Jiménez 2019); Skills at problem-solving (Rubin 2009; Stefanova and Jiménez 2019; Van Boeijen 2016); Teachers’ skills at feedback-giving (Rubin 2009); Distance work skills (Stefanova and Jiménez 2019); Social and interpersonal skills (Stefanova and Jiménez 2019); Deep understanding of diversity in education (Leh, Grau, and Guiseppe 2015); Different types of visualization forms in discussion (Quan and Gu 2018); Self-awareness (King Ramirez 2020) |
| Learning  measurement | Discussion posts (Cheong and Martin 2009; Yang, Olesova, and Richardson 2010); Peer assessment and/or self-assessment (Cheong and Martin 2009; Rubin 2009); Reflective tasks (Leh, Grau, and Guiseppe 2015; Stefanova and Jiménez 2019); Pre-and post-assessment (Park and Wen 2016; King Ramirez 2020); Task presentation (Quan and Gu 2018; Gu, Wang, and Mason 2017) |

Table 6. Tools

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Tools | Learning management system | WebCT Vista (Yang, Olesova, and Richardson 2010); edX platform (Van Boeijen 2016); Canvas (Arndt et al. 2021; King Ramirez 2020); Foreign language learning digital games (Park and Wen 2016) |
| Communication tools | Synchronous HomeMeeting interactive online conference system integrated with Facebook (Lin and Yang 2015); Skype, WhatsApp, and a dedicated Facebook group (Stefanova and Jiménez 2019); MindManager and XMind (two visualization tools) (Quan and Gu 2018); Google docs, international phone calls, and video conferences (King Ramirez 2020); Email and Skype (Gu, Wang, and Mason 2017); Online course and teleconference call (Rubin 2009) |

Table 7. Rules

|  |  |  |
| --- | --- | --- |
| Elements in AT | Sub-elements | Items |
| Rules (Pedagogical strategies) | Group discussions | Facilitator role of teachers in discussion board (Cheong and Martin 2009); Instructors debrief students frequently (Leh, Grau, and Guiseppe 2015); Cultural diversity activities in school as learning materials (Arndt et al. 2021); Virtual partner(s) group discussion about international current events (King Ramirez 2020); Collaborative Online International Learning (Stefanova and Jiménez 2019); Cross-cultural management problems in corporate settings as learning materials (Yang, Olesova, and Richardson 2010) |
| Project-based learning | Mixed multi-cultural project groups (Leh, Grau, and Guiseppe 2015); Customer–merchant model (Quan and Gu 2018); Different roles in collaboration (relationships with Sternberg’s thinking styles inventory) (Gu, Wang, and Mason 2017); Experiential and reflective learning (Van Boeijen 2016) |
| Problem-based learning | (Rubin 2009) |
| Cultural consideration in feedback | Power distance considered in instruction (Rubin 2009); Online learning combined with culturally responsive teaching strategies (Lin and Yang 2015) |
| Digital game-based learning | Learning games designed based on cross-cultural psychology (Park and Wen 2016) |

**4. References**

Arndt, S., S. Madrid Akpovo , M. Tesar , T. Han, F. Huang, and M. Halladay. 2021. “Collaborative Online Learning across Borders (COLAB): Examining Intercultural Understandings of Preservice Teachers in a Virtual Cross-ultural University-based Program.” Journal of Research in Childhood Education 35 (2): 281-296. doi: 10.1080/02568543.2021.1880994.

Cheong, P. H., and J. N. Martin. 2010. “Cultural Implications of E-learning Access (& Divides): Teaching an Intercultural Communication Course Online.” In Cases on Successful E-Learning Practices in the Developed and Developing World: Methods for the Global Information Economy, 78-91. Pennsylvania: IGI global. doi: 10.4018/978-1-60566-942-7.ch006.

Goold, A., A. Craig, and J. Coldwell. 2007. “Accommodating Culture and Cultural Diversity in Online Teaching.” Australasian Journal of Educational Technology 23 (4): 490-507. doi: 10.14742/ajet.1248.

Gu, X., H. Wang, and J. Mason. 2017. “Are They Thinking Differently: A Cross-cultural Study on the Relationship of Thinking Styles and Emerging Roles in Computer-supported collaborative Learning.” Journal of Educational Technology and Society 20 (1): 13-24. <https://ris.cdu.edu.au/ws/portalfiles/portal/20609458/Mason_59692.pdf>

King Ramirez, C. 2020. “Influences of Academic Culture in Collaborative Online International Learning (COIL): Differences in Mexican and US Students' Reported Experiences.” Foreign Language Annals 53 (3): 438-457. doi: 10.1111/flan.12485.

Kumi-Yeboah, A. 2018. “Designing a Cross-cultural Collaborative Online Learning Framework for Online Instructors.” Online Learning 22 (4): 181-201. doi: 10.24059/olj.v22i4.1520.

Kumi-Yeboah, A., J. Dogbey, G. Yuan, and P. Smith. 2020. “Cultural Diversity in Online Education: An Exploration of Instructors’ Perceptions and Challenges.” Teachers College Record 122 (7): 1-46. doi: 10.1177/016146812012200708.

Leh, J. M., M. Grau, and J. A. Guiseppe. 2015. “Navigating the Development of Pre-service Teachers’ Intercultural Competence and Understanding of Diversity: The Benefits of Facilitating Online Intercultural Exchange.” Journal for Multicultural Education 9 (2): 98-110. doi: 10.1108/JME-12-2014-0042.

Lin, W. C., and S. C. Yang. 2015. “Effects of Online Culturally Responsive Pedagogy: Collaborative Learning between College Tutors and Indigenous High School Students.” Journal of Research in Education Sciences 60 (4): 223-253. doi: 10.6209/JORIES.2015.60(4).08.

Mohamad Nasri, N., N. Nasri, and M. A. Abd Talib. 2021. “Regional Contextualization of Culturally Responsive Online Distance Pedagogy (CRODP) among Southeast Asia Higher Educators.” Interactive Learning Environments 1-12. doi: 10.1080/10494820.2021.1967407.

Park, J., and R. Wen. 2016. “A Comparative Framework for Culturally Differentiated Digital Game-based Learning.” International Journal of Comparative Education and Development 18 (3): 138-149. doi: 10.1108/IJCED-04-2016-0008.

Quan, G., and X. Gu. 2018. “Visualization Forms in the Cross-cultural Collaborative Activities of Design and Development of a Digital Resource for Education.” Journal of Educational Computing Research 56 (3): 439-463. doi: 10.1177/0735633117708336.

Rubin, B. (2009). “The Best-Laid Plans.” In Handbook of Blended Shore Education, edited by Strohschen G., 261-272. Boston, MA: Springer.

Shamir‐Inbal, T. and I. Blau. 2021. “Characteristics of Pedagogical Change in Integrating Digital Collaborative Learning and Their Sustainability in a School Culture: E‐CSAMR Framework.” Journal of Computer Assisted Learning 37 (3): 825-838. doi: 10.1111/jcal.12526.

Stefanova, A., and A. G. Jiménez. 2019. “Building Bridges between Cultures-An Experiment with Collaborative Online International Learning (COIL)”. Journal of Teaching English for Specific and Academic Purposes 6 (3): 535-542. doi: 10.22190/JTESAP1803535S.

Van Boeijen, A. 2016. “Culture Specific or Global Design in Open Online Design Education.” Paper presented at International Conference on Engineering and Product Design Education, Denmark: Aalborg University, September 8-9.

Warren, A. N. 2018. “Exploring Experienced Teachers’ Constructions of Culturally and Linguistically Diverse Students in an Online Class.” International Journal of Multicultural Education 20 (2): 58-80. doi: 10.18251/ijme.v20i2.1586.

Yang, D., L. Olesova, and J. C. Richardson. 2010. “Impact of Cultural Differences on Students' Participation, Communication, and Learning in an Online Environment.” Journal of Educational Computing Research 43 (2): 165-182. doi: 10.2190/EC.43.2.b.