**Shi, H. & Aryadoust, V. A Systematic Review of AI-Based Automated Written Feedback Research**

**Supplementary file**

**Appendix A**

**The screenshot of the complete search terms**

****

**Appendix B**

**Journals that published AWF studies**

|  |  |  |  |
| --- | --- | --- | --- |
| Journal | 　 | No. of papers | % |
| Computer Assisted Language Learning |  | 11 | 16.4 |
| Assessing Writing |  | 8 | 11.9 |
| Computers and Education |  | 4 | 6 |
| System |  | 4 | 6 |
| Asia-Pacific Education Researcher |  | 3 | 4.5 |
| Computers in Human Behavior |  | 3 | 4.5 |
| Innovation in Language Learning and Teaching | 3 | 4.5 |
| Interactive Learning Environments |  | 3 | 4.5 |
| Journal of Second Language Writing |  | 3 | 4.5 |
| Education and Information Technologies |  | 2 | 3 |
| Educational Psychology |  | 2 | 3 |
| Educational Technology and Society |  | 2 | 3 |
| ELT Journal |  | 2 | 3 |
| Journal of Computer Assisted Learning |  | 2 | 3 |
| Journal of Educational Computing Research |  | 2 | 3 |
| Language Learning and Technology |  | 2 | 3 |
| Reading and Writing |  | 2 | 3 |
| ReCALL |  | 2 | 3 |
| SAGE Open | 　 | 2 | 3 |

*Note.* The remaining 21 papers were published in the following 21 journals*: Assessment in Education: Principles, Policy and Practice, Australasian Journal of Educational Technology, Big Data, British Journal of Educational Technology, Contemporary Educational Psychology, Educational Technology Research and Development, Frontiers in Psychology, Heliyon, IEEE Transactions on Learning Technologies, Instructional Science, International Journal of Management Education, Internet and Higher Education, Journal of Educational Research, Journal of Engineering Education, Journal of Experimental Psychology: Applied, Journal of Multilingual and Multicultural Development, Language Assessment Quarterly, Language Testing, Language, Learning and Technology, Studies in Educational Evaluation, Technology*, and *Pedagogy and Education.*

**Appendix C**

The Coding Scheme Adapted in this Study

| Variables | Description |
| --- | --- |
| **Research context** |  |
| Ecological setting | The environment where the study takes place, e.g., academic writing class |
| Language environment | 1. L1: writing in the native language 2. L2: e.g., English language learning and writing by non-native English speakers in English-medium educational systems such as the U.S.3. FL: Foreign language learning and writing in native-language-medium educational systems4. others (specify) |
| Educational level | 1. K-12 school: primary and secondary schools 2. University 3. K-12 & University 4. others (specify) |
| Target language | The language used in writing, e.g., English |
| Language proficiency level | Participants’ language level, e.g., High, Intermediate, and Low |
| **AWF system** |  |
| Name | The name of the AWF system used in the research, e.g., Criterion |
| Feedback focus | The types of automated written feedback examined in the research1. Form-focused feedback
2. Meaning-focused feedback
3. Comprehensive/unfocused feedback
 |
| Ways of integrating AWF | The way AWF is used in research. e.g., AWF + peer feedback.  |
| **Research design** |  |
| Participants | Types of participants e.g., learners |
| Sample size | The number of participants that took part in the research |
| Time duration | The time span of the research |
| Genres of writing | The types of writing used in research. e.g., essay.  |
| Data source | The types of data used in research e.g., interview |
| Research methodology | Ways of collecting data and analyzing data explicitly stated in the research1. Quantitative
2. Qualitative
3. Mixed-methods
4. Others (specify)
 |
| **Foci of investigation and results** |  |
| Research questions | The research questions stated in the research |
| Foci of investigation: | The main research topic(s) addressed in the research |
| Results | 1. Positive; 2. Negative; 3. Neutral; 4. Mixed |

The Coding Scheme for the Foci of Investigation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 　 | Subcategories | 　 | References |
| Performance of AWF |  | Accuracy; agreement with human raters' feedback; domain analysis; AWF vis-à-vis the construct of writing |  | Chapelle et al. (2015) |
| Perceptions, use, engagement with AWF, and influencing factors |  | Learners' engagement1; Learners' perception; Learners' use; Teachers’ perception; Teachers' use; Factors influencing the use, perception, engagement with AWF |  | M. Li (2021); Chapelle et al. (2015) |
| Effects of AWF |  | Effect on writing performance; genres; teacher feedback; grammatical accuracy; coherence and cohesion; metacognitive strategy; anxiety; mindset and motivation; self-efficacy; self-regulated learning; and identity | 　 | Fu et al. (2022); Chapelle et al. (2015)  |
| *Note.* 1. We made a distinction between engagement and other similar categories like perception and uses, as engagement is a newly emerged tripartite concept consisting of behavioral, cognitive, and affective aspects (Zhang & Hyland, 2018). |

**Appendix D**

*Feedback Focus of AWF research*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Feedback focus | 　 | # of studies | 　 | Systems |
| Form-focused feedback | 　 | 49(57.6%) | 　 | Checker, A grammar and spelling-checker program, CorrectEnglish, Criterion, Grammarly, LIWC, Microsoft Word Office; Grammarly, Mosoteach, Pigai, Write & Improve, WRITER, Writing Pal  |
| Comprehensive feedback |  | 19(22.4%) |  | Criterion, Glosser, iWrite, MI Write, MY Access!, NC Write, PaperRater, PEG, Writing Planet™ |
| Meaning-focused feedback | 　 | 15(17.6%) | 　 | Ctutor, ACDET, An online science curriculum module, Causal Discourse Analyzer, CohViz, eRevise, Essay Critiquing System 2.0, EssayCritic, Glosser, Intelligent Academic Discourse Evaluator (IADE), Online automatic classification system, Research Writing Tutor (RWT)  |

*Note*. One study (Chapelle et al., 2015) examined two systems; two studies did not specify the name of the systems.

**Appendix E**

*The research design of the AWF studies*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Genres of writing** | **n (%)** | 　 | **Participants** | **n (%)** | 　 | **Sample size** | **n (%)** |  | **Time Duration** | **n (%)** |
| Essay | 59(69.4%) |  | Learners | 73(85.9%) |  | Medium | 31(36.5%) |  | ≥10 weeks | 34(48.6%) |
| Unspecified | 18(21.2%) |  | Learners; teachers | 7(8.2%) |  | Large | 25(29.4%) |  | Unspecified | 30(42.9%) |
| Research articles | 3(3.5%) |  | Teachers | 3(3.5%) |  | Small | 12(14.1%) |  | Two-Five weeks | 9(12.9%) |
| Literature review | 2(2.4%) |  | Learners; teachers; professional development staff; writing experts | 1(1.2%) |  | Very small | 10(11.8%) |  | Six-Nine weeks  | 8(11.4%) |
| Business report | 1(1.2%) |  | Workplace representatives | 1(1.2%) |  | Massive | 6(7.1%) |  | < Two weeks | 4(5.7%) |
| Project proposal | 1(1.2%) |  |  |  |  | Unspecified | 1(1.2%) |  |  |  |
| Reflective journal | 1(1.2%) | 　 | 　 | 　 | 　 | 　 | 　 | 　 | 　 | 　 |

*Note.* For sample size, less than 10 participants were coded very small, the number of participants ranging from 10 to 30 was small size, from 31 to 100 medium, from 101 to 400 large, and over 400 massive

**Appendix G**

**List of reviewed papers**

\*Allen, L. K., Likens, A. D., & McNamara, D. S. (2019). Writing flexibility in argumentative essays: a multidimensional analysis. *Reading and Writing*, *32*(6), 1607-1634. <https://doi.org/10.1007/s11145-018-9921-y>

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\*Bai, L., & Hu, G. (2017). In the face of fallible AWE feedback: how do students respond?. *Educational Psychology*, *37*(1), 67-81. <https://doi.org/10.1080/01443410.2016.1223275>

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\*Conijn, R., Martinez-Maldonado, R., Knight, S., Buckingham Shum, S., Van Waes, L., & van Zaanen, M. (2020). How to provide automated feedback on the writing process? A participatory approach to design writing analytics tools . *Computer Assisted Language Learning*. <https://doi.org/10.1080/09588221.2020.1839503>

\*Cotos, E., Link, S., & Huffman, S. (2017). Effects of DDL technology on genre learning. *Language Learning and Technology*, *21*(3), 104-130. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85030168236&partnerID=40&md5=0139b79a2009739cc939394d6b673a53>

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