



A case study of Chinese secondary students' automated written evaluation feedback literacy

Yu Shao

School of Foreign Languages Education, Shandong University of Finance and Economics, Jinan,
CN-250014, China

shaoyu112233@163.com

Abstract. With the development of modern technology, automated writing evaluation (AWE) systems have gradually become popular tools for assessing essays. In order to make effective use of these systems, students need to have certain feedback literacy. This study explored the AWE feedback literacy of two Chinese secondary students using a combination of think-aloud protocols, interviews and classroom observations. The results showed the complexity and diversity of the two students' AWE feedback literacy in terms of affects management, feedback modes and student beliefs. This study helps to improve teachers' understanding of students' AWE feedback literacy, so as to better cultivate students' feedback literacy and effectively improve their English writing ability.

Keywords: automated writing evaluation (AWE); student feedback literacy; case study.

1 Introduction

With the wide application of modern educational technology, automated writing evaluation (AWE) systems have become an important tool for providing writing feedback. There is several systems for evaluating English writing in China, including Pigai, Youdao AI cloud and Bingo. Some systems such as Aim Writing and Write & Improve are widely popular in globe. While traditional writing assessment usually requires teachers to spend a lot of time on correction and feedback, AWE systems can quickly grade and guide students' compositions according to preset criteria and algorithms, providing real-time and targeted advice. Li et al.'s^[1] study showed that the corrective feedback provided by AWE systems can help improve learners' linguistic accuracy, although this effect may depend on the error types and teaching methods. Wilson and Roscoe^[2] further explored the effectiveness of AWE systems in a study of 114 sixth-grade students, which showed students' increased self-efficacy and better performance on the national English test by using the AWE system. Despite the many benefits of AWE systems, students need to possess a certain level of feedback literacy to make the most of feedback. This case study explored the AWE feedback literacy of Chinese secondary school students, aiming to improve teachers' understanding of

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students' feedback literacy, help them improve students' feedback literacy and promote students' better acceptance, understanding, and utilisation of the AWE feedback.

2 Literature Review

2.1 AWE Systems

In 1996, Page et al. introduced Project Essay Grader, the world's first AWE system, with the aim of reducing the pressure on teachers to mark essays and promoting computers as teacher's assistants. With the continuous progress of computer technology and the in-depth understanding of the nature of language, AWE systems are also developing. The studies on automatic writing evaluation systems mainly focus on the effects of AWE systems on writing proficiency and students' engagement with automatic writing evaluation feedback.

2.1.1 Effect of AWE Systems on Writing Proficiency.

A number of studies at home and abroad have focused on the effect of automatic writing evaluation system on students' writing level. Li et al.^[1] compared the first and final drafts of four compositions of 70 ESL college students and showed significantly higher accuracy of the final drafts of all four compositions than the first drafts after using Criterion. Bai et al.^[3] explored the effects of AWE feedback and model essay feedback on the linguistic complexity of college students' writing, and found that AWE feedback can effectively increase the lexical complexity of students' English writing, but reduce the syntactic complexity of English writing. These studies proved that AWE feedback has a positive effect in improving overall writing performance or a particular aspect of writing ability.

2.1.2 Student Engagement with AWE Feedback.

The quality of feedback depends not only on the feedback itself, but also on how students process the feedback. A number of researchers have studied students' engagement with automatic assessment feedback on writing in recent years. Koltovskaia^[4] through a case study explored the use of AWE feedback provided by Grammarly when revising final drafts by two English as a Second Foreign Language (ESL) undergraduates. The results of the study showed that students had different levels of engagement with AWE feedback. One of the students demonstrated greater cognitive engagement by questioning the AWE feedback, while the other's over-reliance on the feedback demonstrated lower cognitive engagement, leading to blind acceptance of the feedback.

Although the number of articles studying feedback literacy has increased in recent years, covering topics such as the dimensions, current status, and influencing factors of feedback literacy^[5], empirical studies on students' AWE feedback literacy are still relatively few.

2.2 Student Feedback Literacy

The term "literacy" initially referred to the ability to read and write, but this definition was too vague and lacked a clear standard of measurement. Later, with the rise of new literacy, it was recognised that the concept of "literacy" is complex and dynamic, and that its connotation must be determined in specific contexts^[6]. In teaching, the effectiveness of feedback depends largely on student factors, such as knowledge reserves, affective attitudes, learning motivation and so on. Student feedback literacy refers to the sum of various student factors that affect the effect of feedback.

Sutton^[7] first introduced the concept of student feedback literacy, and defined it as "the ability to read, interpret, and use written feedback". Sutton referred to students' feedback literacy from three dimensions: epistemological (knowledge building), ontological (identity construction), and practical (cognition and actions occurring in the use of feedback). Carless and Bond^[8] defined student feedback literacy as "the understandings, capacities, and dispositions needed to make sense of information and use it to enhance work or learning strategies" and proposed a framework of characteristics of student feedback literacy, including understanding feedback, making judgements, managing affects, and taking actions. Starting from the characteristics that students with higher feedback literacy should possess, this framework has attracted much attention from the academic community and the number of related theoretical explorations and empirical studies has gradually increased.

Han and Xu^[9] categorised the feedback literacy of students' written corrective feedback into three dimensions: cognitive capacity, socio-affective capacity and socio-affective disposition. Zhou et al.^[10] expanded the conceptual connotation of feedback literacy from a philosophical perspective, proposing that the dimension of respect should be included in students' feedback literacy, and that students should be aware of what respect is and how they can respect teachers and peers. Chong^[11] proposed a three-dimensional conceptual framework of student feedback literacy, including the engagement dimension, the contextual dimension and the individual dimension, by combining the ecological perspective, the sociocultural theory and the concept of agency.

In Chong's framework, the engagement dimension is derived from Carless and Bond's framework of student feedback literacy characteristics, including understanding feedback, making judgements, managing affects, and taking actions. Understanding feedback refers to understanding what the feedback is and how it works; making judgements is based on the implied assessment criteria; managing affects refers to how to deal with affective responses to feedback; and taking actions refers to adapting a learning strategy in response to feedback. The contextual dimension contains textual, interpersonal, instructional and sociocultural layers. The textual layer refers to the types and modes of feedback; the interpersonal layer refers to the relationships between the feedback participants; the instructional layer refers to the instructional design and course syllabus in the feedback activity; and the sociocultural layer includes factors such as the roles of teachers and students and the school culture. The individual dimension includes students' beliefs about the effectiveness of feedback, learning goals, feedback experience, and abilities.

Based on the three-dimensional framework of student feedback literacy proposed by Chong shown in Figure 1, this study will explore two ninth-grade students' AWE feedback literacy in terms of the engagement dimension, the contextual dimension, and the individual dimension. Since the feedback in this study was provided by an AWE system called Pigai and did not involve teacher feedback, instructional design, or course syllabus, the influence of the instructional layer in the contextual dimension was not considered.

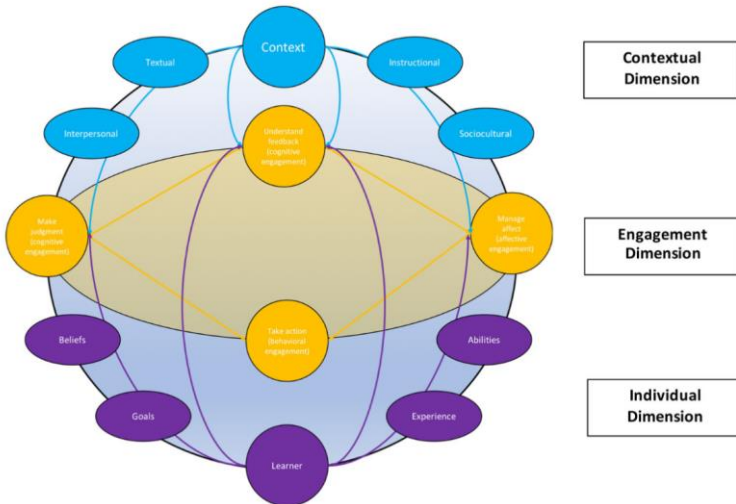


Fig. 1. A three-dimensional conceptual framework of student feedback literacy (Chong, 2021).

3 Methodology

3.1 Research Participants

The participants of this study are two ninth-grade students (Liu and Wang) in Jinan, Shandong Province, whose basic information is shown in Table 1. This study classifies students' English levels according to their average scores on the last two monthly English tests: the full score of the two monthly English tests is both 150. Students with an average score greater than 120 are high-level English learners, students with an average score in the range of 90 to 120 are intermediate-level English learners and those with an average score lower than 90 are low-level English learners. Liu wants to become a diplomatic English interpreter in the future, and endeavours to make English her dominant subject, and wants to enter a famous foreign language university in China through the college entrance examination. Wang wants to become an engineer in the future, and his main motivation for learning English is to pass the secondary school examination and the college entrance examination.

Table 1. Basic information about the subjects.

Surname	Gender	Grade	English level	Dream job
Liu	Female	Ninth grade	High level	English Translator
Wang	Male	Ninth grade	Medium level	Engineer

3.2 Data Collection

The data collection lasted three months and there were three main sources: think-aloud data, interview data and classroom observations. Two students were required to complete three compositions, one a month and subsequently finished thinking-aloud protocols and interviews. The composition topics are based on the unit topics of their English textbooks for that month. At the beginning of the month, the teacher will assign a composition on Pigai, which was graded according to the Junior Year Essay Scoring Formula (100 percent) and was limited to between 100 and 200 words. Students had one week to write the essay, and submitted it to Pigai for correction. When the results were presented, students made revisions based on the markings, remarks and sentence-by-sentence analyses, during which they were required to follow the prompts in Appendix 1 to engage in think aloud process. After that, students sent the teacher the audio recordings of their thinking-aloud data. After the above is completed, the teacher interviewed each student according to the interview outline (Appendix 2) to explore their feedback literacy. At the same time, the teacher also paid attention to the students' dynamic performance through classroom observation throughout the data collection period.

4 Results

4.1 Liu's AWE Feedback Literacy

4.1.1 Engagement Dimension.

The engagement dimension of AWE feedback literacy is explored by means of think-aloud protocols. The engagement dimension is specifically explored from four layers: understanding feedback, making judgements, managing affects, and taking actions.

1) Understanding feedback

The think-aloud report showed Liu's understanding of most of the AWE feedback, and only few feedback was difficult to understand. For example, "I don't quite understand what 'shake...hands' means when it appears 2904 times in the corpus". Liu thought that the feedback given by the system was worth learning on the whole, but there were still shortcomings in the feedback. Liu suggested more feedback on language organisation and logic.

2) Making judgements

Liu's judgements on the feedback are shown in Table 2. It showed that the overall incorrect feedback rate was not low, and in the third essay it was as high as 41.7%.

The results reflected that Liu did not completely trust the system feedback, but rather held a critical view of the feedback. She carefully checked the correctness of the feedback based on the knowledge she already had.

Table 2. Liu's judgement on AWE feedback.

	Total number of feedback (piece)	Correct feed- back (piece)	Incorrect feedback (piece)	Incorrect feed- back rate (per cent)
Composition 1	17	13	4	23.5
Composition 2	23	18	5	21.7
Composition 3	12	7	5	41.7

3) Managing affects

Liu could manage her emotions well and were relatively calm most of her time. When encountering mistakes that she should not have made, she would feel remorseful ("I don't know what I thought at that time", "I should have checked more" and "I shouldn't have submitted it like that"). When encountering incorrect feedback from the system, She would have feelings of incomprehension, speechlessness, and anger ("But some of the feedback was really speechless and a bit annoying" and "the word at first, which I didn't misspell at all, was said to be wrong"). Fortunately, she could control her emotions in time and still calmly conduct the think aloud report.

4) Taking action

Liu's think-aloud process and the composition revision took place simultaneously. Each piece of oral data was followed by her adjustments to the essay accordingly or measures taken to enhance improvement in the future. Liu's reports revealed that her actions could be broadly classified into three categories: 1) making revisions according to the feedback. For example, "That 2.7, what I want to convey should be active. That is extremely disappointing, so I should change that *ed* to be *ing*"; 2) copying and accumulating the recommended expressions and easy-to-confuse words provided by the feedback. For example, "It's a recommended expression. I wrote *realise that*, and I think it is just usual and common. The feedback gave me some more advanced expressions. I'll take them down and use them for my next writing"; 3) maintaining the original expression. For instance, "The chopsticks should be in plural forms because it should be a pair of chopsticks, not a single chopstick, it should still be with an *s*."

4.1.2 Contextual Dimension.

1) Textual layer

The textual layer refers to the impact of feedback types and feedback modes on students' feedback literacy. Liu's interviews showed her satisfaction with the type of feedback provided by Pigai as a whole. However, she suggested that more feedback on language organisation and logic should be added to help students improve their writing skills in a more comprehensive way. In addition, Liu thought that the diagnostic report provided by Pigai was very useful, which could detect many of her problems, such as poorly arranged paragraphs, infrequently used conjunctions, poor vo-

cabulary and so on. These can help students to understand their own compositions from a macro point of view.

2) Interpersonal layer

The interpersonal layer refers to the effect of the relationship between feedback participants on students' feedback literacy. According to the interviews and teachers' classroom observations, Liu had a good relationship with Wang, another research participant, and the two of them talked about everything. Liu was slightly more introverted than Wang and Wang's courage and confidence in asking questions and speaking up in class gave Liu great encouragement. Influenced by Wang, Liu also became braver and dared to question the correctness of the feedback.

3) Sociocultural layer

The sociocultural layer refers to the influence of teacher-student roles, school culture, social culture and other factors on students' feedback literacy. In the interview, Liu said that her teacher was "very young and friendly, with a modern mindset and the ability to understand our thoughts", and that she and her teacher "get along easily and happily, as if they were friends, and usually ask questions about what they don't know directly in class". This reflected Liu's friendly and relaxing relationship with her teacher. Therefore, Liu was more flexible to the teacher's feedback and the feedback from Pigai. She did not believe in the feedback, but scrutinised it with a critical eye. Once she found something wrong with the feedback, Liu would directly and boldly express her own ideas. Besides, Liu said, "This is the first time I have used the machine feedback. Other teachers in the school do not use the machine feedback, and they give the feedback manually. it is very slow." This showed that their school did not use automatic marking systems on a large scale and students were relatively unfamiliar with these systems. Despite in the age of intelligence and artificial intelligence, the development of digital education is not mature and educational intelligence has not been popularised on a large scale. This has led to students maybe understanding science and technology such as AI, but experiencing less of it in the field of education.

4.1.3 Individual Dimension.

1) Beliefs

Liu said that the AWE system had both advantages and disadvantages. The unique sentence-by-sentence feedback helped students locate the original text quickly. Most of the feedback given by the system were correct and comprehensive, which helped students correct their mistakes quickly. The recommended expressions provided by the system were beneficial to expand students' expressions and make their compositions richer. However, there are some drawbacks of the system. For example, some of the feedbacks were wrong, and the system was difficult providing feedback on language organisation and logic. Liu believed that these shortcomings would be solved in the future. As she was aware of the advantages and disadvantages of the AWE feedback, Liu did not blindly regard the feedback as the standard. She evaluated the feedback with a critical and sceptical eye instead.

2) Goals

Liu's recent English learning goal was "to score 130 points in the next monthly exam, and to improve her English composition by about 5 points", for which she "completes the English tasks assigned by the teacher seriously every day, and adds 20 minutes of English reading every day, and finally writes a composition every week." Liu's long-term goal was "to get a high score in English in the middle and high school entrance exams, and finally to enter a famous foreign language university to continue my English studies. After graduation, I want to become a diplomatic interpreter." Liu has made English her lifelong hobby, and she was planning to become an excellent diplomatic interpreter in the future. In short, Liu enjoyed English learning and was committed to an English-related career. She had clear long-term and short-term goals, and was planning how to realise these goals with practical actions.

3) Experience

This was the first time that Liu had used AWE systems, and none of the teachers in other subjects had ever used them. Liu was familiar with traditional teacher feedback and basically did not question the authority of the teacher's feedback because "the teacher seldom corrects my mistakes wrongly. The teacher is different from the machine. The machine is sometimes so rigid that it can't understand what I am trying to express, but the teacher basically doesn't have this kind of problem".

4) Abilities

Based on Liu's two most recent English scores (123 in the first exam and 120 in the second), it is clear that her English skills were strong and her ability was stable. Through classroom observation proved her outstanding ability in listening, speaking, reading and writing. As an English representative in her class, Liu not only loved to learn English by herself, but also enthusiastically answered questions for her classmates and motivated them to learn English, which was praised by her teachers and classmates.

4.2 Wang's AWE Feedback Literacy

4.2.1 Engagement Dimension.

Wang's oral reports were very brief and his performance on the engagement dimension of feedback literacy was surprisingly poor. The report showed that Wang could understand the feedback given by the system and determine whether the system's feedback was correct or not, but Wang stated that all the feedback given by the system was correct. Wang said that his mistakes were all caused by his carelessness, and that the synonym substitutions given by the system were all things he had not learned. He was dissatisfied and impatient with the feedback given by the system, believing that the system was unable to provide more constructive suggestions. Because Wang was not satisfied with the feedback given by the AWE system, he only revised some of the errors later. No explanation was given and nothing else was done.

4.2.2 Contextual Dimension.

1)Textual layer

From the interviews, it is known that Wang was not satisfied with the AWE feedback. He thought that the system "can only provide easy-to-find problems, such as wrong spelling and missing a letter". He considered that these small problems could be detected on their own, so automatic feedback was of little value. Wang's implication was that the system did not function as it should and was not very helpful to him.

2)Interpersonal layer

Wang said that he and Liu had a good relationship and they often discussed questions. However, Liu was unable to share his extracurricular burdens. Wang was so tired of his multiple duties in the class that he did not have time to report in detail on the AWE feedback. He added that she envied Liu because she had only one responsibility as an English representative and therefore she had more time to complete the assignments set by the teacher.

3)Sociocultural layer

Wang said that he was outgoing and had a good relationship with her teachers in all subjects, including her English teacher. Wang said that her English teacher was "open-minded and understanding, and would not make it difficult for students to do things they did not want to do". Wang believed that his teacher would understand him and not ask him to make oral reports. In addition, Wang stated that although AI is currently developing relatively quickly, AWE systems had not been popularised on a large scale in their school.

4.2.3 Individual Dimension.

1)Beliefs

The interviews showed Wang's low belief in the automatic writing evaluation system. He believed that the system could only point out minor problems such as word spelling, and that the feedback on other aspects was still insufficient. Due to the low belief in the AWE system, Wang simply corrected the spelling and omission of words during the revision process.

2)Goals

Wang said in the interview that he had a clear goal for the high school entrance examination, i.e., "I want to enter the best high school in the city". However, when asked about his plans for English, Wang said, "I don't have specific plans for English. As long as my grades in the other subjects are high enough, I can keep my English at the current level." When it came to future career choices, Wang said he wanted to be an engineer and definitely would not choose English-related jobs.

3)Experience

Wang was also new to AWE systems like Liu. Wang knew a little bit about AI, but his focus was mostly in the engineering field, and seldom involved in the education field. Wang's knowledge of educational intelligence only stayed in the online education.

4)Abilities

Wang's average score of the last two English exams was 112 (the first one was 107 and the second was 117), which indicated that his English ability was at an intermediate level and his performance was unstable. Classroom observation revealed that Wang's basic English skills were not solid enough, and sometimes he was not too serious about learning English. However, his self-study ability was not poor, and he had more room for improvement in English.

5 Discussion

This study explored the AWE feedback literacy of two Chinese ninth-grade students based on the three-dimensional framework of student feedback literacy proposed by Chong. The study found that there were significant differences in the feedback literacy of the two students. Liu demonstrated high feedback literacy, while Wang's feedback literacy was relatively weak.

Specifically, at the level of understanding feedback, Liu was able to understand most of the feedback, but a few confused her, while Wang reported that he was able to understand all of the feedback. This is closely related to their interests, goals, and the amount of study time they invested. Liu had a strong interest in English, was committed to studying at a prestigious foreign language university, and dreamed of becoming a diplomatic translator. She was less burdened by class duties and had more time to focus on her English learning. She completed the oral presentation carefully and understood the feedback one by one in the process. On the contrary, Wang took on several duties in his class and participated in various cultural performances and class affairs every day. He had little interest in English and believed it was sufficient to maintain his current level of proficiency. Therefore, he spent very limited time on English every day, resulting in a lack of seriousness about his assignments and a tendency to make blind generalisations. After seeing some feedback on spelling mistakes, he mistakenly thought that the AWE system only provided feedback on such minor issues and assumed that he understood all the feedback.

In terms of making judgements, Liu pointed out the system's erroneous feedback in all three oral reports, with an incorrect feedback rate of 23.5%, 21.7% and 41.7% respectively, whereas Wang stated that there were no errors in the system's feedback. Liu mentioned in her interview that she was neutral towards the AWE system due to the strengths and weaknesses of the system's feedback. Therefore, she would scrutinise each piece of feedback with a critical eye. This is in line with Storch and Wigglesworth's^[12] findings that affective factors such as students' beliefs, goals and attitudes influence their understanding of feedback. Influenced by Wang's boldness in speaking up and expressing his ideas, Liu also dared to point out errors. Wang, on the other hand, believed that the errors pointed out by the system were all caused by his carelessness and that the feedback from the system did not provide much constructive help, leading to his low beliefs in the AWE system. Instead of reporting all the feedback one by one, his oral reports only mentioned some minor spelling errors said nothing about other types of feedback. This is related to his learning goals and time

allocation. Wang was not as enthusiastic about English as Liu and had very limited time allocated to English each day and failed to report all feedback.

In terms of managing affects, Liu was able to control her emotions well, with a calm tone of voice throughout the debriefing process. When she encountered incorrect feedback, she would show anger and disbelief. But she could control her emotions in a timely manner and did not allow negative emotions to affect the reporting of correct feedback. Wang, on the other hand, failed to control his negative emotions in time, and expressed dissatisfaction and impatience with the minor problems in the feedback. And these negative affects appeared throughout the entire think-aloud process. Interviews revealed that Liu left sufficient time to make oral reports, whereas Wang took a small amount of time out of his busy schedule to complete the task.

In terms of taking actions, Liu was able to adopt appropriate strategies based on the feedback to revise errors, insist on correctness, and accumulate expressions recommended by the system. Wang revised some of the errors caused by his carelessness and did not revise or accumulate other feedback. In addition to the factor of learning time, the two students' beliefs and learning goals about the system's feedback also influenced their actions. Liu was neutral towards the automatic writing evaluation system, examining the feedback with a critical eye, absorbing the beneficial parts and rejecting the erroneous feedback. She was committed to pursuing an English-related career, had a great passion for learning English, and endeavoured to seize every opportunity for improvement. Wang had low beliefs in the AWE feedback, was frustrated with the system, and lacked high expectations of his English proficiency, resulting in his reluctance to put in more effort in his actions.

6 Conclusion

Adopting a case study to explore the AWE feedback literacy of two secondary school students in China, the study showed their different characteristics. Liu made lots of effort in feedback engagement. She held moderate belief in the AWE system and therefore critically viewed the feedback of automatic writing evaluation. She had a clear goal and was committed to becoming a diplomatic translator. Influenced by Wang's personality, Liu dared to boldly speak out the wrong feedback. Wang put in less effort in feedback engagement. He had a clear goal for further studies but lacked a clear plan for English learning. He had low belief in the AWE system and had difficulty in controlling his negative emotions during oral reports. The two students' AWE feedback literacy was affected by a variety of factors such as the type and mode of the feedback, the relationship between the participants, learning goals, feedback experiences, and students' beliefs in AWE feedback.

This study helps teachers understand the diversity and complexity of students' AWE feedback literacy. There may be differences in students' AWE feedback literacy. Teachers should pay attention to and respect students' individual differences, understand students' differences in the acceptance and application of feedback, and tailor their teaching to help students use AWE systems more efficiently so that they can provide better guidance for writing instruction. In addition, teachers need to pay at-

attention to guiding students to establish positive feedback attitudes and abilities, to cultivate their open-mindedness and critical thinking towards feedback. Teachers can promote students' in-depth understanding and effective use of feedback, enhance their feedback literacy through discussions, writing exercises and feedback exchanges.

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Appendix 1 Think-aloud Outline

Please answer the following questions verbally, line by line, in a quiet environment, based on the feedback provided by the automated writing evaluation system. Please record the whole process using audio recording software.

1. Can you understand the feedback from the system and how it plays a role in your mind? (understanding feedback)
2. Whether the feedback given by the system is correct and why? (making judgement)
3. How the feedback given by the system makes you feel emotionally and how to deal with that emotion? (managing affects)
4. How would you improve your composition or adjust your learning strategies based on the feedback given by the system (taking actions).

Appendix 2 Outline of a semi-structured interview for students' AWE feedback literacy

1. Contextual dimension
 - 1) What do you think of the type of feedback and feedback model given by the system? (textual layer)
 - 2) How is the relationship between you and (Wang/Liu) classmates? (interpersonal layer)
 - 3) How is your relationship with your teacher? How do schools and society think about AWE systems? (sociocultural layer)
2. Individual dimension
 - 1) How do you evaluate the system? Is the feedback given by the system useful? (beliefs)
 - 2) What are your current learning goals? What career do you plan to pursue in the future? (goals)
 - 3) What did most of the feedback you've been exposed to before look like? Any exposure to automated evaluation feedback? (experience)

4) How do you feel about your English level? How did you do on your last two English exams? (abilities)

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