**Appendix A**

**Construct Definitions of Linguistic Complexity in the Included Studies**

“Linguistic complexity or objective complexity characterizes ‘intrinsic formal or semantic functional properties of L2 elements (e.g., forms, meanings and form-meaning mappings)’ (Housen et al., 2012, p. 4). From Bulté and Housen’s (2012, 2014) analytic view, this construct is multifaceted and multi-componential in nature and reflects ‘the degree of elaboration, the size, the breadth, width, or richness of the learners’ L2 system or repertoire’ (Bulté & Housen, 2012, p. 25) (i.e., *system complexity*) and describes the degree of sophistication of the learners’ linguistic (grammatical and lexical) knowledge (i.e., *structure complexity*)” (Abdi Tabari & Wang, 2022, p. 4).

“[L]anguage output is the adaptive language behavior of the learner by deploying his or her own cognitive and linguistic resources” (Luo, 2022, p. 152).

“Complexity is defined by Skehan (1996) as the elaboration of the developing linguistic knowledge” (Khezrlou, 2020, p. 53).

“Complexity is regarded as the rich elaboration of the produced language” (Kim, 2018, p. 4).

“(the use of more advanced and diverse target language features)” (Hsu, 2017, p. 360).

“Complexity is defined as ‘the capacity to use more advanced language, with the possibility that such language may not be controlled so effectively. This may also involve a greater willingness to take risks and use fewer controlled language subsystems. This area is also taken to correlate with a greater likelihood of restructuring, that is, change and development in the interlanguage system’ (Skehan & Foster, 1999, pp. 96-97)” (p. 48). The author adds, “According to Skehan (1996b), complexity ‘concerns the elaboration or ambition of the language which is produced’ (p.23). Foster and Skehan (1996) contend that complexity can reflect the extent to which learners are using their ‘cutting edge’ interlanguage (Skehan, 1996a) and is associated with their willingness to take risks in using language that they have not gained full mastery"  (Lin, 2013, p. 105-106).

“Complexity is defined as ‘the capacity to use more advanced language, with the possibility that such language may not be controlled so effectively’ (Skehan & Foster, 1999, p. 96). It thus involves learners reorganizing their own underlying and developing language system and framing and trying out new hypotheses” (Hsu, 2012a, p. 9).

“He [Skehan, 1996] also states that complexity relates to ‘the stage and elaboration of the underlying interlanguage system’ (p. 46). According to Ellis and Barkhuizen (2005), ‘elaborated language’ could be taken into consideration from two different senses: First, cutting edge development of the learner language, which is not yet completely automatic, and second, learners’ preparedness to make use of an extensive range of linguistic structures” (Piri et al., 2012, p. 159).

**Appendix B**

**Metrics of Syntactic Complexity Employed in the Included Studies**

|  |  |  |
| --- | --- | --- |
|  |  | Syntactic complexity metric(s) |
| Study | Target language | Global | Variety of forms | Phrasal elaboration | Clausal elaboration |
| Abdi Tabari (2023) | English | Mean Length of T-unit |  | No. of post-modifying noun phrases  | Dependent clauses/T-unit |
| Golparvar & Azizsahra (2023) | English | T-units/sentence |  | Mean length of clauseComplex nominals/clause | Dependent clauses/clause |
| Liang & Xie (2023) | English |  |  | Coordinate phrases/clauseMean length of clause | Dependent clauses/clause |
| Xie & Zhu (2023) | English |  |  | Mean length of clauseCoordinate phrases/clauseComplex nominals/clause | Dependent clauses/clause |
| Abdi Tabari & Wang (2022) | English | Mean length of T-unitStructural similarity of sentences |  | Modifiers/noun phraseComplex nominals/T-unitComplex nominals/clause | Dependent clauses/T-unit |
| Abdi Tabari (2022) | English | Mean length of T-unit  |  | Modifiers/noun phrase | Dependent clauses/T-unit |
| Luo (2022) | English | Mean length of T-unitS-nodes/T-unit |  |  |  |

|  |  |  |
| --- | --- | --- |
|  |  | Syntactic complexity metric(s) |
| Study | Target language | Global | Variety of forms | Phrasal elaboration | Clausal elaboration |
| Abdi Tabari (2021) | English | Mean length of T-unit |  | No. of post-modifying noun phrases Avg. length of post-modifying noun phrases | Dependent clauses/T-unit |
| Abdi Tabari (2020) | English |  |  | Mean length of clause | Clauses/T-unit |
| Fazilatfar et al. (2020) | English |  |  |  | Clauses/T-unit |
| Kherzlou (2020) | English | Mean length of T-unit |  |  | Clauses/T-unit |
| Kim et al. (2020) | Korean | Morphemes/T-unit |  |  | Clauses/T-unit |
| Aref & Mojavezi (2019) | English |  | No. of "various linguistic action word frames utilized" |  | Clauses/T-unit |
| Kang & Lee (2019) | English | Mean length of T-unit |  | Mean length of clause |  |
| McDonough & De Vleeschauwer (2019) | English |  |  | Coordinate phrases/clause | Dependent clauses/clause |
| Kim (2018) | English |  |  |  | Clauses/T-unitDependent clauses/clause |
| Liao (2018) | Chinese |  | No. of different syntactic forms/total sentences |  |  |

|  |  |  |
| --- | --- | --- |
|  |  | Syntactic complexity metric(s) |
| Study | Target language | Global | Variety of forms | Phrasal elaboration | Clausal elaboration |
| Rahimi & Zhang (2018) | English |  |  | Mean length of clausePhrasal coordination | Subordinate clauses/clause |
| Rostamian et al. (2018) | English |  |  | Mean length of clauseCoordinate phrases/clause |  |
| Ziegler (2018) | English |  |  | Mean length of clause | Clauses/AS-unit |
| Abdi Tabari (2017) | English |  | Number of different grammatical verb forms |  | Clauses/T-unit |
| Abrams & Byrd (2017) | German | Mean length of T-unit |  |  | Clauses/T-unit |
| Hsu (2017) | English | Mean length of AS unit | No. of different verb forms/total verb forms | Mean length of clause | Clauses/AS unit |
| Sattarpour & Farrokhi (2017) | English |  |  |  | Subordinate clauses/T-unit |
| Abdi Tabari (2016) | English | Mean length of T-unit |  |  |  |
| Abrams & Byrd (2016) | German | Mean length of T-unit |  |  |  |
| Biria & Karimi (2015) | English |  |  |  | Clauses/T-unit |
| Fei (2015) | Chinese | Mean length of TTCU\* |  |  | Clauses/TTCU\* |
| Nitta & Baba (2014) | English | Structural similarity of all sentences across all paragraphs |  |  |  |

|  |  |  |
| --- | --- | --- |
|  |  | Syntactic complexity metric(s) |
| Study | Target language | Global | Variety of forms | Phrasal elaboration | Clausal elaboration |
| Farshi et al. (2013) | English |  |  | No. of attributive adjectivesNo. of nouns as pre-nominal modifiersNo. of prepositional phrases as post-nominal modifiers |  |
| Lin (2013) | English | Mean length of T-unit |  |  | Clauses/T-unit |
| Hsu (2012a) | English | Mean length of AS-unit | No. of different verb forms/total verb forms | Mean length of clause | Clauses/AS-unit |
| Hsu (2012b) | English |  |  |  | Clauses/AS unit |
| Johnson et al. (2012) | English | Flesch reading ease |  | Mean words preceding the main verb of clauses |  |
| Khorasani et al. (2012) | nglish |  |  |  | Clauses/T-unit |
| Piri et al. (2012) | English |  | No. of different grammatical verb forms |  | Clauses/T-unit |
| Salimi & Fatollahnejad (2012) | English |  |  |  | Clauses/T-unit |
| Salimi et al. (2012) | English | Mean length of T-unit\*\* |  |  |  |
| Farahani & Meraji (2011) | English | S-nodes/T-unit |  |  | Clauses/T-unit |

|  |  |  |
| --- | --- | --- |
|  |  | Syntactic complexity metric(s) |
| Study | Target language | Global | Variety of forms | Phrasal elaboration | Clausal elaboration |
| Meraji (2011) | English | S-nodes/T-unit |  |  | Clauses/T-unit |
| Rahimpour & Safarie (2011) | English |  |  |  | Dependent clauses/clause |
| Gauthier (2007) | French |  | No. of different verb forms | No. of relative clauses |  |
| Ellis & Yuan (2004) | English |  | No. of different grammatical verb forms |  | Clauses/T-unit |

**Appendix C**

**Metrics of Lexical Complexity Employed in the Included Studies**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Target language | Lexical diversity metrics | Lexical sophistication metrics | Lexical density metrics |
| Abdi Tabari (2023) | English | Measure of textual lexical diversity | Log CELEX frequency rating of content words |  |
| Golparvar & Azizsahra (2023) | English | Measure of textual lexical diversity | Log transformation of COCA academic word frequencyRaw COCA academic word frequencyAge of acquisition ratingLexical decision ratingWord naming rating |  |
| Liang & Xie (2023) | English | Type-token ratioCorrected type-token ratio (Carroll, 1964)Mean segmental type-token ratio (not specified)Number of different words | “Sophisticated words”/total words |  |
| Xie & Zhu (2023) | English | Type-token ratioCorrected type-token ratio (Carroll, 1964)Mean segmental type-token ratio (50) |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Target language | Lexical diversity metrics | Lexical sophistication metrics | Lexical density metrics |
| Abdi Tabari & Wang (2022) | English | Measure of textual lexical diversity  | Log CELEX frequency rating of content wordsLSA indexFrequency of academic word list types (Coxhead, 2000) | Verb types2/total verbs |
| Abdi Tabari (2022) | English | Measure of textual lexical diversity |  |  |
| Luo (2022) | English | Mean segmental type-token ratio (88) |  |  |
| Abdi Tabari (2021) | English | voc DGuiraud's index | Log CELEX frequency rating of content words |  |
| Abdi Tabari (2020) | English | Measure of textual lexical diversity |  |  |
| Kherzlou (2020) | English | Guiraud’s index |  |  |
| Kang & Lee (2019) | English | Measure of textual lexical diversity | Log CELEX frequency rating of content words |  |
| Liao (2018) | Chinese | Type-token ratio |  |  |
| Rahimi & Zhang (2018) | English | D | No. of AWL\* words  |  |
| Rostamian et al. (2018) | English | Mean segmental type-token ratio (50)No. of different words for every 10, 50-word random samples |  |  |
| Ziegler (2018) | English | Guiraud's index |  |  |
| Abdi Tabari (2017) | English | Mean segmental type-token ratio (40) |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Target language | Lexical diversity metrics | Lexical sophistication metrics | Lexical density metrics |
| Abrams & Byrd (2017) | German | Guiraud's indexMean segmental type-token ratio (24) |  |  |
| Hsu (2017) | English | Guiraud’s index | Lambda |  |
| Sattarpour & Farrokhi (2017) | English | Mean segmental type-token ratio (40) |  |  |
| Abdi Tabari (2016) | English | Mean-segmental type-token ratio (40) |  |  |
| Abrams & Byrd (2016) | German | Guiraud's indexMean segmental type-token ratio (25) |  | "Contextually appropriate" words/Total words |
| Nitta & Baba (2014) | English | Measure of textual lexical diversity | CELEX rating |  |
| Lin (2013) | English | D | Lambda |  |
| Seyyedi et al. (2013) | English |  | Percentage of open class words |  |
| Hsu (2012a) | English | Guiraud's index |  |  |
| Hsu (2012b) | English | Guiraud's index |  |  |
| Johnson et al. (2012) | English | Measure of textual lexical diversity | No. of 4K\*\* (BNC) word types/100 wordsNo. of 5K\*\*\* (BNC) word types/100 wordsCOBUILD frequency rating | Pronouns/Noun phrases |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study | Target language | Lexical diversity metrics | Lexical sophistication metrics | Lexical density metrics |
| Piri et al. (2012) | English | Mean segmental type-token ratio (40) |  |  |
| Farahani & Meraji (2011) | English | Mean segmental type-token ratio (40) |  | Lexical words/Function words |
| Meraji (2011) | English | Mean segmental type-token ratio (40) |  |  |
| Ong & Zhang (2010) | English | Variation of Guiraud’s index (Types2/Tokens) |  |  |
| Gauthier (2007) | French |  | No. of different verb types beyond the 22 most frequent French verbsNo. of temporal and logical connectors (token)No. of temporal and logical connectors (type) | Type-token ratio of lexical verbs |
| Ellis & Yuan (2004) | English | Mean segmental type-token ratio (40) |  |  |

\*AWL = Academic Word List (Coxhead, 2000)

\*\*4K BNC Word Types = Word types from the fourth 1,000 most frequent word families according to the British National Corpus (Nation, 2006)

\*\*\*5K BNC Word Types = Word types from the fifth 1,000 most frequent word families according to the British National Corpus (Nation, 2006)