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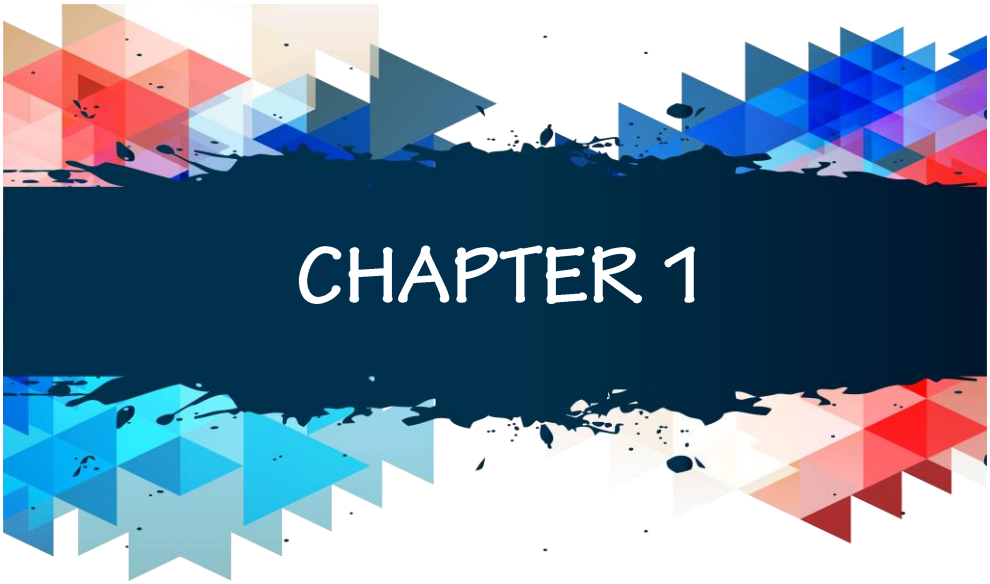

Recent Developments in Educational Data Mining: A Four-Year Bibliometric Analysis

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1. Introduction

Data mining is a combination of disciplines such as statistics, artificial intelligence, machine learning and database management. Data mining is an analysis method used to extract meaningful information, patterns and relationships from large data sets (Gorunescu, 2011). Data mining has been used in marketing (Linoff and Berry, 2011; Chen et all. 2011), health (Herland et all., 2014; Koh and Tan, 2011), finance (Lin et all, 2011; West and Bhattacharya, 2016), education (Baker, 2010; Romero and Ventura, 2013; Koedinger, 2015; Tosunoglu et all, 2021; Sulak and Koklu, 2024), computer security (Xu et all., 2014; Barbara and Jajodia, 2002), social media analysis (Schreck and Keim, 2012; Adedoyin-Olowe et all., 2014) and many more. The common point of using data mining in these fields is to extract meaningful information and patterns from large data sets and to create value by integrating this information into decision-making processes.

In data mining, studies in which the research data is based only on chunks of text are classified in the field of text mining. Text mining is a subfield of data mining that is used to extract meaningful information from large text datasets. This field lies at the intersection of disciplines such as natural language processing, machine learning and statistics (Kao and Poteet, 2007). Text mining aims to uncover important information in text data by analyzing patterns, relationships and trends in texts. In this framework, it has the potential to be applied in various fields such as sentiment analysis, topic modeling, document classification, recommendation systems and information extraction (Asudani et all., 2023; Atman Uslu and Onan, 2023).

While text mining provides in-depth analysis of the content of scientific literature, bibliometric analysis plays an important role in examining publication trends, interdisciplinary interactions and research trends in the academic world. The connection between these two fields creates a synergy in the discovery, analysis and understanding of scientific knowledge, offering researchers a broad perspective.

Bibliometric analysis and text mining are disciplines that play important roles in analyzing text data in the scientific literature. Bibliometric analysis traces the evolution of scientific research and identifies trends in a given field by examining the relationships between academic publications, citations and authors (Subramanyam, 1983). Text mining, on the other hand, analyzes large text datasets to reveal patterns, relationships and trends in texts (Tseng et all., 2007). These two disciplines provide a comprehensive analysis of the scientific literature

and in-depth understanding of knowledge extraction processes. The bibliographic data provided by bibliometric analysis is an important resource for text mining, while the methods of text mining allow bibliometric analysis to be performed in a more comprehensive and in-depth manner. In this context, bibliometric analysis and text mining together form an important synthesis for knowledge discovery and analysis in scientific research.

Bibliometric analysis is based on the detailed analysis of the documents or articles obtained according to certain characteristics and the findings that emerge as a result of these analyzes. In particular, studies specific to a particular field or research published in a specific journal are analyzed in detail according to different parameters and the findings obtained according to these parameters are presented in detail. These findings usually include various data such as keywords, number of authors, number of citations and research topic. For a better understanding of text mining applications, it is important to provide a detailed description of the scope and characteristics of bibliometric analysis. Bibliometric analyses usually involve studies to present findings about fields to readers or to gain more in-depth knowledge about a particular topic. In addition, bibliometric analyses are used for purposes such as analyzing citations in studies and evaluating research (Ellegaard and Wallin, 2015; Gaviria-Marin et all., 2019; Mutluer, 2023).

2. Methodological Framework and Application Steps

Bibliometric analyses are research methods that provide readers with a comprehensive perspective by examining the developments and trends in a particular research area over a period of time (Gokhale et al., 2020). This term was first coined by Alan Pritchard (Pritchard, 1969). Bibliometric analyses are used to scientific publications and citations, to understand research trends in a discipline and inter-researcher relationships. These analyses also examine the attribution relationships (Gutiérrez-Salcedo et al., 2018). For this purpose, the researches carried out in the field of “Education” and “Data mining” were examined. The flow diagram of the bibliometric analysis conducted within the scope of the research is given in Figure 1.

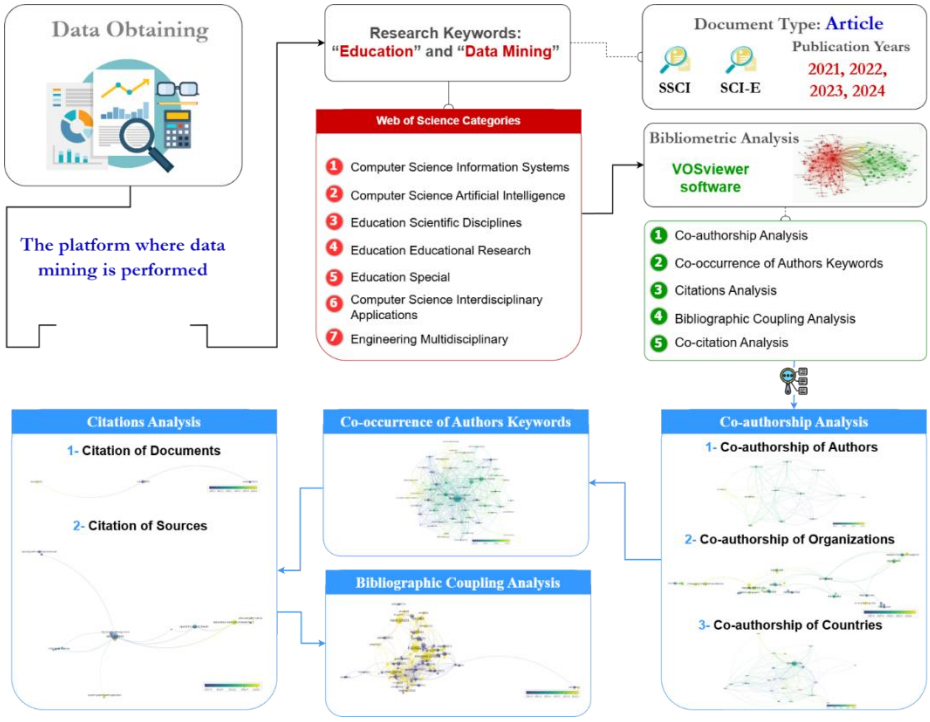

Figure 1. Flow chart

2.1. Data Collection

Web of Science (WoS) is a web-based platform established by Thomson Reuters in 1960. WoS is a bibliographic database that provides comprehensive compilation and presentation of scientific research published in any academic discipline (Sánchez et al., 2017).

In the research conducted on October 15, 2024, in the Web of Science (WoS) database, results related to the keywords "Education" and "Data Mining" were examined. In this study, "Article" was selected as the "Document Type." The years 2021, 2022, 2023 and 2024 were specified as the "Publication Years." Articles included in the "Social Sciences Citation Index (SSCI)" and the "Science Citation Index Expanded (SCI-Expanded)" within the "Web of Science Index" were examined. Additionally, searches were conducted in the "Web of Science Categories" for "Computer Science Information Systems," "Computer Science Artificial Intelligence," "Education Scientific Disciplines," "Education Educational Research," "Education Special," "Computer Science Interdisciplinary Applications," and "Engineering Multidisciplinary."

Later, the VOSviewer software tool was used to perform the bibliometric analysis. The analyses applied through Vosviewer are collected under five main headings as Co-authorship Analysis, Co-occurrence of Authors Keywords, Citations Analysis, Bibliographic Coupling Analysis and Co-citation Analysis.

Under the Co-authorship Analysis heading, Co-authorship of Authors, Co-authorship of Organizations, and Co-authorship of Countries analyses were conducted. The threshold values set for these analyses were a minimum of 3 documents and 3 citations, 5 documents and 5 citations, and 10 documents and 10 citations, respectively. For the Co-occurrence of Author Keywords analysis, the minimum number of keywords was set to 8. Under the Citations Analysis heading, Citation of Documents and Citation of Sources analyses were conducted. The threshold values for these analyses were a minimum of 8 documents and 4 documents and 4 citations, respectively. Under the Bibliographic Coupling Analysis heading, Bibliographic Coupling of Documents analyses were conducted, with a minimum threshold of 8 citations. A total of 7 bibliometric analyses were conducted for the field of data mining in education. These selections indicate the limitations of the research.

2.2. Data Analysis

VOSviewer is a software tool used in bibliometric analysis. This tool is designed for the purpose of discovering, visualizing and analyzing a large amount of academic literature. It creates networks covering journals, researchers or specific publications and shapes them based on citations, bibliographic matching, co-citations or co-authorship relationships. VOSviewer also has text mining features that can identify links where basic concepts in the scientific literature are used together and present them visually (Van Eck & Waltman, 2013). A total of 1170 articles were identified within the scope of the research. The distribution of these articles by year is shown in Figure-2.

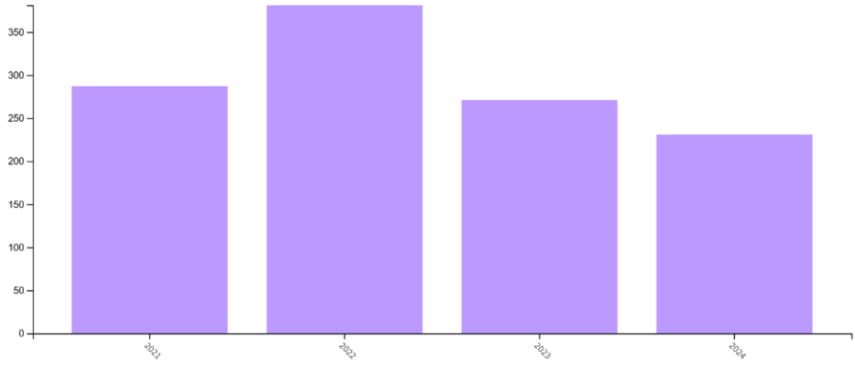

Figure 2. Times Cited and Publications Over Time.

Among the 1170 articles from the years 2021-2024, there were 287 publications in 2021, 381 publications in 2022, 271 publications in 2023 and 231 publications in 2024.

3. Findings

The analyses conducted using VOSviewer are examined under five main headings: co-authorship analysis, co-occurrence of author keywords, citation analysis, bibliographic coupling analysis, and co-citation analysis.

Under co-author analysis, there are subheadings such as co-authorship analysis of authors, co-authorship analysis of organizations and co-authorship analysis of countries. Under citation analysis, there are subheadings such as citation analysis of documents, citation analysis of sources, citation analysis of authors, citation analysis of organizations and citation analysis of countries. Under bibliographic link analysis, there are sub-headings that examine the bibliographic links of documents, sources, authors, organizations and countries. Under inter-citation relationship analysis, there are detailed analysis types such as co-citation of references, co-citation of sources, and co-citation of cited authors. These analyses were used to understand different aspects of articles in the field of data mining in education and to reveal relationships in the literature. In total, 17 different analyses were applied.

3.1. Co-authorship Analysis

3.1.1. Co-authorship of Authors

For the Co-authorship Analysis, criteria were set to select authors who have at least 3 documents and at least 3 citations. Out of a total of 4174 authors, 70

authors met these thresholds. The top 10 most active authors based on the number of documents are presented in Table 2.

Table 1. As a result of the co-authorship of Authors analysis, the 10 most effective authors**.**

ID	Author	Documents	Citations	Total link strength
1	Unil Yun	14	101	82
2	Jerry Chun-Wei Lin	12	86	66
3	Heonho Kim	10	81	61
4	Witold Pedrycz	10	77	33
5	Bay Vo	10	59	65
6	Guoyin Wang	10	48	14
7	Hyeonmo Kim	9	55	61
8	Weiping Ding	9	80	13
9	Chanhee Lee	8	51	51
10	Taewoong Ryu	8	52	52

Upon examining Table 2, it is observed that the author with the highest number of documents (14 documents) and citations (101) is Unil Yun. Similarly, Jerry Chun-Wei Lin and Heonho Kim also have high numbers of documents and citations. Other notable authors based on document count include Bay Vo (10 documents), Guoyin Wang (10 documents), Witold Pedrycz (10 documents), Hyeonmo Kim (9 documents), Weiping Ding (9 documents), Chanhee Lee (8 documents) and Taewoong Ryu (8 documents).

In the network resulting from the threshold we set in our analysis, some of the 70 elements are not connected to each other. The largest group of connected elements consists of 26 elements. For this reason, it is preferred to show only this group of connected elements instead of all elements. This provides a clearer understanding of the most important relationships and connections in the network. In this way, VOSviewer helped us to identify the important elements to focus on in our analysis. In this context, the Overlay visualization of the Co-authorship of Authors analysis is presented in Figure 3. This visualization allows for a more detailed examination of the connected elements in the network

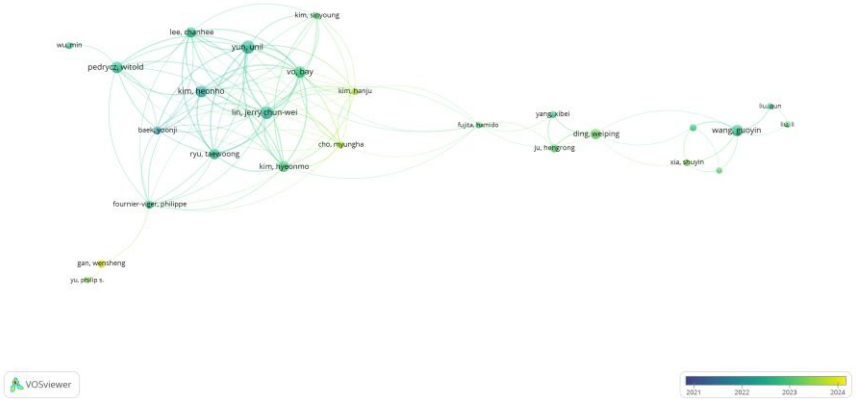

Figure 3. Overlay visualization of Co-authorship of Authors.

To examine the collaboration relationships of authors working in the fields of "Education" and "Data Mining" between 2021-2024, an Overlay visualization of the Co-authorship of Authors analysis was conducted. The transition of colors from blue to yellow highlights the recent collaborations in the network. The size of the circles reflects the collaboration level or the number of publications of each researcher (Van Eck & Waltman, 2010). The distance between two circles indicates the strength of their relationships (Yu et al., 2020). In this context, Heonho Kim and Until Yun are notable for their highest levels of collaboration in 2021 and 2024, respectively.

3.1.2. Co-authorship of Organizations

For the Co-authorship Analysis of Organizations, thresholds were set to identify collaborations and contributing organizations, with a minimum document count of 5 and a minimum citation count of 5. Out of a total of 1652 organizations, 76 organizations met these criteria. Table 3 shows the top 10 most active organizations based on the number of documents.

Table 2. As a result of the co-authorship of Organizations analysis, the 10 most effective organizations.

Id	Organization	Documents	Citations	Total link strength
1	Sejong University	17	128	30
2	Chongqing University of Posts and Telecommunications	14	76	5
3	Nanyang Technological University	13	70	14
4	University of Alberta	13	93	23
5	Nantong University	12	87	10
6	Xidian University	12	135	12
7	Chongqing University	11	65	11
8	Wuhan University	11	72	10
9	Ministry of Education	10	60	12
10	Western Norway University of Applied Sciences	10	82	17

When Table 3 is examined, the organization with the highest number of certificates is Sejong University with 16 certificates. It is followed by Chongqing University of Posts and Telecommunications and Nanyang Technological University with 11 certificates. The organizations with 10 certificates are Xidian University, Western Norway University of Applied Sciences, Nantong University and Chongqing University. Although Xi'an Jiao Tong University has the lowest number of documents among the top 10 with 9 documents, it stands out as the organization with the highest number of citations with 114 citations

According to the thresholds we set in this analysis, although there are connections between many organizations in the network, some of the 76 organizations are not connected to each other. The largest group of connected elements consists of 70 elements. For this reason, it is preferred to show only this group of connected elements instead of all elements. In this context, the Overlay visualization of the Co-authorship of Organizations analysis is presented in Figure 4.

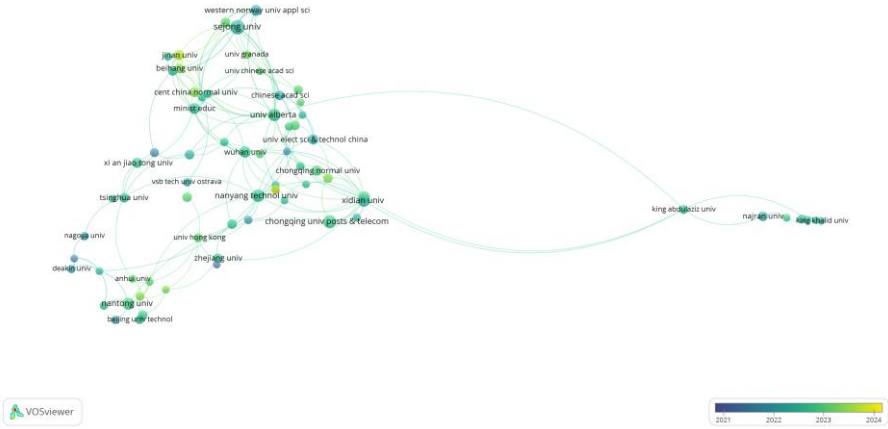

Figure 4. Overlay visualization of Co-authorship of Organizations.

Figure 4 shows that Chongqing University has the most recent collaborations. Nagoya University in 2021 and Sejong University in 2022, Michigan University in 2024 are also notable for their strong relationships with other organizations.

3.1.3. Co-authorship of Countries

In the Co-authorship Analysis of Countries, specific thresholds were used to identify the co-authorship relationships and contributions of countries. The minimum document count was set to 10, and the minimum citation count was set to 10. A total of 87 countries were examined, and 26 countries met these criteria. Table 4 shows the top 10 most active countries based on these thresholds.

Table 3. As a result of the co-authorship of Countries analysis, the 10 most effective co-untries.

Id	Country	Documents	Citations	Total link strength
1	People's Republic of China	610	3609	211
2	United States of America	145	860	109
3	Japan	72	438	59
4	South Korea	65	402	67
5	Spain	47	236	21
6	Saudi Arabia	45	288	58
7	India	44	216	22
8	Germany	42	259	31
9	Australia	40	317	51
10	Canada	34	236	51

Table 4 reveals that the People's Republic of China stands out significantly with 610 documents and 3609 citations, demonstrating a prominent global impact. The United States follows in terms of document count. Other notable countries within the top 10 based on document count include Japan, South Korea, Spain, Saudi Arabia, India, Germany, Australia and Canada. These countries play a significant role in the field of data mining in education. The Overlay visualization of the Co-authorship of Countries analysis is presented in Figure 5.

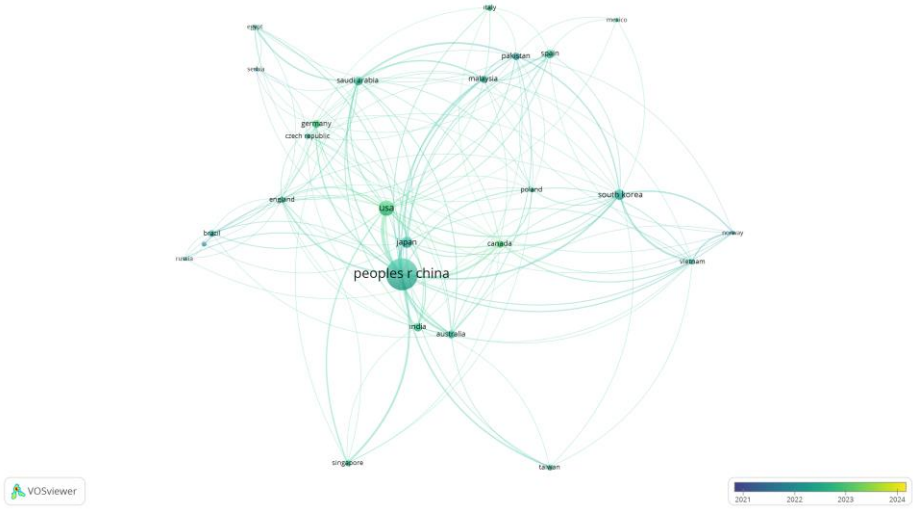

Figure 5. Overlay visualization of Co-authorship of Countries.

Figure 5 shows that in recent years, countries like India, England, Taiwan, and Germany have gained attention. In 2021, Turkey, Brazil, and the Czech Republic had strong relationships with other countries, while China exhibited very strong interactions in 2024.

3.2. Co-occurrence of Authors Keywords

In the Co-occurrence of Authors Keywords analysis, the minimum number of keywords was set to 8 to evaluate the frequency of co-occurrence. Out of a total of 3769 keywords, 72 keywords met these criteria. Table 5 lists the top 10 most active keywords based on these thresholds.

Table 4. As a result of the Co-occurrence of Authors Keywords analysis, the 10 most effective keywords.

Id	Keyword	Occurrences	Total link strength
1	Data Mining	413	817
2	Educational Data Mining	138	244
3	Feature Extraction	115	387
4	Machine Learning	111	233
5	Task Analysis	56	203
6	Deep Learning	52	150
7	Learning Analytics	47	82
8	Data Models	40	175
9	Education	40	146
10	Feature Selection	40	80

Table 5 shows that the keywords Data Mining, Educational Data Mining, Feature Extraction, and Machine Learning are among the most frequently used, with occurrences of 413, 138, 115 and 111, respectively. Other notable keywords among the 72 include Task Analysis, Deep Learning, Learning Analytics, Data Models, Education and Feature Selection. The Overlay visualization of the Co-occurrence of Authors Keywords analysis is presented in Figure 6.

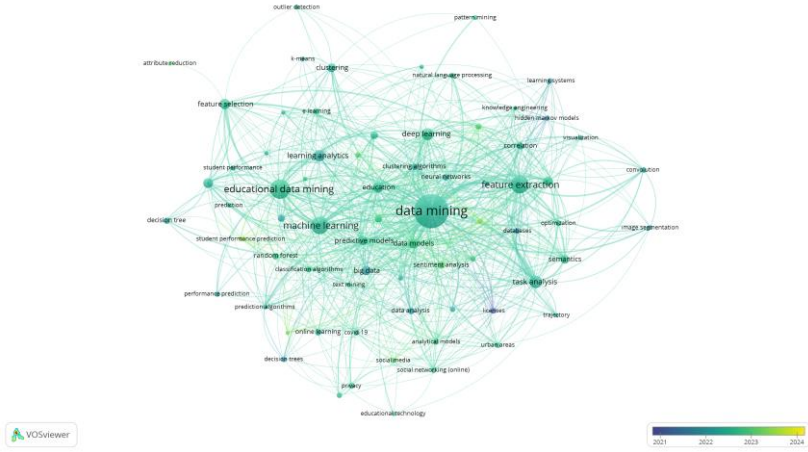

Figure 6. Overlay visualization of Co-occurrence of Authors Keywords.

Figure 6 shows that all keywords are concentrated around data mining. Recent keywords such as educational technology, sentiment analysis, social media, attention mechanism, behavioral sciences, convolutional neural networks, differential privacy, outlier detection, and pattern mining are becoming more prevalent. In early 2021, keywords like education, big data, data analysis, databases, correlation, licenses, decision trees, learning systems, semantics, training, and task analyses were more common, while in mid-2022, keywords like data mining, feature extraction, educational data mining, and predictive models were preferred by authors.

3.3. Citations Analysis

3.3.1. Citation of Documents

In the Citation of Documents analysis, the minimum document citation count was set to 8 to identify significant articles by examining their citation counts. Out of a total of 1160 documents, 251 met these criteria. Table 6 lists the top 10 most cited articles.

Table 5. As a result of the Citation of Documents analysis, the 10 most effective articles.

Id	Document	Titles	Journal	Citations	Links
1	(Ezugwu et al., 2022)	A Comprehensive Survey of Clustering Algorithms: State-Of-The-Art Machine Learning Applications, Taxonomy, Challenges, and Future Research Prospects	Engineering Applications of Artificial Intelligence	295	0
2	(Li et al., 2021)	An Integrated Cluster Detection, Optimization, and Interpretation Approach for Financial Data	IEEE Transactions on Cybernetics	146	0
3	(Nazir et al., 2022)	Issues and Challenges of Aspect-based Sentiment Analysis: A Comprehensive Survey	IEEE Transactions on Effective Computing	135	0
4	(Cui et al., 2021)	Rolling Element Fault Diagnosis Based on VMD and Sensitivity MCKD	IEEE Access	121	0
5	(Chen et al., 2022)	Two Decades of Artificial Intelligence in Education: Contributors, Collaborations, Research Topics, Challenges, and Future Directions	Educational Technology and Society	113	0
6	(Song et al., 2022)	A Survey on Deep Learning Based Knowledge Tracing	Knowledge-Based Systems	66	0
7	(Savaglio & Fortino, 2021)	A Simulation-driven Methodology for IoT Data Mining Based on Edge Computing	ACM Transactions on Internet Technology	59	0
8	(Zhou et al, 2023)	Secret-to-Image Reversible Transformation for Generative Steganography	IEEE Transactions on Dependable and Secure Computing	59	0
9	(Iqbal et al., 2021)	A Novel Blockchain-Based Integrity and Reliable Veterinary Clinic Information Management System Using Predictive Analytics for Provisioning of Quality Health Services	IEEE Access	52	1
10	(Hanif, 2021)	The rise of software vulnerability: Taxonomy of software vulnerabilities detection and machine learning approaches	Journal of Network and Computer Applications	50	0

According to Table 6, the most cited article is (Ezugwu et al., 2022) with 295 citations. It is followed by (Li et al., 2021) with 146 citations and (Nazir et al., 2022) with 135 citations. The fourth and fifth most cited articles are (Cui et al., 2021) and (Chen et al., 2022) with 121 and 113 citations, respectively, indicating they are highly referenced and prominent in this field.

The analysis shows that some of the 143 nodes are not interconnected. The largest connected group comprises 3 nodes. Therefore, only this connected group

is displayed to help identify the key elements to focus on in the analysis. The visualization of the Citation of Documents analysis is presented in Figure 7.

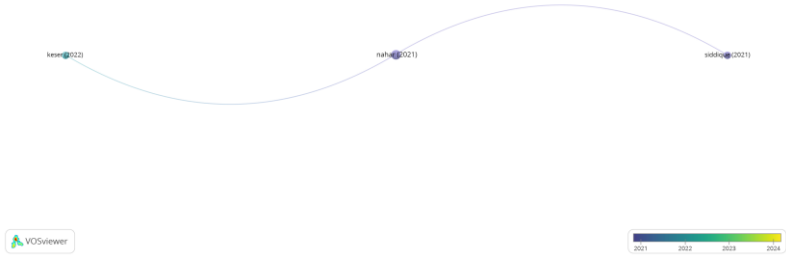

Figure 7. Overlay visualization of Citation of Documents.

Figure 7 shows that the majority of documents are not interconnected. The connected documents are (Siddique et al., 2021), (Nahar et al., 2021), and (Keser & Aghalarova, 2022) in a sequential order from earlier to more recent dates.

3.3.2. Citation of Sources

In the Citation of Sources analysis, the criteria for each source to have a minimum of 4 documents and 4 citations were determined to examine the citation status of the sources. As a result of the examination of 231 sources in total, 57 sources that met these criteria were identified. Table 7 lists the 10 most effective sources ranked according to the number of documents cited by the sources.

Table 6. As a result of the Citation of Sources analysis, the 10 most effective sources.

Id	Source	Documents	Citations	Total link strength
1	IEEE Access	149	736	25
2	Education and Information Technologies	59	382	28
3	Engineering Applications of Artificial Intelligence	10	323	2
4	IEEE Transactions on Cybernetics	10	301	2
5	Applied Sciences-Basel	50	282	10
6	Educational Technology and Society	6	182	2
7	Knowledge-Based Systems	16	172	3
8	Expert Systems with Applications	24	169	3
9	Electronics	26	165	0
10	Systems	12	159	3

When Table 7 is examined, it is observed that IEEE Access is the highest cited source with 736 citations. Education and Information Technologies ranks second with a number of 382 citations. It is followed by Engineering Applications of Artificial Intelligence and IEEE Transactions on Cybernetics ranks third and fourth with a number of 323 and 301 citations, despite the low number of documents compared to others. It is followed by Applied Sciences-Basel (282 citations) and Educational Technology and Society (182 citiations) despite having only 6 document. This shows that although the journal has a relatively low number of documents, it has a significant impact and acceptance.

The analysis results show that some of the 57 nodes are not interconnected. The largest connected group consists of 34 nodes. Therefore, only this connected group is displayed. The Overlay visualization of the Citation of Sources analysis is presented in Figure 8.

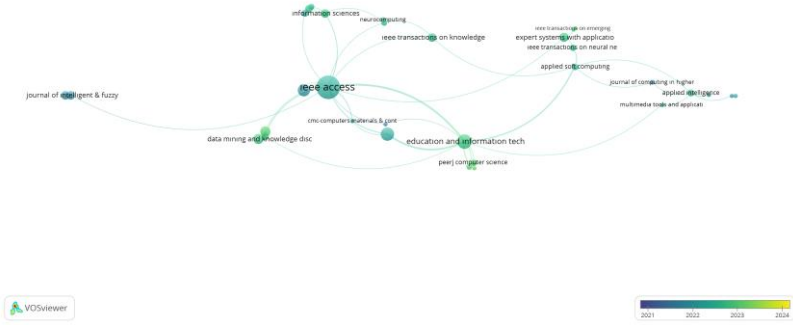

Figure 8. Overlay visualization of Citation of Sources.

Figure 8 shows that the most influential journals are IEEE Access, Applied Sciences-Basel, and Educational Technology and Society. Nowadays, Education and Information Technologies and Expert Systems with Applications have started gaining more attention through increased citations.

3.4. Bibliographic Coupling Analysis

3.4.1. Bibliographic Coupling of Documents

The Bibliographic Coupling of Documents analysis is conducted to identify the most influential documents by examining the bibliographic connections between them. Bibliographic connections represent the citations of one document in other documents. In this analysis, connections between documents containing

similar topics or referencing each other were examined (Shah et al., 2020; Yilmaz, 2021; Yu et al., 2020). The minimum citation count criterion between documents was set at 8. Out of a total of 1160 documents, 251 surpassed this threshold. Table 8 lists the top 10 most influential documents based on their total link strength, which is derived from evaluating the bibliographic connections between documents.

Table 7. As a result of the Bibliographic Coupling of Documents analysis, the 10 most effective articles.

Id	Document	Title	Journal	Citations	Total link strength
1	(Batool et al., 2023)	Educational Data Mining to Predict Students' Academic Performance: a Survey Study	Education and Information Technologies	33	219
2	(Jang et al, 2022)	Practical early prediction of students' performance using machine learning and eXplainable AI	Education and Information Technologies	15	135
3	(Karalar et al., 2021)	Predicting Students at Risk of Academic Failure Using Ensemble Model During Pandemic in a Distance Learning System	International Journal of Educational Technology in Higher Education	21	111
4	(Trakunphutthirak and Lee, 2022)	Application of Educational Data Mining Approach for Student Academic Performance Prediction Using Progressive Temporal Data	Journal of Educational Computing Research	9	90
5	(Ahmad, 2024)	Data-Driven Artificial Intelligence in Education: A Comprehensive Review	IEEE Transactions on Learning Technologies	8	87
6	(Bertolini et al., 2021)	Enhancing Data Pipelines for Forecasting Student Performance: Integrating Feature Selection with Cross-Validation	International Journal of Educational Technology in Higher Education	11	83
7	(Thaher et al., 2021)	An Enhanced Evolutionary Student Performance Prediction Model Using Whale Optimization Algorithm Boosted With Sine-Cosine Mechanism	Applied Sciences-Basel	10	82
8	(Zhang et al., 2023)	Predicting and Understanding Student Learning Performance Using Multi-Source Sparse Attention Convolutional Neural Networks	IEEE Transactions on Big Data	25	80
9	(Keser & Aghalarova, 2022)	HELA: A Novel Hybrid Ensemble Learning Algorithm for Predicting Academic Performance of Students	Education and Information Technologies	15	67
10	(Siddique et al., 2021)	Predicting Academic Performance Using An Efficient Model Based on Fusion of Classifiers	Applied Sciences-Basel	15	66

According to the analysis results derived from Table 8, the document by Batool et al. (2023) has a total of 219 bibliographic connections despite receiving only 33 citations. This indicates that the document is closely linked with other documents, frequently citing them. Similarly, the documents by Jang et al. (2022) and Karalar et al. (2021) exhibit high total link strength despite having a limited number of citations. The document by Trakunphutthirak and Lee(2022), although it has 9 citations, shows a total link strength of 90 suggesting lesser interaction with other research. Consequently, it is observed that the total link strength is lower compared to the top five. The overlay visualization of the largest connected subset, comprising 220 out of the 251 documents analyzed for Bibliographic Coupling of Documents, is presented in Figure 9.

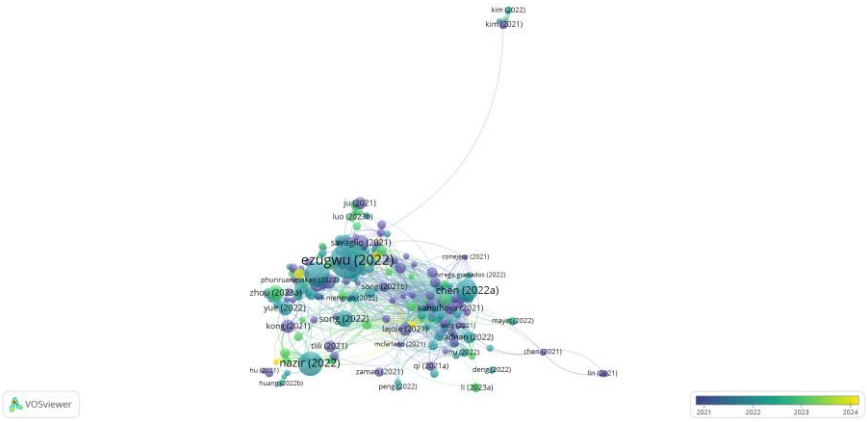

Figure 99. Overlay visualization of Bibliographic Coupling of Documents.

Figure 9 shows that (Ezugwu et al., 2022), (Song et al., 2022), (Nazir et al., 2022) and (Chen et al., 2022) are the most influential articles in the specified time period.

4. Discussion

The importance of data mining in the field of education is increasingly recognized. Educational institutions have large amounts of data. Data mining aims to analyze this data and extract meaningful information. Schools can use this data in data mining to improve student achievement and understand student behavior.

Bibliometric analyses of studies in the field of data mining in education have been used to examine the existing literature and to provide guidance for future

research. With the help of bibliometric analyses, researchers can determine which topics are more studied, which areas have gaps, and which authors are prominent. In order to help researchers who want to write articles in the field of data mining in education, the results obtained from the analyzes are given.

As a result of the analysis conducted under the title of Co-authorship Analysis, it was seen that the authors who collaborated the most in the fields of "Education" and "Data Mining" were concentrated around Unil Yun, Jerry Chun-Wei Lin, Heonho Kim, Witold Pedrycz and Bay Vo. The most collaborative institutions were Sejong University, Chongqing University of Posts and Telecommunications, Nanyang Technological University, University of Alberta and Nantong University. On the basis of countries, it was determined that the countries that cooperated the most were People's Republic of China, United States of America, Japan ,South Korea and Spain.

The Keyword Co-occurrence Analysis of author keywords identified the most frequently repeated terms as Data Mining, Educational Data Mining, Feature Extraction, Machine Learning, Task Analysis, Deep Learning, Learning Analytics, Data Models, Eduction and Feature Selection.

Under the Citations Analysis heading, the Citation of Documents analysis found that the most cited articles were Ezugwu et al. (2022), Li et al. (2021), Nazir et al. (2022), Cui et al. (2021), and Chen et al. (2022). The most frequently cited sources included IEEE Access, Education and Information Technologies, Engineering Applications of Artificial Intelligence, IEEE Transactions on Cybernetics, and Applied Sciences-Basel.

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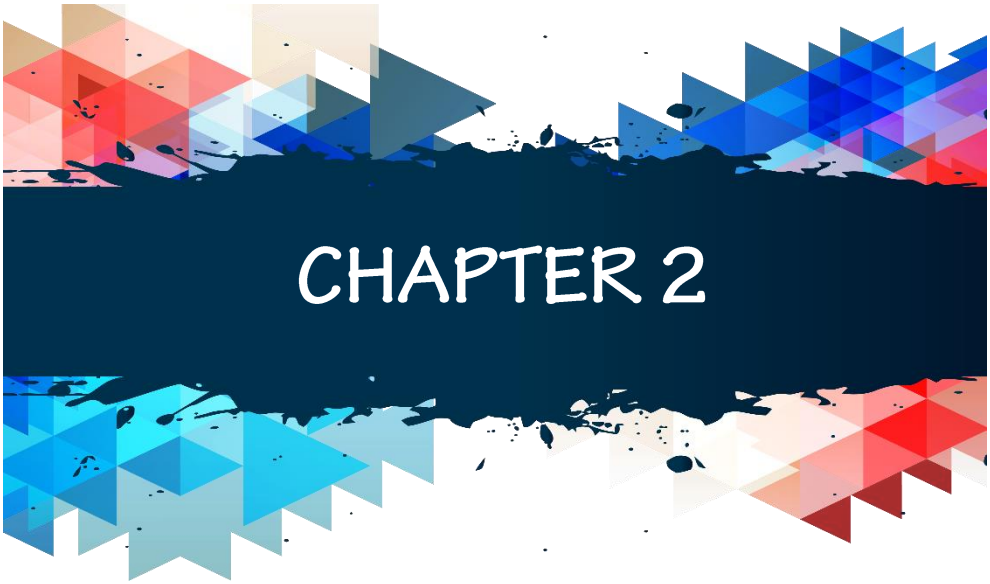

Bibliometric Analysis of Publications Related to Augmented Reality in Education in The Last 20 Years

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1. INTRODUCTION

Augmented Reality (AR) constitutes a type of virtual environment merging virtual elements like computer-generated graphics and sounds with reality (Zhu & He, 2012). It is defined as a technology proficient in seamlessly integrating virtual information into the real world, facilitating interactive experiences (Sugimoto, 2021). AR has gained widespread popularity across various platforms, ranging from mobile devices to smart glasses (Eck & Waltman). One of its key advantages is the ability to offer users immersive experiences unattainable in real life (Guo et al., 2021). Presently, AR finds applications in diverse fields such as education, healthcare, retail, architecture, and entertainment. Particularly in education, AR technology presents opportunities to create enduring learning environments by providing tangible experiences to students (Guo et al., 2021; Walczak et al., 2006; Koklu and Sulak, 2021).

In contemporary times, Augmented Reality (AR) finds application across various domains including education, healthcare, retail, architecture, and entertainment. In the realm of education, AR technology presents opportunities to establish enduring learning environments by providing students with concrete experiences (Guo et al., 2021; Walczak et al., 2006). Furthermore, AR has been observed to be an effective tool in foreign language learning (Alfadil, 2020), health sciences (Moro et al., 2017), mathematics teaching in primary education (Demitriadou et al., 2020), and enhancing the learning motivation of chemical engineering students (Low et al., 2022). Additionally, its utilization in school physical education systems has been acknowledged as an effective method for enhancing training ability (Liu et al., 2022).

The using of Augmented Reality (AR) technology is increasingly significant in the healthcare sector. For instance, De Paolis and Ricciardi's studies have demonstrated the use of augmented reality to guide surgeons during the radiofrequency ablation treatment of liver tumors (De Paolis & Ricciardi, 2018). Additionally, Tsao et al. conducted research revealing that the integration of augmented reality and virtual reality in memory therapy systems for the elderly positively impacts their mental and emotional well-being (Tsao et al., 2019). Moreover, Salavitabar et al. have highlighted the AR visualization of 3D rotary angiography for congenital heart disease as a pivotal advancement in medicine, enabling more precise surgical planning (Salavitabar et al., 2023).

Augmented reality is increasingly employed in the retail industry to enhance customer relationships and elevate the shopping experience. For instance, Dacko's study showcases the use of mobile augmented reality to create smart

shopping environments within the smart retail sector through shopping applications (Dacko, 2017). Moreover, studies in the fashion retail sector, as illustrated by Davis and Aslam, utilize augmented reality applications to analyze consumer expectations and experiences (Davis & Aslam, 2024). Furthermore, McLean and Wilson's research delves into customer interaction with augmented reality mobile applications in retail settings (McLean & Wilson, 2019). Additionally, Poushneh and Vasquez-Parraga investigate the visible impact of augmented reality on retail customer experience, satisfaction, and willingness to purchase (Poushneh & Vasquez-Parraga, 2017).

These use cases exemplify the diversification and evolution of Augmented Reality (AR) alongside its technological advancements. As the field expands, bibliometrics plays an increasingly vital role in comprehending and evaluating this diversity within the scientific community. Bibliometrics stands as one of the paramount tools for both quantitative and qualitative analyses of scientific endeavors (Wallin, 2005). This discipline aids researchers across various research domains by leveraging its ability to analyze extensive datasets. Table 1 provides a literature review of bibliometric analysis research within the realm of "Augmented Reality."

Numerous scientists focusing on augmented reality have employed bibliometric mapping methods in their research. For instance, Min and Yu conducted a bibliometric mapping review on educational applications of augmented reality, particularly in language learning (Min & Yu, 2023). López-Belmonte et al. considered significant factors such as document types, institutions, authors, and the most cited articles in their study (López-Belmonte et al., 2023). Similarly, Zhao et al. conducted a bibliometric mapping analysis to delineate the fundamental elements of research on virtual reality and augmented reality (Zhao et al., 2023). Hincapie et al. presented an analysis of leading journals, authors, and institutions pertaining to augmented reality educational applications using the Scopus database (Hincapie et al., 2021).

All these studies contribute to identifying and understanding important factors in the field of augmented reality due to the analyses conducted using various bibliometric mapping tools like VOSviewer, CiteSpace, SciMAT, HistCite, and BibExcel. In addition to providing valuable information about the development of applications across different sectors through these bibliometric analyses, they also offer guidance to future researchers.

Table 1. Comparison of previous bibliometric studies on the keyword "Augmented Reality" with this study

REFERENCES	HIGHLIGHTS	RESEARCH TOPIC	DATABASE	YEAR RANGE	NUMBER OF PUBLICATIONS	BIBLIOMETRIC TOOLS
(Min & Yu, 2023)	Augmented Reality in Language Learning	The annual trend of publications; the top 10 authors, sources, organizations and countries; users' attitudes; ways to integrate language teaching and learning; and the impact of AR.	Web of Science	2008 - 2022	1275	VOSviewer and CiteSpace
(López-Belmonte et al., 2023)	Augmented reality in the categories of Education Educational Research	Document Type; institutions; authors; sources; countries and most cited articles on AR in education; and how to teach AR effectively.	Web of Science	1999 - 2019	777	Science Mapping Analysis Tool (SciMAT)
(Zhao et al., 2023)	"Virtual Reality in Education" OR "Augmented Reality in Education"	Co-occurrences between all keywords; analysis of bibliographic contexts on organizations, authors and sources.	Web of Science	2018 - 2022	5231	VOSviewer
(Jajic et al., 2022)	Augmented reality within the scope of business and economics research field	Analysis of major journals, conferences, authors and countries.	Web of Knowledge	2017 - 2021	488	VOSviewer
(Khodabandelou et al., 2022)	Mobile Assisted Language Learning	Direction and type of research; years; countries; prolific institutions, top authors and co-creation; co-authorship, citation and co-citation; top 10 sources cited; and top 20 keywords via VOSviewer.	Web of Science	2000 - 2020	5343	VOSviewer and CiteSpace
(Hincapie et al., 2021)	Augmented Reality Educational Applications	The most relevant journals, the level of productivity of the most distinguished authors, institutions/countries and the impact of each author, journal, citation by the author.	Scopus	2003 - 2018	29	-
(Calabuig-Moreno et al., 2020)	The Emergence of Technology in Physical Education	Total global citation score (TGCS) and total local citation score (TLCS) calculation, relationships between authors and keywords, co-authorship and co-keyword analysis.	Web of Science	1900 - 2019	461	HistCite, BibExcel and VOSviewer
This Study	Augmented Reality	The impact of co-authorship relationships between authors, countries and institutions, co-occurrence of author keywords and citation of documents, sources and authors.	Web of Science	2003 - 2023	2911	VOSviewer

2. MATERIALS AND METHODS

The concept of bibliometrics was first introduced in 1969 in the Journal of Documentation by Pritchard (1969). Bibliometrics aims to understand the emergence and development of a discipline by evaluating academic products and their effectiveness over a certain period. It is a discipline that analyzes statistical data on the number of publications and citations of scientific studies (Rejeb et al., 2022). Academics can identify the main themes and ideas in their field by researching the literature with bibliometric analysis, considering various intellectual, social, and conceptual frameworks (Donthu et al., 2021; Vogel & Guttel, 2013; Zupic & Čater, 2015). In this process, additional methods such as performance analysis and science mapping are often used to better depict bibliometric analysis (Cobo et al., 2011; Santana & Cobo, 2020). In the context of augmented reality, the detailed flow chart of the bibliometric analysis conducted in this field is presented in Figure 1.

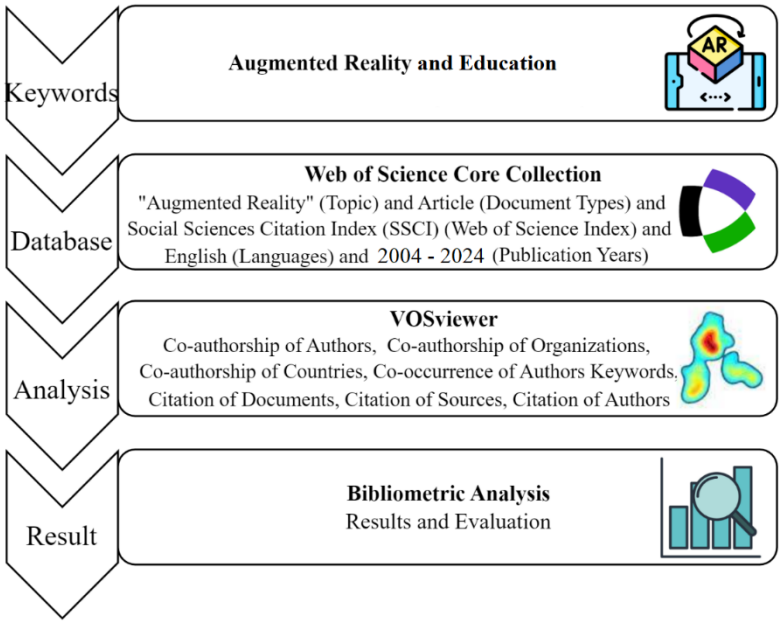

Figure 1. Flowchart of the bibliometric analysis for the keyword “Augmented Reality” and “Education”

2.1. Data Collection

The data for bibliometric analysis in the field of "Augmented Reality" was gathered using the Web of Science (WoS) Core Collection, an academic research database known for its comprehensive coverage and high-quality indexed

publications. WoS assists researchers in easily locating publications that meet rigorous quality standards and staying abreast of current developments in scientific literature. With features like subject coverage, research performance analysis, and citation analysis, WoS is widely recognized as one of the most reputable scientific citation index databases (Pranckutė, 2021; Wang et al., 2016). It was selected for this analysis due to its extensive coverage of diverse topics, its reputation for hosting peer-reviewed publications, and its popularity among researchers (Vieira & Gomes, 2009). The records exported from the WoS database contain a wealth of information including authors' contact details, publication year, title, source summary, document types, keywords, journal information, and references.

2.2. Data Analysis

During bibliometric analysis, not only the number of publications by researchers, but also the quality of the journals in which these publications are housed, holds great importance (Calabuig-Moreno et al., 2020; Sanmarco et al., 2019). Consequently, these factors were considered when implementing restrictions for the query result to be exported from the Web of Science (WoS) database. In this study conducted on 30.09.2024, 2911 results were obtained by filtering for the years between 2004-2024, including only the "Article" document type, within the "Social Sciences Citation Index (SSCI)" and “Science Citation Index Expanded (SCI-Expanded) subset, written in English, and published between 2004-2024, inclusive of both 2004 and 2024, encompassing all fields related to the keyword "Augmented Reality" and “Education”. No additional restrictions were applied in other areas such as access and country of publication. Figure 2 depicts the graph illustrating the number of publications and citations for the 2913 results obtained, organized by year.

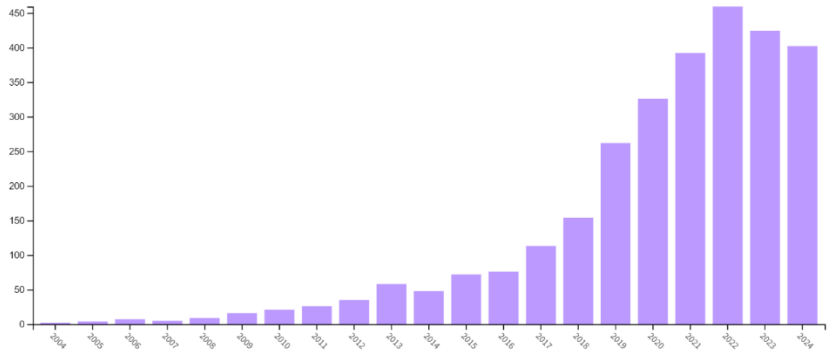

Figure 2. Citations and publications over time

It is evident that the number of articles in the field of augmented reality has steadily increased in the last two years. The highest number of articles was observed in 2022, totaling 459 articles. Despite the decline in the last two years, there has been significant progress in the number of articles written in the field of "Augmented Reality" and “Education” compared to the number of publications in 2004. This indicates that the field of augmented reality still possesses potential for growth.

The text-based document exported from the Web of Science (WoS) database was analyzed using VOSviewer, a software tool designed for creating bibliometric networks and visualizing interactions (Eck & Waltman). The analysis results include network maps and cluster analyses, visually representing the connections between articles, authors, keywords, or institutions (Yu et al., 2020). Additionally, this visualization analysis can be conducted using various programs such as RStudio, CiteSpace, Gephi, Vivo, and HistCite (Amarathunga et al., 2023). This article aims to gain a better understanding of the significant contacts and collaborations related to "Augmented Reality" and “Education” through the utilization of VOSviewer (version 1.6.20).

3. FINDINGS

A comprehensive bibliometric review was conducted, encompassing various analysis methods including Co-authorship analysis of Authors, Co-authorship analysis of Organizations, Co-authorship analysis of Countries, Co-occurrence analysis of Authors Keywords, Citation analysis of Documents, Citation analysis of Sources, and Citation analysis of Authors. The dataset obtained from this analysis was thoroughly examined across multiple factors such as authors, journals, citations, keywords, countries, and institutions. This approach has facilitated the evaluation of academic research in the field of augmented reality from a broad perspective.

3.1. Co-authorship of Authors

The "Co-authorship of Authors" analysis is utilized to investigate the connections among authors who frequently collaborate and publish together. It helps identify these authors within the field (Dirik et al., 2023). The analysis aimed to determine which researchers work closely together and collaborate most frequently in scientific research related to augmented reality. This analysis was conducted based on a criterion that focuses on researchers with a minimum of 5

documents and at least 2 citations. Consequently, 119 active authors who have made significant contributions to the field were identified.

These criteria were selected to generate the most meaningful results while minimizing data loss. Additionally, if these criteria are deemed less relevant, there is an option to highlight the most relevant countries in the cloud map created by VOSviewer. This step proves effective in identifying the top-ranked highlights that warrant focus in the analysis. Table 2 presents the 10 most influential authors, ranked by the number of articles they have authored.

Table 2. Top 10 authors sorted by article column

Nu	Author	Article	Citations	Total Link Strength
1	Daisuke Iwai	24	320	25
2	Kosuke Sato	21	273	21
3	Gwo-Jen Hwang	16	977	6
4	María del Mar Molero Jurado	15	188	57
5	Jae Yeol Lee	15	414	25
6	Mark Billinghurst	14	304	6
7	Jose Jesus Gazquez Linares	14	171	54
8	Vincenzo Ferrari	14	232	25
9	Maria Del Mar Simon Marquez	13	174	53
10	Archana Mantri	13	218	12

In the ranking based on the number of articles, Daisuke Iwai emerges as the researcher with the highest number of publications, boasting 24 documents. Following closely behind, Kosuke Sato (21 publication) and Gwo-Jen Hwang (16 publication). Similarly, María del Mar Molero Jurado and Jae Yeol Lee also exhibit a substantial number of documents with 15 publications each. The list of authors continues in a nearly sequential order. Among the 119 authors identified, other notable researchers include Mark Billinghurst (14), Jose Jesus Gazquez Linares(14), Vincenzo Ferrari(14) Maria Del Mar Simon Marquez(13) and Archana Mantri(13). Table 3 presents the authors in descending order according to the number of citations.

Table 3. Top 10 authors sorted by citations column

Nu	Author	Article	Citations	Total Link Strength
1	Jyh-chong Liang	5	1319	8
2	Hsin-yi Chang	6	1271	8
3	Gwo-jen Hwang	16	977	6
4	Jorge Martin-Gutierrez	8	826	1
5	Timothy Jung	7	662	1
6	Hongen Liao	9	649	20
7	Chin-chung Tsai	11	612	13
8	Christian Moro	8	609	5
9	Zane Stromberga	5	592	5
10	Ichiro Sakuma	8	533	26

By ranking the researchers according to the number of citations, this table illustrates the extent to which they have garnered academic attention. Jyh-chong Liang maintains his position at the forefront of the field with the highest number of citations. Notably, researcher such as Gwo-jen Hwang who are among the top 10 in both tables, have significantly enhanced his influence within his fields by achieving both high document numbers and high citation numbers. Furthermore, despite Jyh-chong Liang and Hsin-yi Chang having a notably high citation count, the lower number of publications suggests that their work has undergone thorough evaluation. To further enhance and visualize the analysis, a word cloud map depicting the authors' co-authorship analysis is provided in Figure 3.

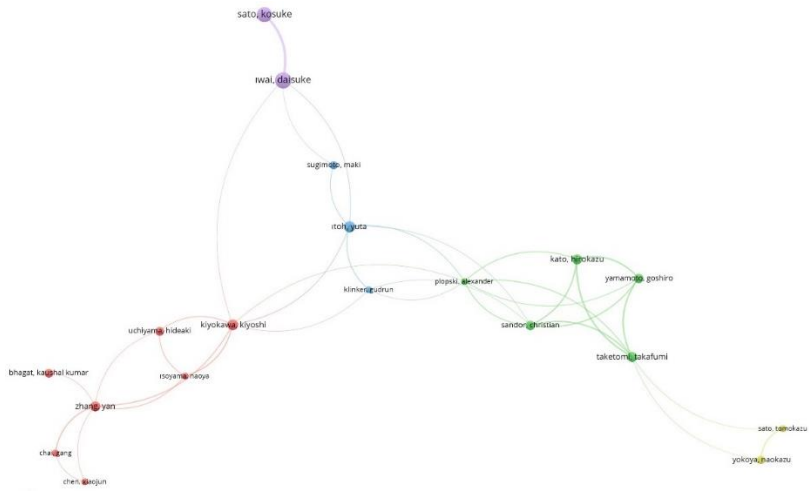

Figure 3. The co-authorship of authors cloud map.

The Co-authorship of Authors cloud map is depicted in Figure 3. Upon analysis, it is observed that the cloud map of the 19 most related authors is clustered into five distinct groups. These groups comprise authors Kaushal Kumar Bhagat, Hirokazu Kato, Yuta Itoh, Tomokazu Sato and Daisuka Iwai.

3.2. Co-authorship of Organizations

The "Co-authorship of Organizations" analysis assesses scientific publications in which an organization collaborates with other organizations, evaluating the interaction among these publications (Turgut & Gursoy, 2023). Initially, the analysis required an organization to have at least 5 documents and 10 citations. Consequently, 273 out of 3065 organizations met the criteria and surpassed the threshold. Table 4 presents the ranking of organizations in compliance with the specified restrictions based on the number of documents.

According to the analysis results, the Osaka University emerges as the institution with the highest number of articles among these organizations. Furthermore, other notable universities among the 273 institutions include The University of Tokyo, the National Taiwan Normal University, National Taiwan University of Science and Technology and Nanyang Technological University. Table 5 ranks the institutions based on the number of citations, providing insights into their effectiveness.

When considering Table 4 and Table 5 together to conduct a more accurate analysis, the National Taiwan University of Science and Technology emerges as an institution that has focused on a specific topic and conducted research effectively. It is evident that this institution is distinguished with a substantial difference in both the number of documents (39) and citations (3049) compared to other institutions. Additionally, Manchester Metropolitan University, National Taiwan Normal University, and Nanyang Technological University stand out in both tables as notable institutions. To further enrich the analysis, the connections between these institutions are presented in Figure 4 to facilitate a more comprehensive analysis.

Table 4. Top 10 organizations ranked by number of article

Nu	Organization	Article	Citations	Total Link Strength
1	Osaka University	46	682	18
2	The University of Tokyo	40	941	30
3	National Taiwan Normal University	39	2520	29
4	National Taiwan University of Science and Technology	39	3049	29
5	Nanyang Technological University	38	1341	29
6	National Cheng Kung University	28	685	26
7	NARA Institute of Science and Technology	24	534	28
8	Shanghai Jiao Tong University	24	553	11
9	Beijing Normal University	23	615	15
10	Tokyo Institute of Technology	23	654	11
11	Ataturk University	23	1144	0
12	Technical University of Munich	23	634	15

Table 5. Organizations ranked by number of citations

Nu	Organization	Documents	Citations	Total Link Strength
1	National Taiwan University of Science and Technology	39	3049	29
2	National Taiwan Normal University	39	2520	29
3	Nanyang Technological University	38	1341	29
4	Curtin University	7	1309	6
5	Kyung Hee University	17	1223	11
6	Harvard University	10	1220	10
7	National Kaohsiung Normal University	5	1196	7
8	Universitat Politècnica de València	16	1192	9
9	National Changhua University of Education	7	1162	6
10	Atatürk University	23	1144	0

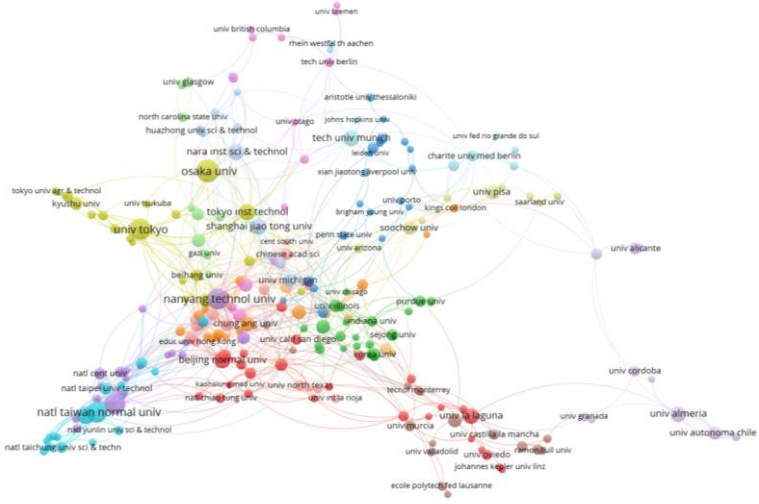

Figure 4. Organizations' co-authorship cloud map

The cloud map of the co-authorship analysis of the organizations is displayed in Figure 4. The analysis reveals that 273 institutions focusing on "Augmented Reality" are clustered into 16 different groups. Universities, positioned at the apex of these clusters, serve as the focal point of the analysis. Notably, the Bejing Normal University at the center of the red cluster. The purple cluster is represented by "Nanyang Technological University," the green cluster encompasses "University of Tokyo", the blue cluster includes " National Taiwan Normal University" the light blue cluster houses " Technical University of Munich,"

3.3. Co-authorship of Countries

The "Co-authorship of Countries" analysis assesses co-authorship between different countries. It is used to understand cooperation and connections between countries in scientific publications (Donthu et al., 2021). Within the scope of the analysis, the 10 smallest documents and 10 citation criteria were determined. As a result, 50 countries in the data set of 105 countries meet these criteria. Details of the analysis are given in Table 6.

Table 6. Ranking of countries by number of documents

Nu	Country	Article	Citations	Total Link Strength
1	People's Republic of China	505	9183	291
2	USA	500	12613	326
3	Japan	277	4994	103
4	Spain	250	8541	160
5	Taiwan	244	8278	91
6	South Korea	233	5724	122
7	Germany	220	4650	145
8	England	145	5197	200
9	Italy	117	3219	105
10	Australia	104	4285	52

According to Table 6, the People's Republic of China (505) and the USA (500) show a significant difference compared to other countries in the fields of augmented reality and education. This shows that the PRC and USA has made a great contribution to scientific studies in the field of "Augmented Reality" and “Education” plays an active role at the international level. With 277 documents, "Japan" ranks third. "Spain" ranks fourth with 250 documents and "Taiwan" ranks fifth with 244 documents. The ranking of countries according to their citations is shown in Table 7.

Table 7. Ranking of countries according to the number of citations

Nu	Country	Article	Citations	Total Link Strength
1	USA	500	12613	326
2	People's Republic of China	505	9183	291
3	Spain	250	8541	160
4	Taiwan	244	8278	91
5	South Korea	233	5724	122
6	England	145	5197	200
7	Japan	277	4994	103
8	Germany	220	4650	145
9	Australia	104	4285	100
10	Italy	117	3219	105

"United State of America" has a clear dominance in the scientific literature in the field of augmented reality, as can be seen from the two tables. America stands out with an impressive 500 documents and a very large number of citations,

12613. These figures unequivocally demonstrate that the United States is a prominent leader in augmented reality research, excelling in both quantity and quality. While there may be fluctuations in the overall ranking of countries, it is evident that the top 10 out of 50 countries are vying for prominence. The cloud map of the co-authorship analysis of the countries is depicted in Figure 5.

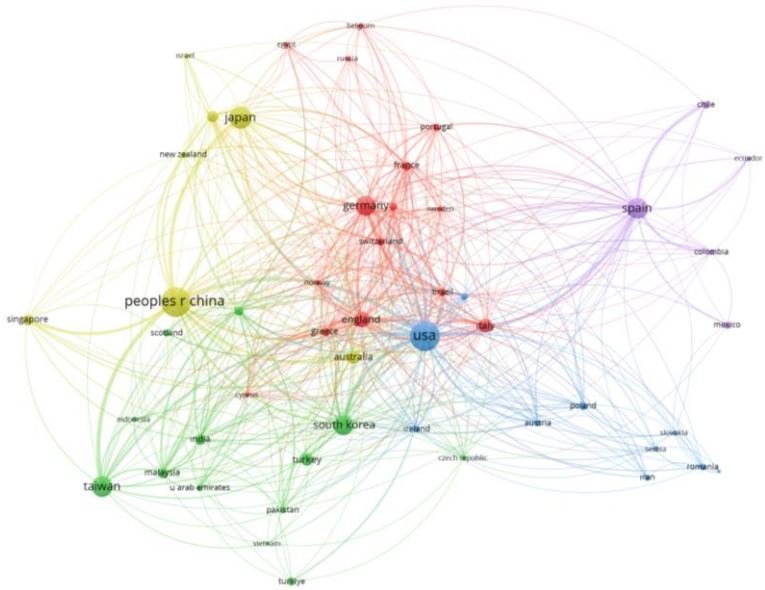

Figure 5. Cloud map of countries' co-authorship

As a result of the analysis, it is seen that the cloud map of the 50 countries with the highest number of co-authorships is gathered around 5 different clusters. These countries are Germany, South Korea, USA, People's Republic of China and Spain. Here, it is seen that USA, People's Republic of China and Germany are at the center of the connections. When Table 4 and Table 6 are analyzed together, it is seen that the top 10 universities with the highest number of publications are in parallel with the countries with the highest number of documents (such as Taiwan, Spain and South Korea).

3.4. Co-occurrence of Authors Keywords

"Co-occurrence of Authors Keywords" analysis is used to examine how often keywords used by authors occur together (Donthu et al., 2021). Our bibliometric analysis on "Augmented Reality" was used to understand keyword relationships

in this field. The minimum occurrence rate of a word was chosen as 15. In this analysis, a total of 82 related keywords were analyzed. The details of the relationship between keywords are given in Table 8.

Table 8. Relationship between keywords

Nu	Keyword	Occurrences	Total Link Strength
1	Augmented Reality	1285	1412
2	Virtual Reality	427	737
3	Education	188	383
4	Mixed Reality	138	303
5	Augmented Reality (AR)	93	81
6	Mobile Learning	67	115
7	Medical Education	63	124
8	Metaverse	61	126
9	Visualization	60	135
10	Extended Reality	55	134

"Augmented Reality" emerged as the most prevalent term strongly associated with other keywords. "Virtual Reality" and "Education" are also significant keywords frequently appearing alongside "Augmented Reality," with 427 and 188 occurrences, respectively. Furthermore, keywords such as "Mixed Reality" "Augmented Reality (AR)," "Mobile Learning," "Medical Education," "Metaverse," "Visualization" and "Extended Reality" have occurrences of 138, 93, 67, 63, 61, 60 and 55 respectively. The cloud map of the Co-occurrence of Authors Keywords analysis is provided in Figure 6.

In total, 82 keywords are grouped around 9 different clusters, with node size and post size being directly proportional to keyword frequency (Guo et al., 2021). The keyword "Augmented Reality," represented in red, demonstrates a strong relationship with all other words. Following "Augmented Reality," the term "Virtual Reality," depicted in blue, emerges as the most frequently used keyword. Similarly, the term "Education" is the most frequent word within the purple cluster. “Mixed Reality” holds the highest frequency within the green cluster. Also “Extended Reality” shown light blue cluster and “Similation” is orange cluster. Examining the connections between words according to each color facilitated a more concrete analysis than the tabular analysis.

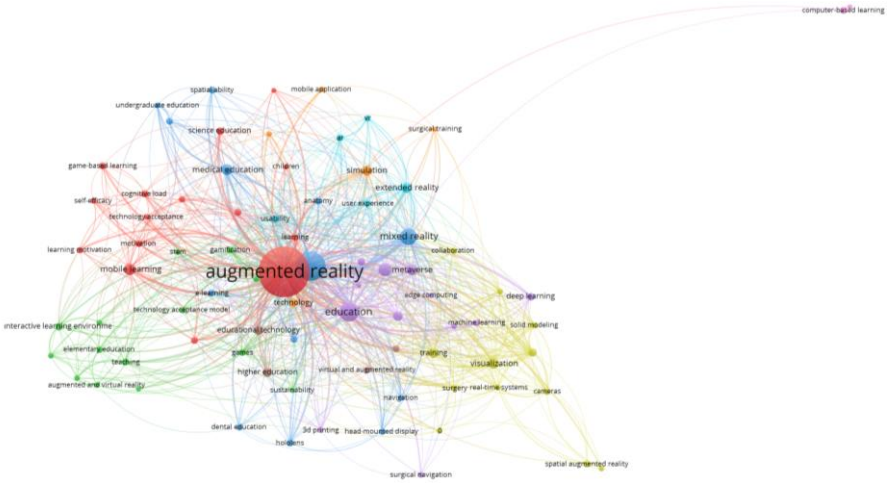

Figure 6. Word cloud map of co-occurrence of authors' keywords

3.5. Citation of Documents

The "Citation of Documents" analysis evaluates how many citations a given document has received (Merigó et al., 2015). To find out the most important articles in the field of "Augmented Reality" that should be analyzed first, the minimum number of citations of a document was chosen as 30. After this selection, 550 out of 2911 articles met the requirements and passed the threshold. The journals, titles, years of publication, number of citations and number of links of the articles that passed the threshold are given in Table 9.

(Wu et al., 2013) was the most highly cited paper, with a total of 1107 citations.It also has 112 links. (Guttentag, 2010) and (Dunleavy et al., 2009) also have a significant citation rate with 740 and 708 citations respectively. In addition, the table shows that important articles such as (Dwivedi, 2021) and (Kim et al., 2020) are among the top 5 most cited documents in the field of "Augmented Reality" and “Education”. This information can be used as an important source for identifying the most valuable articles in “Augmented Reality" literature. Table 9 provides a valuable reference for researchers who want to conduct citation analysis for academic studies in this field. The cloud map of the Citation of Documents analysis is given in Figure 7.

Table 9. Most cited documents

NU	JOURNALS	TITLES	CITATIONS	LINKS	YEAR	REFERENCES
1	Computers and Education	Current Status, Opportunities and Challenges of Augmented Reality in Education	1107	112	2013	(Wu et al., 2013)
2	Tourism Management	Virtual Reality: Applications and Implications for Tourism	740	8	2010	(Guttentag, 2010)
3	Journal of Science Education and Technology	Affordances and Limitations of Immersive Participatory Augmented Reality Simulations for Teaching and Learning	708	72	2009	(Dunleavy et al., 2009)
4	International Journal of Information Management,	Setting the future of digital and social media marketing research: Perspectives and research propositions	707	2	2021	(Dwivedi)
5	Journal of Travel Research	Exploring Consumer Behavior in Virtual Reality Tourism Using an Extended Stimulus-Organism-Response Model	588	7	2020	(Kim et al., 2020)
6	Computers and Education	Impact of an Augmented Reality System on Students' Motivation for a Visual Art Course	572	69	2013	(Di Serio et al., 2013)
7	Frontiers in Psychology	The past, present, and future of virtual and augmented reality research: a network and cluster analysis of the literature	477	3	2018	(Cipresso et al., 2018)
8	Computers and Education	Virtual laboratories for education in science, technology, and engineering: A review	448	7	2016	(Potkonjak et al, 448)
9	Anatomical Sciences Education	The effectiveness of virtual and augmented reality in health sciences and medical anatomy	432	27	2017	(Moro et al., 2017)
10	Journal on Computing and Cultural Heritage	A survey of augmented, virtual, and mixed reality for cultural heritage	430	2	2018	(Bekele et al, 2018)

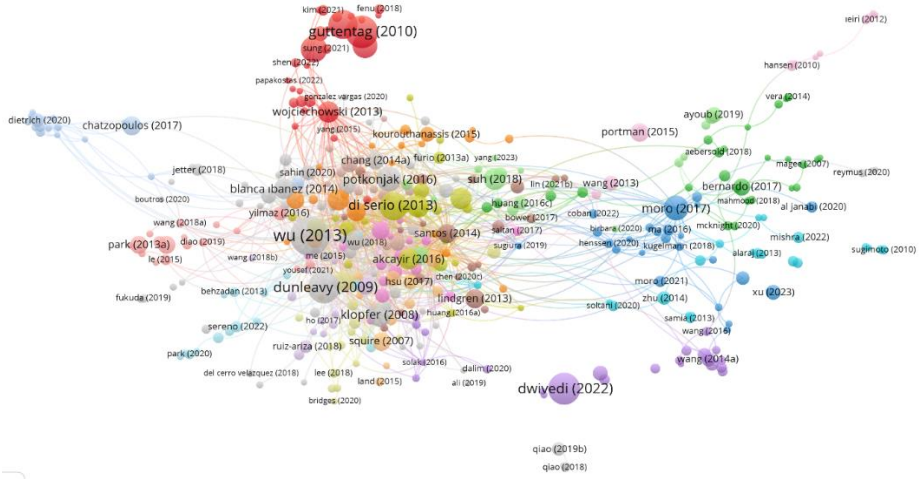

Figure 7. Citation of documents cloud map

When the VOSviewer program asked if it should reduce the 550 articles to the most relevant 402 sources before extracting the cloud map, we said yes and

obtained the cloud map of the Citation of Documents analysis. It is observed that this cloud map is gathered around 23 clusters. Figure 7 and Table 9 show that (Wu et al., 2013), (Guttentag, 2010), (Dunleavy et al., 2009) have higher citations and stronger links compared to other articles as shown in Table 9.

3.6. Citation of Sources

The "Citation of Sources" analysis helps us evaluate the most cited journals by examining their citation analysis (Guo et al., 2021). When the minimum number of documents of a source was set to 10 and the minimum number of citations of a source was set to 10, 48 out of 834 journals were able to pass the threshold. The most cited journals are given in Table 10.

Table 10. Most cited journals

NU	SOURCE	ARTI-CLE	CITA-TIONS	TOTAL LINK STRENGTH
1	Computers and Education	59	8122	1202
2	Computers in Human Behavior	22	1809	187
3	Interactive Learning Environments	69	1554	514
4	Institute of Electrical and Electronics Engi-neers Access+	89	1427	158
5	Journal of Science Education and Technology	32	1411	369
6	Anatomical Sciences Education	36	1364	115
7	IEEE Transactions on Visualization and Com-puter Graphics	63	1164	63
8	Sustainability	82	1067	160
9	Applied Sciences-Basel	90	1045	126
10	Education and Information Technologies	121	989	569

The top 5 most cited journals are Computers and Education (8122 citations, 59 documents), Computers in Human Behavior (1809 citations, 22 documents), Interactive Learning Environments (1554 citations, 69 documents), Institute of Electrical and Electronics Engineers Access+ (1427 citations, 89 documents) and Journal of Science Education and Technology (1411 citations, 32 documents). The Citation of Sources cloud map is shown in Figure 8.

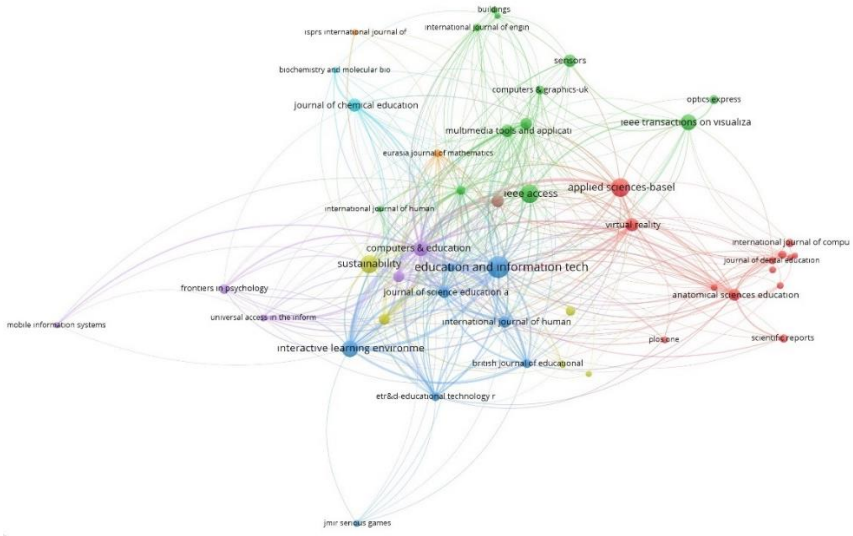

Figure 8. Citation of sources cloud map

When the Citation of Sources cloud map is analyzed, it is seen that 48 journals are grouped around 8 classes. Among these 66 journals, Applied Sciences-Basel, IEEE Access, Education and Information Technologies, Sustainability, Computers and Education, Journal of Chemical Education, Eurasia Journal of Mathematics and Electronics stand out.

3.7. Citation of Authors

"Citation of Authors" analysis assesses how often an author's works are cited. This is used to measure an author's academic impact (Turgut & Gursoy, 2023). In the authors' citation analysis according to the determined thresholds, 119 authors who met the criteria of at least 5 documents and at least 5 citations were examined. The ranking of authors' co-citations is given in Table 11.

Table 11. Ranking of authors' co-citations

NU	AUTHOR	ARTICLE	CITATIONS	TOTAL LINK STRENGTH
1	Jyh-Chong Liang	5	1319	173
2	Hsin-Yi Chang	6	1271	178
3	Gwo-Jen Hwang	16	977	205
4	Jorge Martin-Gutierrez	8	826	1
5	Timothy Jung	7	662	2
6	Hongen Liao	9	649	117
7	Chin-Chung Tsai	11	612	180
8	Christian Moro	8	609	43
9	Zane Stromberga	5	592	43
10	Ichiro Sakuma	8	533	120

Jyh-Chong Liang tops the table with 1319 citations and 5 documents. Philipp A. Rauschnabel's work on augmented reality has an important interaction in this field. Hsin-Yi Chang ranks second with 1271 citations, although the number of documents is lower than the other leading names. Gwo-Jen Hwang ranks third in the table with 977 citations and 16 documents. Jorge Martin-Gutierrez and Timothy Jung also achieved good citations with fewer documents. Hongen Liao stood out in terms of total link strength. Authors such as Chin-Chung Tsai, Christian Moro, Zane Stromberga and Ichiro Sakuma are also authors with significant citation counts. The Citation of Authors cloud map is shown in Figure 9.

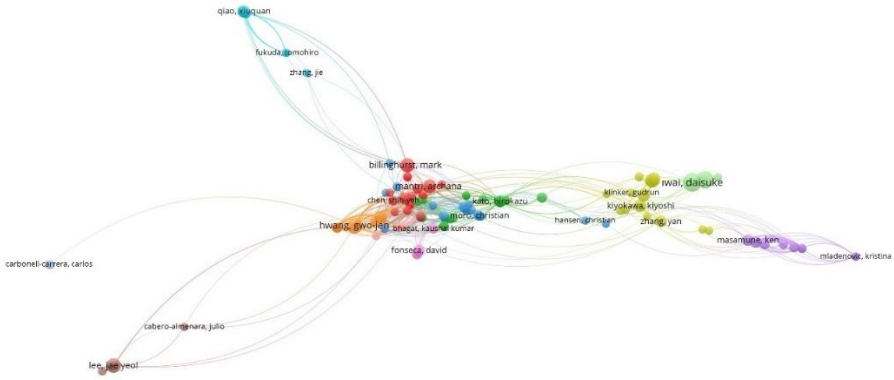

Figure 9. Author citation cloud map

A total of 108 authors are grouped around 12 clusters. Notable authors in each cluster are as follows: Mark Billinghurst, Hirokazu Kato, Nassir Navab, Yuta

Itoh, Ken Masamune, Xiquan Qiao, Gwo-Jen Hwang, Jae Yeol Lee, Kaushal Kumar Bhagat, Kuo-En Chang, Daisuke Iwai and Jose Luis Saorin.

4. DISCUSSION AND CONCLUSIONS

In this study, the aim is to empower researchers writing articles on "Augmented Reality" to make informed decisions throughout the article writing process. By streamlining the complexity of various stages in article writing, the goal is to enable researchers to progress efficiently without wasting time at each step. To achieve this objective, a comprehensive bibliometric review was conducted, incorporating different analysis methods such as Co-authorship of Authors, Co-authorship of Organizations, Co-authorship of Countries, Co-occurrence of Authors Keywords, Citation of Documents, Citation of Sources, and Citation of Authors.

Among these analyses, the most significant elements include Citation of Documents, Co-authorship of Authors, Co-occurrence of Authors Keywords, and Citation of Sources. Each of these analyses plays a crucial role in academic research, and their importance is highlighted through the explanations provided below.

When authors embark on the process of writing an article, their primary goal is to enhance its visibility, thereby enabling widespread benefit. In the academic realm, this visibility is gauged through citation numbers. As citations accumulate, a document or article gains recognition as a pioneering work in its field. Therefore, researchers initiating the article-writing process in a particular field should first focus on the works of pioneers in that domain. Particularly for new researchers, aligning their research with the works of pioneering scholars serves as a guiding beacon. At this juncture, the bibliometric analysis of Citation of Documents plays a crucial role in identifying the trailblazers of a specific field and the seminal articles.

The Co-authorship of Authors analysis holds significance as it determines which authors to begin the literature review with. It directs researchers seeking to commence a literature review by exploring the collaborative endeavors of pioneering researchers in a specific field. This analysis facilitates an understanding of the collaborative networks prevalent in the field, thereby enabling researchers to conduct an informed literature review.

The Co-occurrence of Authors Keywords analysis is particularly vital for researchers aiming to write an article in a specific field. This analysis identifies the most effective keywords by examining their frequency of occurrence

together. Keywords play a pivotal role in aiding readers searching for resources in a specific field, enabling them to locate relevant materials with ease. Consequently, this analysis assists researchers in staying abreast of evolving trends within their fields, thereby enhancing their scholarly pursuits.

The Citation of Sources analysis serves as a crucial guideline in selecting the appropriate journal for article submission upon completion of the writing process. Journal selection is a critical determinant for timely publication and reaching the desired audience effectively. By identifying the most cited journals, this analysis enables researchers to assess the efficacy of their efforts and make informed decisions regarding journal submission.

In this study, articles on "Augmented Reality" underwent bibliometric analysis using various methods. Data were collected from the "Web of Science" database, yielding a total of 2911 studies meeting the specified criteria. Seven types of analyses were performed: co-authorship analysis of authors, co-authorship analysis of organizations, co-authorship analysis of countries, co-occurrence analysis of author keywords, citation analysis of documents, citation analysis of sources, and citation analysis of authors.

The analysis revealed the authors with the highest number of collaborations in Augmented Reality and Education, including " Jyh-chong Liang," "Hsin-yi Chang," " Gwo-jen Hwang," "Gwo-Jen Hwang," and " Jorge Martin-Gutierrez." Noteworthy institutions with prolific collaborative efforts include "National Taiwan University of Science and Technology, "National Taiwan Normal University,", "Nanyang Technological University", "Curtin University" and "Kyung Hee University." The countries of authors conducting the most collaborative studies were predominantly centered around the United States of America, People's Republic of China, Spain, Taiwan, South Korea, England, Japan, Germany, Australia, and Italy.

Furthermore, the co-occurrence analysis of author keywords highlighted recurring terms such as "Augmented Reality," "Virtual Reality," "Education," "Mixed Reality," "Augmented Reality (AR)," "Mobile Learning," "Medical Education," "Metaverse," "Visualization," and "Extended Reality."

In the citation analysis of documents, the most cited articles included works by (Wu et al., 2013), (Guttentag, 2010), (Dunleavy et al., 2009), (Dwivedi et al., 2021) Kim et al., 2020) and (Di Serio et al., 2013. Additionally, the analysis of selected sources focused on pre-eminent journals such as "Computer and Education," "Computers in Human Behavior," "Sustainability," "International Journal of Human-Computer Interaction," and "Journal of Retail Consumer

Services." Notable authors highlighted in the citation analysis of authors included Philipp A. Rauschnabel, M. Claudia Tom Dieck, Hsin-Yi Chang, Timothy Jung, and Hsin-Kai Wu.

While the study provides valuable insights, some limitations warrant consideration. The selection of the WoS database over other databases such as Scopus, PubMed, and Google Scholar, commonly preferred in bibliometric analyses, may pose a limitation. Additionally, the reliance on VOSviewer, rather than employing various programs like RStudio, CiteSpace, Gephi, Vivo, and HistCite, could be considered another limitation of the research.

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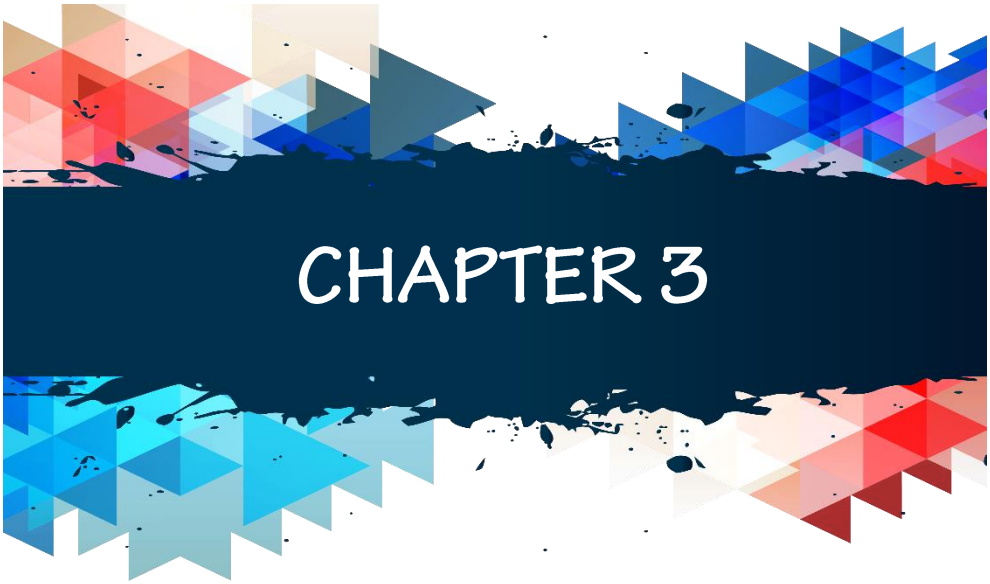

The Need For Culturally Responsive Teaching in the Context of Türkiye

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Introduction

In education systems, students differ in terms of gender, language, race, ethnicity, religion, socioeconomic status, disability, and culture. This variety has even risen dramatically in many countries because of the massive global migration that has occurred in the last few decades due to wars, famine, a lack of educational opportunities, and economic difficulties. Students all have different expectations and needs in learning environments and based on the increasing number of culturally and linguistically diverse students in classrooms, it is of great importance for teachers to address the needs of culturally diverse students. One strategy used to address the issues experienced by culturally diverse students in the educational systems of many nations that receive immigrants is utilizing culturally responsive teaching (CRT) in the learning-teaching process. By considering students' cultural background and needs when planning the courses, it may be possible to let these students succeed as well. In this chapter, first, the components of CRT are explained. This study also offers information and suggestions regarding culturally responsive differentiated instruction, culturally responsive classroom management, and measurement and evaluation processes in CRT. Then, the education of culturally diverse students is discussed within the context of Türkiye.

Culturally Responsive Teaching

Multicultural education is defined as ensuring equal learning opportunities for all students, regardless of gender, social class, ethnicity, race, or culture (Banks & Banks, 2009). Gay (2015) claims that CRT is developed from multicultural education. Multicultural education is more comprehensive and concentrates on instructional activities, teaching materials and resources, policymaking, curriculum content, and evaluation. According to Gay (2018), CRT is the process of using prior experiences, cultural knowledge, and performance forms to help students learn in a more effective and meaningful way. Culturally responsive pedagogy, as described by Ladson-Billings (1995), focused on instruction that includes three essential elements: academic achievement, the growth and upkeep of cultural competency, and the growth of the ability to challenge social norms, values, and institutions that create and uphold social injustices. In CRT, it is considered that culture interacts with the way students learn. CRT is based on the notion that a more meaningful and easier-to-learn teaching process can be achieved when information is taught by associating it with students' life experiences (Gay, 2018). CRT affirms students' cultures, perceiving them as transforming and liberating assets rather than disadvantages. CRT also incorporates students' cultures into the teaching process, hence strengthening

them to take ownership of their learning, and it also increases their future engagement in societal activities (Santamaria, 2009).

CRT enhances the engagement and motivation of culturally diverse students in the learning process by establishing a connection between the cultures of students who are viewed as minorities in schools and the cultures that are intended to be taught there (Ladson-Billings, 1995). CRT plays a pivotal role in culturally diverse classrooms since the relevant literature demonstrates that when the instruction is only based on local culture, culturally diverse students generally perform lower than mainstream students and are depicted as low achievers (Bonner, Warren & Jiang, 2009; Jordan, 2010). Regardless of cultural, emotional, social, linguistic, and economic differences, CRT aims to equip students with higher-order skills. In addition to academic achievement, CRT seeks to foster critical thinking, and social and cultural competency (Kotluk & Kocakaya, 2019). Additionally, CRT might support giving students equitable opportunities and a deeper awareness of other cultures in the classroom. CRT includes establishing a secure, welcoming, and accepting learning environment where diversity is valued to inspire all students to learning (Soylu, Kaysılı & Sever, 2020). Gay (2002, 2018) depicts the characteristics of CRT as in the following:

a) CRT is valid because it accepts the fact that various cultural experiences affect students' learning, hence cultural experiences are included in the curricula as valuable resources. It builds meaningful bridges between schools and home life. It ensures the implementation of different teaching strategies in relation to students' learning styles. Students learn about the culture of their classmates besides their own culture and learn to respect them. The teacher pays attention to appealing to various cultures while preparing his/her materials.

b) CRT is comprehensive since it takes into account the holistic development of students. Furthermore, students are responsible not only for their own learning, but also for the learning of their friends.

c) CRT is multi-dimensional because it covers many elements of education such as teacher-student relationship, classroom atmosphere, classroom management, teaching techniques and evaluation.

d) CRT is supportive by enabling students to become more successful and better individuals. It supports children to be willing and determined to pursue success without giving up by ensuring that they believe they can fulfill their learning tasks.

e) CRT is transformative since it aims to develop students' critical thinking skills, social awareness and individual competence so that they can cope with situations such as prejudice, racism and exploitation.

f) CRT is liberating because it eliminates the belief that the concepts taught are absolute facts and true. It tries to indicate to students that there is no definitive version of reality and that it will not remain unchangeable. In short, it states that information should not be one-sided.

Considering different aspects and benefits of CRT in learning environments it becomes a necessity for teachers to be respectful and sensitive to cultural values and implement CRT in culturally diverse settings. However, the central understanding in CRT is not to learn the cultural backgrounds of students one by one or to ensure that all students are brought to the same cultural level, but for teachers to have ideas and strategies that will make these cultures meaningful in the classroom (Soylu et al., 2020). The following recommendations to apply CRT are made for teachers:

1. Being aware of their own racist thoughts and prejudices (Pevec-Zimmer, Juang & Schachner, 2024),
2. Applying self-evaluation to determine their own knowledge about other cultures (Montgomery, 2001),
3. Obtaining information about the cultural background of their students (Brown, 2007),
4. Understanding the social, economic and political contexts of students (Gay, 2015),
5. Creating interactive learning environments (Aceves & Orosco, 2014),
6. Showing willingness and fidelity to applying pedagogical approaches that are sensitive to cultural values in the learning-teaching process (Montgomery, 2001).

Teachers, in the light of the principles of social justice and pluralistic understanding, need to pay attention to the implementation of classroom practices that match students' cultural background and experiences.

Culturally Responsive Teaching Frameworks

It is necessary for teachers to comprehend the components of CRT in order to apply CRT appropriately. According to Gay (2002) five components of CRT exist, which are "cultural diversity knowledge base, culturally relevant curricula, cultural caring and building learning community, cross-cultural communication and cultural congruity in classroom instruction" (pp.106-112). These domains and specific strategies that teachers can employ in each domain are shown in Table 1.

Table 1. Components of Gay's (2002) CRT Framework

CRT Domains	Strategies
Cultural diversity knowledge base	1. Learning culturally diverse students' traditions, cultural values, communication and learning styles and preferred relational patterns. 2. Obtaining comprehensive factual knowledge regarding the cultural characteristics of specific cultures. 3. Gaining a greater understanding of CRT.
Culturally relevant curricula	1. Evaluating the curriculum's strengths and weaknesses in terms of diversity 2. Making the required adjustments in the curriculum. 3. Recognizing the effect of different types of curricula (formal, hidden) and employing them to help convey information, values, and actions regarding cultural diversity.
Cultural caring and building learning community	1. Participate in an ethical, emotional, and academic collaboration to support each other. 2. Being engaged in culturally diverse students' success. 3. Holding high expectations for success from culturally diverse students 4. Using cultural scaffolding, which entails drawing on students' cultures and experiences, for expanding their intellectual horizons and succeeding academically. 5. Letting students discuss their cultural values.

Cross-cultural communication	1. Understanding cultural codes and communication styles (linguistic structures, contextual factors) in order to properly teach culturally diverse students. 2. Having positive attitude towards culturally diverse students.
Cultural congruity in classroom instruction	1. Adapting teaching methods to the various learning styles of culturally diverse students. 2. Using active teaching methods. 3. Preparing various multicultural instructional examples and materials.

Cultural Diversity Knowledge Base

Teachers need to develop knowledge base regarding cultural diversity besides to content and pedagogical knowledge. First of all, teachers need to have a knowledge base regarding the culturally diverse students' traditions, cultural values, communication and learning styles and preferred relational patterns due to the fact that they all have a direct impact on learning processes. For instance, teachers need to be aware of a) which cultures value living in community and prefer cooperative problem solving as well as how these choices impact students' motivation and performance in the classroom; b) how various cultural norms about acceptable ways for children to engage with adults are displayed in learning environments; and (c) how socialization to gender roles varies among different cultures and how it affects enacting equity measures in education (Gay, 2002).

Another strategy for cultural diversity knowledge base is obtaining comprehensive factual knowledge regarding the cultural characteristics of specific cultures. This is important in order to make education more engaging and stimulating for students with different cultural backgrounds. By being more knowledgeable about the contributions that other cultural groups have made to a variety of academic subjects, teachers can also make up for knowledge gaps (Gay, 2018). Moreover, teachers need to gain a greater understanding of CRT theory. Teachers can obtain quality information regarding CRT through research and incorporate this information into classroom instruction. Also, teachers may be equipped with this kind of information in teacher training programs.

Culturally Relevant Curricula

Besides to knowledge base, teachers need to learn how to transform it into teaching practices and curriculum designs that are culturally responsive. Culturally responsive teachers expose the content and design of curriculum to continuous critical analysis and can evaluate the curriculum's strengths and weaknesses in terms of diversity and make the required adjustments to raise their overall quality. The curriculum in CRT should be updated by removing texts that are stereotypical and alienating, and it should take the cultural values of the students, their past learning, interests, and needs into account (Ladson-Billings, 1995).

Another strategy to enable culturally relevant curricula is to recognize the effect of different types of curricula (formal, hidden) and employ them to help convey information, values, and actions regarding cultural diversity. Culturally responsive teachers need to be careful about how formal curriculum deals with cultural diversity and correct some issues in the implementation of formal curriculum. Formal curriculum may ignore controversial issues, put greater emphasis on the achievements of specific cultures or disregard women. Instead of ignoring controversial topics in the curriculum such as racism, culturally responsive teachers should address controversial subjects directly and include multiple knowledge and perspectives regarding the topic. In addition, culturally responsive teachers should recognize the impact of hidden curriculum and employ it to help convey information, values, and actions regarding cultural diversity. For instance, teachers may utilize images and pictures displayed on classroom walls to reflect a wide variety of gender, race, socioeconomic status, and culture and show that each of them is valuable (Gay, 2018).

Cultural Caring and Building Learning Community

In order to foster cultural caring and build a learning community teachers and students from varied cultural backgrounds need to participate in an ethical, emotional, and academic collaboration to support each other. Teachers also need to care about culturally diverse students and be engaged in their success. Teachers should always have high expectations for success from culturally diverse students in order for them to achieve academically and reach their full potential. If the teacher believes that the student will be successful and he/she will acquire high-level skills and makes the student feel this belief, there is a high probability that the student will be successful (Garcia & Chun, 2016). In addition, teachers need to be skilled at using cultural scaffolding, which entails drawing on their own cultures and experiences, to assist students from varied cultural backgrounds in

expanding their intellectual horizons and succeeding academically (Aceves & Orosco, 2014).

Teachers should also do their best to learn about students' cultural backgrounds and values and utilize these in the learning-teaching process. Students from varied cultural backgrounds might be permitted to discuss their cultural values, so both the teacher and other students have an opinion about their culture (Ladson-Billings, 1995). Students can take an active role in the learning process when they are given the opportunity to express their opinions on a situation and learn in ways that are unique to their social and cultural backgrounds.

Cross-Cultural Communication

Cross cultural communication is also another pivotal component of CRT, since some students find learning challenging without cross-cultural communication. What culturally diverse students know and are capable of knowing and doing is determined typically by how well teachers are able to communicate with students from varied cultural backgrounds. As a result, teachers need to learn how to communicate with different group of students. An important strategy for teachers to enable cross-cultural communication is to understand cultural codes and communication styles. Cultural communication profoundly influences the expression of intellectual thought, which is culturally encoded, among students from various cultural groups. Teachers should be able to understand these codes in order to properly teach culturally diverse students. Therefore, it is necessary for teacher education programs to teach how different cultural groups' communication styles reflect cultural values and impact learning behaviors, and how to adapt classroom interactions accordingly. Knowledge of various cultures' communication styles includes "linguistic structures, contextual factors, cultural nuances, discourse features, vocabulary usage, speaker and listener roles, intonation, gestures, and body movements" (Gay, 2002, p.111).

In addition, for a healthy communication teachers should have a positive attitude toward culturally diverse students and their families, and respect all regardless of their race, culture, religion or socio-economic background, so students are not exposed to discrimination at school.

Cultural Congruity in Classroom Instruction

Cultural congruity focuses on delivering instruction to culturally diverse students. An important strategy for cultural congruity is to adapt teaching methods to the various learning styles of culturally diverse students. Cultural

characteristics influence how teaching methods should be tailored for culturally diverse students. For instance, cooperative learning aligns well with communal cultural systems (Gay, 2002). Thus, teachers should investigate how specific cultural groups prefer learning. Also, teachers need to incorporate pedagogical content knowledge with students' unique traits and cultural values (Kotluk & Kocakaya, 2019).

Furthermore, it is necessary for teachers to use active teaching methods so that students can learn by experiencing and take responsibility for their own learning. In an active learning environment teachers should take the role of a facilitator. In CRT, cooperative learning can be applied. Through this process, students take on the responsibility of one another, cooperating toward a common goal, and developing positive interdependence.

Continually incorporating multicultural instructional examples and materials into the teaching process is another effective strategy for establishing cultural congruency in the classroom. To effectively teach culturally diverse children, teachers should expand their repertory of multicultural instructional examples. This is a learnt skill that should be included in teacher education programs. To teach effectively, it is important to recognize the importance of examples in the instructional process, learn about different ethnic groups' cultures and experiences, gather teaching examples from relevant sources, and apply multicultural examples to teach various knowledge and skills. For example, examples from ethnic architecture may be used to teach geometric principles or different examples of literature may be utilized to teach various reading skills. Teachers should also utilize materials that consider students' cultural and linguistic identities.

In addition to Gay's (2002) framework of CRT, several scholars have explained the elements that teachers need to focus on to utilize CRT. Table 2 illustrates the frameworks, their elements and effective strategies for each element.

Table 2. Other CRT Frameworks

Frame-works	Elements	Strategies
Aceves& Orosco (2014)	1. Problem solving 2. Child centered instruc-tion 3. Assessmen 4. Materials	1. Providing students with real-world problems to solve. 2. Responding to students' needs and cultural backgrounds. 3. Using both formal and informal as-sessment methods. 4. Incorporating materials that consider cultural backgrounds of the students.
Siwatu (2007)	1. Curriculum & Instruc-tion 2. Classroom management 3. Assessment 4. Cultural enrichment	1. Using student's unique learning pref-erences, cultural knowledge, experi-ences, and prior knowledge. 2. Integrating students' culture for a cul-turally relevant classroom environment. 3. Using a variety of assessment tech-niques. 4. Equipping students with knowledge and skills necessary to function in main-stream culture.
Ladson-Billings (2001)	1. Academic achievement 2. Cultural competence 3.Critical consciousness	1. Concentrating on student's academic performance (e.g., setting clear objec-tives) 2. Helping students gain cultural compe-tency. 3. Cultivating a feeling of sociopolitical consciousness.

Aceves and Orosco (2014) have identified four elements of CRT: a) problem solving, b) child centered instruction, c) assessments, and d) materials. Problem solving requires teachers to provide students with real, open-ended problems, pose questions, and come up with answers for genuine challenging

circumstances. Problem solving becomes culturally responsive when students address problems that touch on linguistic and cultural issues in order to better their everyday lives. Students are encouraged to care about their communities through culturally responsive problem solving. Some examples may be gathering and evaluating extra sources to enhance the curriculum in order to better represent the cultural and linguistic backgrounds of students, looking into universities that offer programs that support culturally diverse students, and gathering oral histories from local elders about study subjects. In addition, according to Aceves and Orosco (2014) teachers apply child centered instruction when the learning opportunities and outcomes emphasize student-generated concepts, cultural background, needs, prior knowledge, values, communication preferences, and styles. Teachers in culturally responsive classrooms also give students choices for class activities, support student-directed learning, and help them with these activities. Teachers also provide students with the freedom to choose the type and content of the instruction as well as the resources they require to manage their own learning. Furthermore, in culturally diverse classrooms teachers should select both formal and informal assessment methods that consider students' cultural background. Assessment process should be designed to find out what students already know and understand to help teachers and families build on students' strengths. When assessing assessment results teachers must understand that standards for expected student achievement can change based on students' cultural backgrounds and experiences. Moreover, teachers must use teacher-selected and research-developed materials that validate and take into account students' cultural and linguistic identities in order to comply with CRT. Teachers and students should examine this content critically to ensure that it accurately reflects the variety represented in the school community. Aceves and Orosco (2014) suggest that teachers should supplement course materials in cases when this material lacks representative cultural and linguistic variety.

Another framework was suggested by Siwatu (2007) that identified four elements of CRT: a) curriculum and instruction, b) classroom management, c) assessment and d) cultural enrichment. "Curriculum and instruction" and "assessment" elements are similar to Aceves and Orosco's (2014) "child centered instruction" and "assessment" dimensions in that using student's unique learning preferences, cultural knowledge, experiences, and prior knowledge during instruction and assessing students through a variety of assessment techniques are essential for CRT. A different element in Siwatu's (2007) framework is 'classroom management'. It is necessary for teachers to integrate students' culture for culturally relevant classroom environment and use a variety of

culturally responsive classroom management strategies such as setting expectations clearly and equitably or creating a safe and secure learning environment. In addition, Siwatu (2007) offers 'cultural competence' as an important element of CRT. Accordingly, culturally responsive teachers equip culturally diverse students with the necessary knowledge and skills to function in the mainstream culture while also helping them preserve their own cultural identity, native language, and ties to their culture.

In Ladson-Billings' (2001) framework of CRT, three elements are included which are academic achievement, cultural competence and critical consciousness. Ladson-Billings (2001) supports the view that students must experience academic success at school. Providing opportunities for students to learn is only one aspect of academic success; a more important aspect is making sure that these opportunities are accessible to all students including culturally diverse students. Predictably, these differences in opportunity result in variations in academic outcomes. Another element suggested by Ladson-Billings (2001) is cultural competence similar to Siwatu's (2007) 'cultural enrichment'. Cultural competency, according to Ladson-Billings, is more than simply being able to collaborate with individuals from other cultures, it also means assisting students to recognize and value their own cultural practices and beliefs while gaining access to mainstream culture. One solution for this may be to create classroom environments where students feel they can be themselves. For this purpose, student response systems or small group work may be utilized. The last element is critical consciousness which means being able to "critique the cultural norms, values, and institutions that produce and maintain social inequities" (Ladson-Billings, 1995). Critical consciousness also means analyzing the biases critically. Critical consciousness starts when educators identify sociopolitical issues of gender, racism, and class in themselves and comprehend the root reasons before addressing these issues in their instruction. Teachers may also assist students to develop critical consciousness that allows them to question the status quo of the existing social order. For this purpose, teachers may bring controversial issues to class to discuss. For instance, a science teacher may give examples of successful women in science because of the widespread prejudice that most science professors are men.

An Approach for the Design of CRT: Culturally Responsive Differentiated Instruction

To meet the diverse needs of students and optimize each student's learning opportunity in the classroom, teachers utilize differentiated instruction (DI), a teaching approach in which they modify the curriculum, instructional methods,

learning activities, and student products (Tomlinson et al., 2003). According to Tomlinson (2000), differentiation would give teachers more freedom to engage students in their classes by assigning various organized tasks that would correspond to each student's level of interest.

DI covers five domains: content, process, product, affect and learning environment (Valiandes, Neophytou & Hajisoteriou, 2018). According to Benjamin (2020), content differentiation involves adapting lesson plans by changing the tasks and assignments to the proper degrees of difficulty. Tomlinson and Imbeau (2010) describe process differentiation as the way in which students comprehend and make sense of the content. In addition, product differentiation means providing students with different alternatives to demonstrate what they have learnt by the end of the lesson (Tomlinson, 2014). Affect which is about the impact that students' emotions and feelings have on their learning. Teachers should be responsive to their students' emotional expressions, recognize the significance of emotions for students' self-concept, motivation, and interpersonal skills and view them as an integrated part of the curriculum rather than something apart from it (Tomlison & Imbeau, 2010). The last domain is learning environment, and it refers to both physical and emotional climate in the classroom. Teachers can arrange the desks in accordance with the needs of the students. The features of the classroom environment are thought to have a significant impact on learning outcomes since learning takes place in a setting where students interact with teachers, other students, and learning resources.

During the differentiation process students' readiness, interests and learning profiles are taken into account (Oliver, 2016; Tomlinson, 2014). 'Readiness' refers to students' prior knowledge regarding the content. 'Interest' shows the topics and activities that spark a student's curiosity or motivate them. 'Learning profile' describes a student's preferred mode of acquiring new knowledge or abilities, such as visual or hands-on as well as the environmental elements, such as working under bright light or in small groups. Gender and culture might have an impact on a student's learning profile. For instance, students from cultures where collaboration is valued more than competitiveness might perform better in small groups than working individually. Therefore, it is essential for teachers to recognize and determine students' readiness levels, interests and learning profiles so that they can differentiate instruction based on these characteristics.

In CRT practice, matching different instructional methods and techniques with the learning styles of students or establishing connections between related themes about cultural groups and school culture can make the teaching process more effective (Gay, 2018). Therefore, CRT can be incorporated into DI (Porter-

Liddell, 2023; Santamaria, 2009; Valiandes et al., 2018). Through the integration of CRT and DI practices students from diverse cultural backgrounds may examine the values, beliefs, and opinions that influence their experiences while also learning the subject through the most effective teaching method for their learning styles (Santamaria, 2009).

CRP uses differentiation to adapt instruction to every facet of a student's culture because DI acknowledges and expects that every student is unique and that instruction should be tailored to their differences (Klingner et al., 2005). Culturally responsive differentiated instruction (CRDI) not only makes it possible to meet each student's unique learning needs but also it makes teachers more aware of cultural concerns and requires them to adopt a cultural lens when observing their students (Valiandes et al., 2018). It also provides several benefits for students. Porter-Liddell (2023) argues that CRDI helps students feel like they belong in the classroom and with their coursework, which promotes more engagement and better learning outcomes. Hence, it is essential that teachers differentiate instruction based on students' cultural backgrounds to ensure a positive classroom environment and enhance academic achievement. Kılınç (2021) indicated that CRDI enhances empathetic tendency of students, as well. Additionally, it helps students respect and make friendships with peers from different cultural backgrounds. When the instruction is differentiated based on students' cultural backgrounds, readiness, interests and learning profiles, students learn better and enjoy more during the learning process.

Culturally Responsive Classroom Management

Teachers make use of some classroom management practices enhancing appropriate behaviour and alleviate unwanted behaviour of students (Rusby et al., 2011). Effective classroom management calls for the capacity to effectively address students' emotional, social, cultural, and cognitive wants (Brown, 2004). Even though classroom management is essential since instruction and classroom management are closely linked, it is even more important in culturally diverse classrooms. Teachers who are good at traditional classroom management strategies such as monitoring students or establishing control may ignore integrating culturally responsive classroom management (CRCM) (Gaias et al., 2019). However, it is necessary for teachers to modify classroom management strategies based upon students' cultural backgrounds and needs to enhance learning experiences (Martin et al., 2016).

Weinstein, Tomlinson-Clarke and Curran (2004) propose that CRCM is composed of five elements which are:

a) understanding the social and economic circumstances of teaching and learning,

b) learning about the cultures and histories of learners,

c) recognizing and confronting one's own ethnocentrism,

d) being willing and able to use CRCM strategies, and

e) establishing a caring atmosphere in the classroom.

CRCM addresses a wide range of pedagogical elements, from the general to the specialized, such as selecting culturally relevant curriculum and employing consistent communication techniques (Brown, 2004). In addition, in order to lead CRCM teachers must set and uphold expectations fairly, interact with students in a way that is consistent with their culture, take into account the cultural and familial backgrounds of their students, and foster relationships that are intimate, compassionate, and personal to foster engagement and participation (Bal, 2018; Brown, 2004; Weinstein, Curran & Tomlinson-Clarke, 2003; Weinstein et al., 2004). Besides to these strategies, Tartwijk et al. (2009) suggest that teachers should establish clear classroom rules and adapt instructional strategies to meet the needs of each student.

Brown (2004) suggests that students' behavior in the classroom may be a reflection of cultural norms and may differ from the behavioral norms in traditional classrooms. CRCM also makes it clear that classroom management is influenced by teachers' assessments of appropriate behavior, which are based on cultural presumptions. As a result, educators could incorrectly interpret behaviors that are dictated by culture as resistance (Bondy et al., 2007). Thus, more support to in-service teachers is required to enhance CRCM skills (Pas et al., 2016).

Assessment Practices in Culturally Responsive Teaching

In culturally diverse classrooms assessment ought to be "culturally responsive" to guarantee fairness and equity for students with culturally diverse backgrounds (Brown et al., 2019). Culturally responsive assessment (CRA) refers to evaluation procedures, methods, and customization for specific students and classrooms as well as evaluation results that take into account cultural differences in engagement, thinking, and learning (Nortvedt et al., 2020). The methods and procedures used in assessment can either strengthen students' feeling of belonging or contribute to their perception that it is not possible for them to belong because of the feeling of undervalue attached to their experiences and knowledge (Montenegro & Jankowski, 2017).

Herzog-Punzenberger et al. (2020) state that CRA is student-centered and focuses on how students can contribute to the assessment process by drawing on their prior knowledge and experiences so that it may be possible for them to reduce the distance that exists between instruction and assessment situations. For assessment to be culturally responsive it should measure learning outcomes designed to acknowledge the legitimacy of different ethnic groups' cultural legacies as subjects that belong in the formal curriculum and as influences on students' attitudes, dispositions, and learning styles (Gay, 2018).

Teachers can encourage culturally diverse students to participate in assessment settings in a number of ways, such as by using a range of assessment and response methods and upholding cultural norms of communication and student authority (Nortvedt et al., 2020). Aceves & Orosco (2014) state that teachers should choose formal (i.e., standardized) and informal assessments that take the language and cultural identities of their students into account. CRA should enable students to show what they have learned in a variety of ways, be open and transparent about the learning that is occurring, assist students to reflect on their learning experiences, and involve them in assessment process (Montenegro & Jankowski, 2017). In the literature various assessment methods that provide students more chances to show what they have learned have been put forth, mainly consisting of a) creativity assessment, b) performance-based assessment, c) peer assessment, and d) self-assessment (Brown et al., 2019; Nayır et al., 2019). In addition, Slee (2010) suggests that CRA should be authentic so that students get the chance to participate in pertinent and meaningful real-world assessment tasks, particularly in the professional setting related to the subject or discipline.

Furthermore, portfolios and projects which produce more legitimate, relevant, comprehensive and formative assessments with results that represent better what all students are capable of and have the potential to improve teaching and learning in more focused ways may be used for CRA (Montenegro & Jankowski, 2017; Nortvedt et al., 2020). Portfolios offer students flexibility to show their learning and offer a more comprehensive picture of what students are capable of. Like portfolios, projects also offer freedom for students to showcase a broad range of abilities and knowledge that are frequently drawn from earlier assignments, experiences, and learning throughout the course.

Nayır et al. (2019) points out the need for CRA frameworks and tools for policymakers and teachers to evaluate culturally diverse students. Hence they suggest the use of culturally responsive rubrics. When developed in a culturally sensitive manner and shared with students in advance rubrics can be a useful tool

for precisely evaluating each student's learning while accommodating differences in the ways that the learning is presented.

The Education of Culturally Diverse Students in Türkiye and The Need For Culturally Responsive Teaching

Türkiye is a country where people from different cultures live together. According to the research conducted by KONDA in 2006, 2007 and 2011 it was determined that Turkish, Kurdish, Zazaki, Arabic, Balkan languages, Laz, Circassian, Armenian and Greek are spoken and there are people from 36 different ethnic origins and different religions in Türkiye (Nayir, 2019). In addition, migration results in Türkiye to have a growing number of multicultural students who are Syrian, Ukrainian, and Palestinian. According to a recent report published by the Directorate of Migration Management (DMM) there are approximately 4,708,555 foreign people in Türkiye, with 1,317,122 of them being children between the ages of 5 and 17 (MoNE, 2024). It is also indicated that 1,0006,821 of these children are enrolled in different school levels, accounting for 76,44% schooling (MoNE, 2024). With 806.480 students enrolled in public schools across Türkiye, Syrians make up the majority of the students; the remaining 109.903 students are Iraqi, Afghan, Palestinian, Somali, and Yemeni (MoNE, 2024). Tomlinson et al. (2003) predicts that there will be a rise in the number of students from immigrant families by 2035. This situation increases the significance of culturally responsive education and teaching processes in Türkiye.

Eranıl & Kasalak (2024) state that various initiatives have been tried in Türkiye for the education of Syrians since the time they arrived in Türkiye in 2011, such as educating Syrians in Temporary Education Centers, creating various projects to help Syrian children to integrate into the Turkish education system and educating Syrians in state schools. However, various problems have been reported regarding the education of Syrians. Pehlivan Yılmaz and Günel (2022) pointed out the problems experienced in culturally diverse classrooms as language problems, prejudice against refugee students and refugee students' inefficiency regarding academic capabilities. Most importantly teachers were not ready for the education of culturally diverse students (Soylu et al., 2020; Pehlivan Yılmaz &Günel, 2022). Teachers thought that they lacked necessary knowledge and skills to provide a proper education to culturally diverse students. Soylu et al. (2020) state that teachers lack information about the cultural background of students and do not have necessary resources to address these issues from a pedagogical standpoint. Özüdoğru (2022) indicated that teachers tried to address the psychological and physiological needs of culturally diverse students instead

of their educational needs. It was also found that teachers did not employ a variety of CRT practices such as integrating content from different cultures or holding high expectations for culturally diverse students. As a result, culturally diverse students were reported as invisible in class by the teachers.

Receiving education is the right of all children, and culturally diverse students are entitled to learn together in the same class with Turkish peers in Türkiye. The challenges experienced in culturally diverse classrooms affect culturally diverse students' access to quality education and academic success negatively (Eranıl &Kasalak, 2024). Hence, it can be stated that there is a huge barrier to culturally diverse students' learning. As a remedy, CRT may be used by teachers to ensure the rights of culturally diverse students and alleviate the problems met. It is reported that CRT improves academic achievement (Kotluk & Kocakaya, 2019) as well as the interaction between refugee students and other students, increases participation in the lessons, and breaks prejudice against refugee students (Pehlivan Yılmaz & Günel, 2022).

Considering the benefits of using CRT it is essential to equip teachers with CRT skills. Türkiye updated its teacher education curriculum in 2018 and included a new elective course called 'Inclusive Education' (CoHE, 2018). However, being an elective course this course is not offered to each pre-service teacher. Thus, Türkiye lacks a proper teacher education curriculum to educate culturally diverse students. Thus, there is a need for CRT in teacher education curriculum.

Conclusion and Recommendations

Considering the growing number of refugees in Türkiye, it is crucial that teachers embrace CRT techniques since they offer numerous advantages to students from varied cultural backgrounds. Despite the efforts made by the Ministry of National Education to ensure equal opportunity in education such as distributing free coursebooks to all students, supporting students from multicultural homes in the education process may be insufficient. Therefore, there is an urgent need to strengthen teacher competencies in dealing with diversity-related issues that arise in classrooms. However, as mentioned before teachers do not feel competent enough to teach these students. Thus, professional development activities that include both theorical information and practical opportunities should be offered to teachers to provide them with the necessary knowledge and skills to apply CRT effectively. In addition, pre-service teachers should be trained about CRT in various courses. The content of these courses should include CRT, CRDI, CRCM and CRA. In these courses pre-service

teachers need to offered practical opportunities. ‘Inclusive Education” course can also be provided to pre-service teachers as a must course.

Furthermore, it may be suggested that Turkish education system should prioritize CRT methods and practices and maintain continuity through educational curriculum to make this process practical and sustainable (Pehlivan Yılmaz & Günel, 2022). If CRT practices are reflected in the Turkish curriculum, then it may be more possible to raise the awareness of teachers and stimulate them to implement CRT. In this process policy makers have an important responsibility for managing educational policies effectively.

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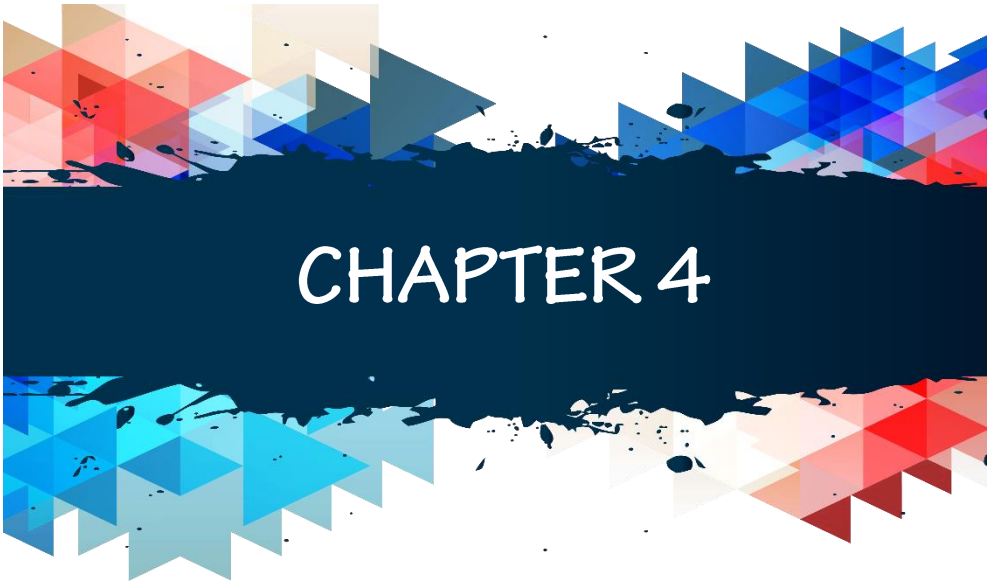

Learners' Self-Efficacy and Achievement in Emi Subjects

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Introduction

EMI has been commonly researched with regard to its advantages, perceived difficulties, and strategies to attend to difficulties mostly among undergraduate learners. This study is significant because it investigates the variable (EMI) among high school learners, and it examines the relationship between perceived learner self-efficacy and their EMI achievement which, to the knowledge of the researcher, has not been studied in the literature despite a body of research suggesting issues incited by low English proficiency of learners in EMI courses. When it comes to the domain of self-efficacy, its effect on achievement has already been reported in EFL and ESL contexts. However, it has not been studied how unorthodox learning environments such as EMI could interact with self-efficacy,

Literature Review

The following sections deal with the two key components of the present study, EMI and self-efficacy. The first section sheds light on the definition of EMI and its conception in bilingualism, and the second part places an emphasis on the field of self-efficacy and overview of related studies.

English-medium instruction

English-medium instruction is defined as, "the use of the English language to teach academic subjects in countries or jurisdictions where the first language (L1) of the majority of the population is not English." (Dearden, 2015, p. 4). As implied in the definition, EMI is conceptually separated from Content and Language Integrated Learning (CLIL) in that CLIL aims to develop both language and content, whereas EMI does not assume such a dual objective but the development of academic subjects only (Dearden, 2015; Soruç and Griffiths, 2018). However, as reported by Coleman, Hultgren, Tsui and Shaw (2018), although content instructors believe that they do not aim to teach language (Airey, 2011) and EMI does not assume language instruction (Macaro, Curle, Pun, An and Dearden, 2018), incidental language learning could take happen anyway (Coleman, et al., 2018).

According to the report sponsored by British Council and prepared by Julie Dearden, EMI has overwhelmingly high presence in universities as compared to secondary and primary schools. Over the past decades, it has gained growing popularity, and has been widely studied across Europe such as Austria, Italy and Poland (Dearden and Macaro, 2016), Spain (Aguilar, 2015), Middle East such as Turkey (İnan, Yüksel, and Gürkan, 2012; Soruç and Griffiths, 2018), UAE

(Belhiah and Elhami, 2015), Asia such as Korea (Byun, Chu, Kim, Park, Kim and Jung, 2011) and China (Lei and Hu, 2014) As suggested by these and many other studies, the mostly adopted reason for EMI instruction is the desire for globalization (Coleman, et al.,2018).

The history of English-medium instruction (EMI) dates back to 1950s in Turkey. EMI first started to be implemented by Middle East Technical University (METU) in 1956, and by Boğaziçi University in 1971. It started to be adopted by foundation universities when Bilkent University decided to change the language of instruction to English including all departments in 1984. The number of universities adopting EMI has been increasing particularly since 2000, and according to Coşkun (2013) 23 state universities out of 53 has offered EMI programs in their faculties (Macaro, Akincioglu and Dearden, 2016). The trend started to spread at high schools in 1994 with Koç School's authorization of International Baccalaureate Diploma Program- a program assuming EMI in Math and science subjects. Since then, a growing number of national high schools (overwhelmingly private high schools) has taken on EMI in Turkey. In such schools EMI starts in the period following preparatory English year during which participants undergo an intensive English program to attain the level needed for EMI in upcoming years. However, it is very common that learners finish the year with different degrees and beliefs of self-efficacy. Based on this, it is thus important to find out whether high school learners' EMI achievement is correlated with the degree of self-efficacy.

English-medium instruction and Diploma program

According to 6 January 2019 statistics as granted by ibo.org, IB Diploma Program is implemented by 3424 high schools in 150 countries. DP requires learners to undertake national sciences, and math in English, and presumes that whoever doing this program does not have linguistic issues regarding comprehension, research and production in English, which is pertinent to the principles of EMI. That being said DP also offers courses that are taken in the mother tongue in Turkey such as Language A, and Turkey in 20th century. Given DP's policies and principles of EMI both take for granted the dual language abilities, in other words bilingual competence is deemed fundamental for a student considering undertaking this program.

To have a better insight into the outcomes of a subject in the DP, Figure 1 is the quoted from DP Physics subject aims, which projects adopted approach of DP subjects:

Through the overarching theme of the nature of science, the aims of the DP physics course are to enable students to:

1. appreciate scientific study and creativity within a global context through stimulating and challenging opportunities

2. acquire a body of knowledge, methods and techniques that characterize science and technology

3. apply and use a body of knowledge, methods and techniques that characterize science and technology 4. develop an ability to analyse, evaluate and synthesize scientific information

5. develop a critical awareness of the need for, and the value of, effective

collaboration and communication during scientific activities

6. develop experimental and investigative scientific skills including the use of current technologies

7. develop and apply 21st century communication skills in the study of science

8. become critically aware, as global citizens, of the ethical implications of using science and technology

9. develop an appreciation of the possibilities and limitations of science and technology

10. develop an understanding of the relationships between scientific disciplines and their influence on other areas of knowledge.

Figure 1: IB Diploma Program Physics Aims (ibo.org)

As reflected in Figure 1, not a single statement implies development of English language skills, conversely it entirely zeroes in on science-oriented outcomes. Therefore, the program is a pure bilingual program in which academic, social, thinking, communication skills are targeted with little emphasis on linguistic abilities. The following part attends to the other research variable, self-efficacy with an emphasis on its definition, breadth and scope of research in language field.

Self-efficacy

Self-efficacy is defined as one's judgment of their capability to complete a task (Bandura, 1977). According to Pajares (1996), self-efficacy affects people in three ways. Firstly, it influences behavior, and the aspiration to engage in the related task. Secondly, it facilitates judging the required effort and time people need to spend on the task. Finally, it influences people's opinions and feelings. When it comes to the repercussions of self-efficacy in the classroom, it is widely observed that students are generally inclined to opt for the tasks that they think they can undertake and abstain from those they suppose they can barely cope with. To illustrate, a student with high self-efficacy believes to put higher effort that learners will need to spend to achieve the task. Yet, a student with low self-efficacy think that the given tasks are more difficult than they practically are (Pajares, 1996, Stevens, Olivarez, Lan and Tallent-Runnels, 2004). The scholarly results of studies demonstrated that in the case that ability levels of students with high self-efficacy and low self-efficacy are, students with high self-efficacy tend to learn and achieve more than those with low ones. Similarly, Zimmerman (2000) argues that self-efficacy not only affects motivation, but also the persistence and commitment invested in learning. Bandura (1997) contends that learners' beliefs can better predict learner performance than learners' real ability, which is of high importance for teachers in that a student with higher self-efficacy and low capabilities can perform better that those with low self-efficacy and high abilities. Therefore, self-efficacy poses, as a motivational variable in learning and it seems impossible to research learning, motivation and academic achievement without regard for self-efficacy beliefs of individuals (Pajares and Urdan, 2006, as cited in Roofi, Tan and Chan, 2012).

As self-efficacy is claimed to have influence on people's thoughts, feelings and behavior; to put it differently, the views that individuals hold about their capabilities impact their behavior, it is not surprising that research shows that the effect of self-efficacy on academic and learning achievement, and motivation of learners (Pajares, 1996; Schunk, 1995). Many studies (Pintrich and De Groot, 1990; Zajacova, Lynch and Espenshade, 2005) yielded the results showing the significance of self-efficacy for achievement. However, there is not, to the knowledge of the researcher, any research delving into correlation between self-efficacy and achievement in bilingual programs such as immersion programs, Content-based instruction (CBI) and CLIL. Therefore, self-efficacy will be tackled within the boundary of SLA.

Self-efficacy and Achievement

Regarding the relationship between self-efficacy and learning achievement, a substantial amount of research displayed that self-efficacy plays a significant role

in helping to account for students' learning and the performance that is pertinent to achievement (Schunk, 1989, as cited in Kitikanan and Sasimonton, 2017). Moreover, it is also pointed out in the previous studies that self-efficacy is predictor of students' academic achievement (Pajares and Graham, 1999; Shih and Alexander, 2000, as cited in Kim, Wang, Ahn and Bong, 2015). For instance, Pintrich and De Groot (1990) found a positive correlation between self-efficacy and academic achievement among 173 middle school students. The self-efficacy was measured through nine items with seven-point scale. The findings of the study revealed that students with high self-efficacy were better at reporting their use of cognitive strategies and persisting at difficult tasks. Morever, Zajacova et al., (2005) also examined the effect of self-efficacy on learner achievement. They found that effect of self-efficacy on learners overall achievement (GPA) was positively significant.

A number of studies were conducted to research-efficacy in language learning (Huang, Lloyd and Mikulecky, 1999; Cheng, 2002; Kim et al., 2015; Kitikanan and Sasimonton, 2017). Specifically, the relationship between specific achievements and self-efficacy was explored in many studies (Rahimi and Abedini, 2009; Li and Wang, 2010; Wang and Kim, 2011; Woodrow, 2011). To exemplify, Mills, Pajares, and Herron (2007) aimed to explore the relationship between self-efficacy and achievement rates of 303 intermediate French learners at a college. They used a survey to collect data, and they concluded that self-efficacy predicted language learning success of tertiary level students of intermediate French.

Another study was that of Rahimi and Abedini (2009). They investigated the role of self-efficacy on listening comprehension among 61 undergraduate Iranian learners of English. The self-efficacy questionnaire on listening comprehension was handed to the participants, and then they took a listening test. The findings gained from Pearson correlation and T-test indicated that self-efficacy in listening was significantly and positively in correlation with the listening test results.

Similarly, Li and Wang (2010) investigated the relationship between reading self-efficacy and the reading strategies by adapting the reading self-efficacy section of Questionnaire of English Self-efficacy (QESE)- developed by Wang (2004)- to test the relationship between the reading self-efficacy and the use of reading strategies of 182 sophomore Chinese learners of English. Their findings revealed that there was a significantly positive correlation between the reading self-efficacy and reading strategies. In other words, students whose self-efficacy was higher reported more use of reading strategies than those with low reading self-efficacy.

There are also studies which sought a correlation between self-efficacy and writing skills. For instance, Woodrow (2011) researched the relationship between self-efficacy and writing anxiety, and English writing performance of 738 university-level Chinese learners of English. She found that although writing anxiety was not in relation to the learners' writing performance, their reported self-efficacy was predictive of their writing performance. To elaborate, the participants with high self-efficacy reported that they studies longer hours of English and deemed themselves as conscientious learners thus suggesting the positive impact of self-efficacy on writing production.

Nevertheless, there are also studies (e.g. Shenghui C Huang and Chang, 1996) which found no relation between self-efficacy and the achievement. For instance, Shenghui C Huang and Chang (1996) researched the English self-efficacy and academic achievement. The sample consisted of one Korean, one Taiwanese and two Japanese students who studied in intensive English program of Indiana University. They collected data through interviewing, observation, documentation of writing assignments, a list of writing questions and the reading and writing self-efficacy questionnaire. The findings revealed that even though some of the participants with high self-efficacy made high achievement in writing and reading, one subject with high self-efficacy performed poorly in writing as compared to the other three participants, and she was the one with lowest TOEFL score.

Turkish context

There are many studies conducted to investigate self-efficacy in Turkey. These studies investigated different correlations with regard to self-efficacy. The following section displays the overview of Turkey-based studies in a chronological order.

Çubukçu (2008) examined 100 junior level university students' foreign language anxiety and self-efficacy by means of a survey, and the study resulted in negative correlation between them. Yilmaz (2010) explored 160 Turkish EFL majors' self-efficacy and learning strategies in Çanakkale Onsekiz Mart University. He found that learners with high self-efficacy beliefs indicated more use of various learning strategies. The associated learning strategies are: memory, compensation, cognitive, metacognitive, social and affective strategies. Erkan and Saban (2011) examined the relationship between writing anxiety, writing performance, and writing self-efficacy among 188 undergraduate EFL students in a Turkish university. Data were collected from questionnaires and composition on a given topic. The results of the study revealed that writing anxiety and writing

performance of the learners are negatively correlated, writing anxiety and writing self-efficacy again are not positively correlated, but writing anxiety and attitude towards writing are found to be positively correlated. Tilfarlıoğlu and Çiftçi (2011) inquired if there was a correlation between self-efficacy and learner autonomy among 250 preparatory-level university students through questionnaire. The result of the study showed a significant relationship between self-efficacy and learner autonomy, and self-efficacy and academic success. Balaman-Uçar (2016) explored Turkish university EFL students' reported level of self-efficacy, their preferred language learning strategies, and the relation of these concepts in Turkish context. The findings showed that Turkish students were highly self- efficacious about their learning of English, as measured by a self-efficacy scale with 88 items.

As shown, studies investigating the relationship between self-efficacy and achievement at specific language skills such as reading, listening, writing abound, yet there is little focus on the high school level in Turkey, and to the knowledge of the researcher, there is no study that looks into the relationship between self-efficacy and EMI achievement at high school level. Therefore, this study will delve into this gap by investigating the relationship between learners' self-efficacy and academic achievement in EMI-based school subjects, and scrutinize whether students' bilingual competence is a predictor of success or is aligned with their rating of self-efficacy.

METHODOLOGY

The Instrument

A Likert-type learner self-efficacy scale was prepared based on the suggestions of Dörnyei (2010). The scale was used to collect data. A seven-point rating scale was inspired from *A Questionnaire of English Self-efficacy (QESE)* suggested by Kim, Wang, and Bong (2015). There are 21 items and each item of the scale was prepared out of the reflection papers of a pilot group of 52 first year and 26 second-year EMI students who gave extended responses to the open-ended questions with regard to their self-efficacy and perceptions in EMI lessons. For the reflection paper they were asked to comment on their perceptions, feelings, self-efficacy, difficulties during EMI classes. The other source of items were the subject aims addressed in DP's subject guides. The next paragraph tackles the categorization of items and along with their sources.

As said, DP subject guides and pilot groups' reflection papers were taken into consideration to determine the scale items. The required qualities and outcomes

rely heavily on the DP's learner profile and subject aims. Overall, the scale is centered on the following skills and phenomena:

- **Comprehension (Items 1-7):** Understanding of the subject content regardless of the medium of instruction, as underscored in the DP's subject guides.
- **Production (Items 8-12):** Performing, experimenting, researching and other productive outcomes are expected from the learners as stated in DP's subject guides.
- **Language improvement (Items 13-21):** Despite not being a focal aspect in the DP, learners expressed their content of incidental language development and/or their revelation of lack of sufficient proficiency in the reflection papers.
- To check the reliability of the scale, all the respondents' (N=153) entries were

entered into the SPSS and Cronbach's alpha was found α=.95, which makes this scale highly reliable. It was also found that in the case of removing whichever item from the scale α becomes .92 minimum.

Research Question

The current research is based on a correlational design, which integrated a questionnaire, and aimed to find out any potential correlation between learner self-efficacy and their EMI achievement. In line with this goal, the following research questions can formulated for this research:

1. Is there a significant difference in self-efficacy among different grades of high school students?

2. Is there a relationship between high school bilinguals' self-efficacy and their EMI achievement?

Setting and Participants

Although EMI has been increasingly adopted on high school level for the purpose of raising bilingual generations, it is limited to private schools most of which offer DP (N=49) in Turkey, according to the official figures in the IB's website. Almost half of these schools (N=24) are based in İstanbul, and the rest of them is located in Ankara, İzmir, Bursa, Kocaeli, Erzurum and the other cities. However, there are also schools that embrace EMI but do not officially carry out DP. In the beginning of the study, it was aimed to reach a great number of

students for which purpose ten high schools offering EMI subjects were able to be contacted and sent the consent letter (Appendix B), yet only three of them accepted the request to conduct the study in their schools. The low ratio of acceptance is generally experienced among researchers in Turkey. The reason lies in the fact that schools are not transparent to share the facts and mostly abstain from being compared with others even though their identity is kept confidential.

The prepared questionnaire was administered at three high schools where not all of the students undertake EMI subjects but at least as much as 50% and where EMI is delivered for the minimum 50% of the school's curriculum. In other words, students are exposed to EMI subjects to the extent of 50% including the subjects; math, biology, chemistry, physics, literature; and Turkish or other language-medium subjects to the extent of 50% including Turkish language, second foreign language, history, geography, PE, IT, religion studies and electives. Therefore, it cannot be contended that schools deliver fully EMI curriculum but partly. All three schools mandate preparatory year for the sake of building up and consolidating English proficiency since English is not aimed to be delivered as an end but as a means to understand and perform effectively at EMI subjects at the upper grades.

When it comes to the respondents, they consist of three groups (Table 1): First year (N= 48), second year (N=74) and third (final) year (N=31) DP students. The reason third year is called final year is because it is the final year for EMI. In the fourth year, students prepare for national exams (LYS-YGS) in their national curriculum. Most of these students purposefully selected DP program despite local curriculum was also at their disposal. Yet, some students had to undertake DP program since their school (one school) does not offer an alternative curriculum. In sum, almost all of the respondents are assumed to have preferred to study DP deliberately.

Table 1

Participant Statistics

Year	*Frequency*	*Percent*
Grade 9 (First year)	48	31.4
Grade 10 (Second year)	74	48.4
Grade 11 (Final year)	31	20.3
Total	153	100

Data Collection Procedure

The study lasted for six weeks, and the summary of data collection procedure is given in Figure 2.

Week 1 Reflection paper

Week 2 Reflection paper, Content analysis

Week 3 Preparation of the scale

Week 4 Contact with schools, Search for sample

Week 5 Administration of the scale

Week 6 Processing data

Figure 2: Summary of data collection procedure

In the first week, a group of EMI students commented on their EMI experience by writing a reflection paper in order that relevant scale items could be prepared. In the second week the reflection paper was written by more students, and then the researcher did content analysis through which more than a hundred recurring phenomena were found, and the items related to self-efficacy were identified and used for the scale if needed. In the third week, preparation of the scale was finalized. In the fourth week, the researcher started seeking sample to administer this due to which consent letter was prepared and shared with the management

team. In total ten schools were contacted but only three of them accepted the implementation of the study. After getting appointment from the schools, the researcher became present at schools and administered the survey to different groups in the fifth week. In the last week data were first entered into SPSS 22 and processed to reach research objectives.

FINDINGS

It would be wise to start findings with the result of the respondents' self-efficacy degrees. Table 2 summarizes self-efficacy degrees of respondents on grade level and as a total sample.

Table 2

Self-efficacy Degrees

Grade	Low (%)	Medium (%)	High (%)
9	0	20.8	79.2
10	1.4	12.1	86.5
11	6.5	25.8	67.7
Total	2	17.6	80.4

As indicated in Table 2, the most striking figure is that overall self-efficacy of all the respondents is high. Moreover, learners' self-efficacy increases from 9th to 10th grade, and suddenly decreases from 10th to 11th grade.

As stated in the methodology section, the scale items were prepared based on a pilot group's reflective papers and the DP's subject aims. In line with this, there are three main categories in the scale that reflect EMI's bilingual approach. The following table (Table 3) shows highly rated categories.

Table 3

Category Ratings

Category	Low (%)	Medium (%)	High (%)
Comprehension	0.7	5.2	94.1
Production	2	21.5	76.5
Improvement	2.6	17.7	79.7

As seen, overall all the categories are highly rated but the most highly rated category is comprehension (items 1-7). Apart from these descriptive statistics, the following section deals with correlational statistics with regard to aforementioned research questions of the study.

The first research question enquired whether there would be a significant difference among different levels of EMI learners. In the present study, since there are different numbers of participants at each grade, ANOVA for nonparametric research was used and entries of participants were loaded into SPSS 22 under their own grades (i.e. grade 9, grade 10, grade 11). Table 4 shows the significance value between grades.

Table 4

Overall Significance Value

	Sum of Squares	*df*	*Mean Square*	*F*	*Sig.*
Between groups	2525	2	1262	3.176	.045
Within groups	59646	150	397		
Total	62172	152			

As shown, self-efficacy varies significantly between grades (p=.045). Therefore, we need to check Tukey (Table 5) to analyze difference comparing each grade with one another.

Table 5

Multiple Comparison

	(I)grade	*(J)grade*	*Mean Difference(I-J)*	*Std.Err.*	*Sig.*	*95% Confidence Interval*	
						Lower	*Upper*
Tukey HSD	Grade 9	Grade 10	-3.7	3.6	.56	-12.5	4.9
		Grade 11	6.9	4.5	.28	-3.9	17
	Grade 10	Grade 9	3.7	3.6	.56	-4.9	12
		Grade 11	10	4.2	.034	.62	20
	Grade 11	Grade 9	-6.9	4.5	.28	-17	3.9
		Grade 10	-10	4.2	.034	-20	-.62

Table 5 indicates that although it was found that there was an overall significant difference (p=.045) within groups, there is not a significant difference between grade 9 and grade 10 (p=.56), grade 9 and grade 11 (p=.28). However, there is still a significant difference between grade 10 and grade 11 (p=.034).

To further analyze the correlation between the grades and to see whether self-efficacy increases in alignment with the grades, a correlation test was needed. Due to nonparametric data, Pearson was not exploited. Instead, Spearman rank correlation test was utilized. Table 6 demonstrates the aimed correlation.

Table 6

Correlations

			Grade	Total item
Spearman's rho	Grade	Correlation Coefficient	1	-.05
		Sig. (2-tailed)		.54
		N		153
	Total item	Correlation Coefficient	-.5	1
		Sig. (2-tailed)	.54	
		N	153	153

As revealed through Spearman's rho in Table 6, we cannot claim that self-efficacy increases as the grade grows or vice versa since the significance value is above p=.05. In sum, as indicated in these analyses we can claim that there is a significant difference between grades but self-efficacy does not necessarily increase from 9th grade through 11th grade.

The second objective of the study was to analyze the correlation between learners' reported self-efficacy and their EMI achievement. To this end, it was needed to reach each learner's EMI achievement which were not accomplished due to confidentiality reasons. Yet, participating schools accepted to give overall achievement of each grade on EMI subjects. Table 7 displays the summary of self-efficacy scores of learners (Max=147) and their EMI achievement (Max=100%)

Table 7

Summary of Self-efficacy Scores and Achievement

Grade	Achievement	Self-efficacy
9	81.4	118.8
10	78.5	122.6
11	84.7	111.9

As said in the former paragraphs, learners' individual achievement score could not be reached, however, their achievement score is already sufficient to allow us to comment on their success. It is seen that 9th graders' average of achievement in math, biology, physics, chemistry, and literature is 81.4% which is high; likewise their self-efficacy score is 118 out of 147 which is again high. The same applies to 10th graders whose average of EMI subjects is 78.5% and their self-efficacy point is 122 which are obviously high. Lastly, final year students' overall achievement on EMI subjects is higher than the previous years' 84.7 although they have slightly lower but still high self-efficacy scores.

Discussion

RQ1: Is there a significant difference in self-efficacy among different grades of high school students?

To begin with, although the rate of self-efficacy increases from 9th grade to 10th grade, it decreases from 10th grade to 11th grade. This might be because of the upcoming DP exams for the final year group, which could increase their anxiety and perceived self-efficacy at the same time. When it comes to the overall difference of level of self-efficacy, it was found to be significant ($p=0.045$), which suggests that the difference is significant among different grades, which might be a result of diversity of learners with different English proficiency (despite not being a concern of EMI) or with different degree of familiarity with the content area. In this research question, it was also targeted to find out whether rating of self-efficacy grew in parallel with the grades, and the result showed that it did not grow. The reason behind this might lie in the fact that English language proficiency is not an aimed component whether it be first year or last year. If it were primary goal of EMI subjects, learners' self-efficacy could increase from 9th

to 11th grade because during two years learners are exposed to more input and produce more English, which could normally increase their self-efficacy. Nevertheless, a great number of students expressed that they develop their English language skills by learning new words, improving macro skills, yet this can be explained by incidental learning that does not assume explicit language instruction which is quite common in EMI settings (Coleman, et al., 2018).

In sum, this research question indicated that EMI self-efficacy has little relevance to morphosyntactical language development but full relevance to academic content uptake.

RQ2: Is there a relationship between high school bilinguals' self-efficacy and their EMI achievement?

The results showed that there is a relation between self-efficacy and EMI achievement among all the grades. In other words, all three grades rating of self-efficacy is high as well as their EMI achievement scores, which accords with Zajacova et al., 2005; Tilfarlıoğlu and Çiftçi, 2011; Kim et al., 2015; Balaman-Uçar, 2016; Kitikanan and Sasimonton, 2017). As has already been researched widely in SLA setting, self-efficacy has been found to predict learner achievement not only in common SLA settings but also in novel bilingual settings such as EMI in this case.

Conclusion

The study investigated the relationship between perceived learner self-efficacy and their EMI achievement, and sought among three different level whether self-efficacy increases as the year. The results showed that EMI and similar bilingual programs (e.g. CBI) aim to convey content knowledge without aiming to teach foreign language. In addition to this, it does not matter which grade the students study, their self-efficacy is about the content area (e.g. Biology, Math). This study could be further conducted thanks to the prepared scale with larger groups of people and at different bilingual programs such as CBI, CLIL, immersion and so forth.

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APPENDICES

A. Learner Self-efficacy Scale in English-medium Instruction

Dear participant,

Thank you for taking part in this questionnaire. The purpose of this questionnaire is to measure your self-perceived capabilities about classes with English-medium instruction. There are thus no right or wrong answers. Please do not write your name on the questionnaire. Data will only be used for this study.

Thank you.

—

Değerli katılımcı,

Bu ankete katıldığınız için teşekkür ederim. Bu anketin amacı İngilizce ile öğretim yapılan derslerdeki (Örn, Matematik, Kimya, Fizik) öz yetkinliğinizi ölçmektir. Dolayısıyla doğru ya da yanlış bir cevap yoktır. Lütfen adınızı yazmayınız. Veriler yalnızca bu çalışma için kullanılacaktır ve hiç bir şekilde okul ya da öğrenci ismi belirtilmeyecektir.

Teşekkürler.

Açıklama:

(1) Bunu kesinlikle yapamıyorum

(7) Bunu çok iyi yapıyorum.

1	2	3	4	5	6	7
I am totally unable to do this	**I am unable to do this**	**I am possibly unable to do this**	**I am possibly able to do this**	**I am basically and in principle able to do this**	**I am able to do this**	**I am able to do this well**

1. I can understand school subjects delivered in English	1	2	3	4	5	6	7
2. I can understand listening materials	1	2	3	4	5	6	7
3. I can understand reading materials	1	2	3	4	5	6	7
4. I can ask questions in the classroom	1	2	3	4	5	6	7
5. I can understand teachers' response	1	2	3	4	5	6	7
6. I can understand teacher's lecture	1	2	3	4	5	6	7
7. I can understand course books	1	2	3	4	5	6	7
8. I can express my ideas	1	2	3	4	5	6	7
9. I can do homework assignments	1	2	3	4	5	6	7
10. I can do research	1	2	3	4	5	6	7
11. I can give presentations	1	2	3	4	5	6	7
12. I can write reports (e.g. reflection, lab)	1	2	3	4	5	6	7
13. I can improve my English	1	2	3	4	5	6	7
14. I can improve my listening skills	1	2	3	4	5	6	7
15. I can improve my writing skills	1	2	3	4	5	6	7
16. I can improve my reading skills	1	2	3	4	5	6	7

17. I can improve my speaking skills	1	2	3	4	5	6	7
18. I can learn more vocabulary	1	2	3	4	5	6	7
19. I can learn terminological vocabulary	1	2	3	4	5	6	7
20. I can improve my grammar skills	1	2	3	4	5	6	7
21. I can improve my research skills	1	2	3	4	5	6	7

B. Consent Letter

Dear Sir/Madam:

Warmest Greetings!

I would like to ask for your permission to allow me to conduct a survey among 9th, 10th, and 11th grade students in your school. This is a requirement for a research study, named *Self-efficacy in English-medium instruction*. I am conducting this survey in high schools where English is the medium of instruction in major school subjects such as math, biology, physics, chemistry.

The survey lasts 5-10 minutes and could be arranged at a time convenient to the school's schedule. Participation is entirely voluntary and there are no known or anticipated risks to participation in this study. All information provided will be kept confidential and will be used only for academic purposes. The respondents will not put their name on the survey and the name of the school will not be mentioned anywhere including this study.

If you agree, kindly sign below your acknowledgement of consent for me to conduct this survey at your school.

Your approval is highly appreciated. Thank you in advance for your interest and assistance with this study.

Sincerely,

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MA in English Language Teaching

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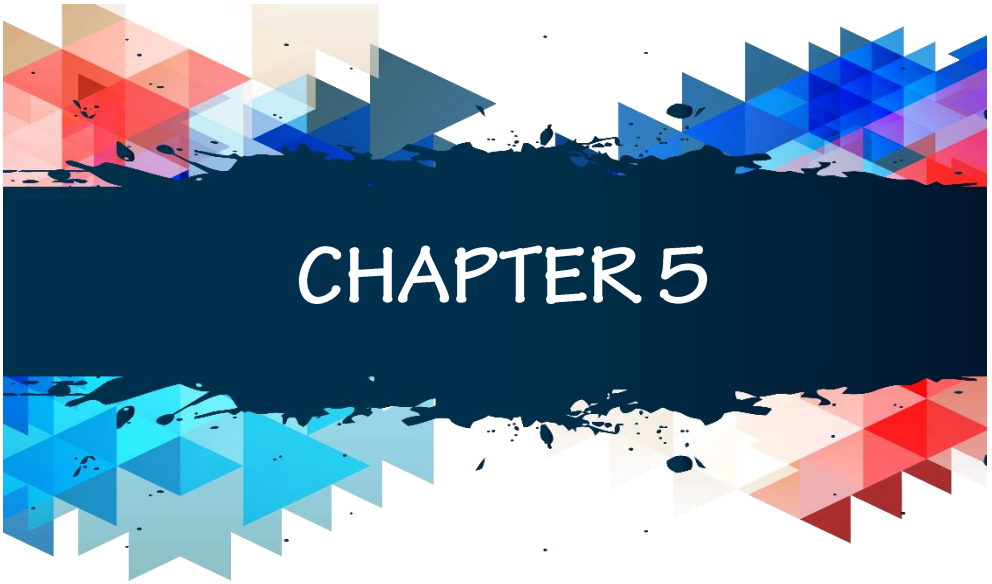
BA in English Language and Literature

Approved by:

_____ _____
_____

Printed name and title Signature Date



The Impact of Chunking on Vocabulary Knowledge and Its Perception As A Technique

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Introduction and Research Purpose

It is incontrovertible that vocabulary knowledge bears a significant role in second language acquisition (hereinafter SLA) on account of serving as the rudiment for an effective communicative competence (Schmitt, 2000). Despite its pivotal position in SLA, it has not received concerted focus for the sake of enhancing vocabulary teaching by transcending conventional strategies such as translation, dictionary, definitions, visuals and so forth (Atay and Kurt, 2006). In SLA settings today, teachers strive to get their learners to memorize vocabulary, improve their communication skills in an attempt to prepare them for the real world. Since vocabulary is the lynchpin of receptive and productive skills, one cannot understand grammatical structures of the target language nor can they comprehend texts and exchange ideas in the same language. A bigger struggle is ascribed to the ways students process newly encountered language due to the propensity to forgetting a large portion of the learnt vocabulary (McColley, 2014). The researcher, as an English language teacher, has witnessed that learners are overwhelmed by the amount of words they are supposed to learn to master the effective comprehension and communication. In spite of a variety of techniques such as giving definitions, translations, using visuals and dictionaries and the others, most learners are prone to forgetting the bulk of the vocabulary. It is thus imperative to unearth techniques that will assist vocabulary acquisition. To this end in the current study the researcher experimented *chunking* technique to see whether learners perform better in vocabulary acquisition when the words are introduced in chunks rather than as discrete items.

Literature Review

Chunking was coined by Miller (1956) who defined it as the process of sorting bits of stimuli into larger units or chunks. While introducing the term he intended to account for the reason short-term memory (a.k.a working memory) retains roughly seven digits of information by attesting that the capacity of working memory is not contingent upon the size of information, but the amount of 'chunks' in a message. By arranging bits into larger units one is capable of multiplying the volume of information their memory can attend to. Following Miller's coinage chunking received scholarly attention as evidenced by several researchers' mention of and contribution to the term. Namely, Firth (1968) devised the term *collocation* as the frequent co-occurrence of words. Fodor and McLaughlin (1990) stated that a chunk is a unit shaped by welding pieces of information. Considering it as psychological mechanism Ellis (2001) conceptualized chunking as recursive encoding of great amounts of stimuli in working memory explaining by the principle of associative learning which he later called *the law of contiguity*.

According to the rule, items frequently occurring together are liable to be connected in imagination, thus once one of the items is imagined the accompanying items are likely to be imagined at the same time, which in the end evolves into chunks. Chunking, a usual operation of human brain (Baddeley and Hitch, 1974, as cited in Driscoll, 2013), is regarded as a memory-boosting technique that entails learners memorizing words in units rather than as discrete items. In other words, the technique assumes constant tracking of the chunks in the language whether it be written or audiovisual as a result of which one can process more items at a time (Miller, 1956).

In the light of the second language acquisition (hereinafter SLA), chunking carries a significant role, for language is not, in contrast to its traditional conception, made up of grammar and individual words but units, patterns or chunks. Therefore, language is not accumulated as individual items in the mind, which explains the fluency of native speakers who do not have difficulty retrieving words and the incompetence of foreign language learners who store words as single items (Lewis, 1997). Anderson (1982) underscored the strong liaison between the frequency of practice and performance which he named *the power law of practice*. Newell (1990, as cited in Ellis, 1996) pointed out that three assumptions of chunking as a learning technique give rise to the law of practice: (a) the more practice the more chunks (b) the more chunks developed on a task the better performance (c) higher order chunks occur less often. The law of practice was accommodated to SLA by Kirsner (1994) who accentuated that lexical noticing processes in listening and reading and lexical production processes in speaking and writing are regulated by the relationship between the extent of latency of responses and the amount of trials of practice. The innate inclination to chunking and the capacity of storing items in working memory lead us into considering chunking as a technique for an explicit implementation, which mandates instructors to make learners aware of chunks by adapting lesson materials (Bustamante, 2019).

In congruence with the shift in the perspective to chunking from as a pre-wired feature of human consciousness to a learning mechanism, chunking as a vocabulary acquisition technique has been endorsed by the scholars. To exemplify, Ellis (2001) highlighted that there are high chances that associated words will be useful in the learning of new words. Xu and Padilla (2013) asserted a solid correlation between chunks and vocabulary retention, thus suggesting chunking or association in order to remember difficult words and optimize retrieval and retention.

Chunking has received concerted research efforts since its debut, which resulted in abundant studies in the field. Namely, Zageer (2013) investigated the impact of chunking on the long-term memory among 60 university students through an instrument consisting of two lists of 24 words. While the first list comprises complete words and the other is composed of abbreviated words. The study yielded that tertiary level learners retrieved more from the list of abbreviated words than the list with complete words as evidenced by a higher mean value (M=18.2). Lah, Saat and Hassan (2014) explored chunking strategies in upper secondary chemistry classes, and they found that students used various chunking strategies such as similar chunking, mixed chunking and natural chunking while learning periodic table. Studies seeking relation between English macro skills and chunks also abound. To exemplify, Haiyan (2014) looked into the psychological aspects of chunks among 30 freshmen Chinese EFL learners through the evidence from speaking as aided via a computer program (i.e. Cool Edit 2.0). The data analysis revealed that fluent participants retrieved and stored chunks as a single item, and never or seldom paused within chunks, whereas non-fluent participants generated opposing results. In the same vein, Pereyra (2015) sought a correlation between extensive reading and acquisition of lexical chunks with the participation of 7 adult intermediate EFL learners in a 16-week project, and the result showed a positive correlation between the hours spent on extensive reading and the acquisition of lexical chunks. Similarly, Xu (2016) scrutinized relationship between reading and listening performance, and working memory of 112 non-major Chinese university students on a pre-and post-test experimental design. The results indicated that the students' performance in skimming, reading in detail and listening was influenced by the depth and variety of chunks. Fairly recently, Rindiani (2018) explored the vocabulary retention of 229 seventh grade students in Indonesia based on a quasi-experimental research design. The pretest mean score (M=57) of vocabulary retention showed a significant increment after the treatment (i.e. chunking technique) as measured by the post-test mean value (M=72.8).

A review of the literature revealed that although chunking has so far been investigated from a variety of perspective, the impact of chunking on learners' vocabulary performance is rather underexplored and not explored with the participation of high school students. This study will thus address the lack by examining chunking as a potential vocabulary acquisition technique as an alternative to traditional learning strategies.

Methodology

As the current research is based on an experimental research design, the experimental group underwent treatment (i.e. chunking technique) before reading an authentic text about the impact of the Internet on our memories, while the control group learned the words through translation and definition. The present paper thus explored the impact of chunking on learners' vocabulary knowledge. In line with this objective, the following research question was addressed:

1. Is there a difference in the vocabulary knowledge of high school students who received vocabulary instruction through chunking and those having received traditional vocabulary teaching?

Setting and Participants

The study was conducted at four intact pre-International Baccalaureate (hereinafter IB) Diploma Program classes at an IB-authorized private high school in Istanbul. Since the school has been accredited by the IB Organization, it has a rigid admission policy that includes an aptitude test measuring knowledge of academic subjects, psychodrama probation and an interview. The participating classes are pre-IB (9th grade) IB students who had had a-year-long intensive English at the onset of high school and are undertaking pre-IB curriculum in which science, literature and math are delivered in English as well as English as a second language course. Given the year-long mandatory exposure to English, students' level of English is at least B1 (intermediate) which has influenced the choice of the text and chunks as a data collection instrument. As concerned, the participants (N=80) were selected based on convenient sampling, after which they were randomly grouped as control and experimental group.

Data Collection Instrument

A vocabulary scale gauging both vocabulary knowledge and production was sought for this research study. The Vocabulary Knowledge Scale (hereinafter VKS) (Appendix A) having 5-point self-report Likert design developed by Wesche and Paribakht (1996) will be exploited as a pretest and posttest in its original version. The levels will as follows:

1: I don't remember having seen this word before.

2: I have seen this word before but I don't know what it means.

3: I have seen this word before and I think it means _____ (synonym or translation).

4: I know this word. It means _____ (synonym or translation).

5: I can use this word in a sentence. e.g.: _____ (if you do this section,

please also do section 4).

Figure 1. VKS levels

As displayed in Figure 1, level I denotes participants having no knowledge of the given word, while level II signifies recognition of the word despite having no idea about its meaning. Level III and IV demonstrate both recognition and translation or its synonyms, whereas level V, the highest level, stands for semantic, syntactical and morphological awareness as well as production of the word. Figure 2 exhibits the scoring criteria:

Score Category

1 The word is not familiar at all.

2 The word is familiar, but its meaning is not known.

3 A synonym or translation of the target word is correct.

4 The target word is used with semantic appropriateness in a sentence.

5 The use of the target word is both grammatically and semantically correct in a

sentence.

Figure 2. VKS scoring criteria

In concern with the scoring of the scale, as showcased in Figure 2, score 2 will be assigned to levels III, IV and V for erroneous responses. For accurate synonyms or meaning (levels III and IV) score 3 will be given. If target words are used in a plausible context but with incorrect grammar, score 4 will be assigned. Score 5 will only be granted in the case of semantically and grammatically accurate responses.

Data Collection Procedure and Data Analysis

The research were completed in five weeks. In the first week, the VKS was handed out to both groups as a pretest. In the second week the teacher researcher covered the target text *Google Effect: Is technology making us stupid?* on the

pages 146-148 in the textbook *English B for the IB Diploma English B Coursebook* (Philpot, 2018) along with the pre-reading and follow-up comprehension and production activities at the regular pace. While covering the texts, the practitioner explained the predetermined words in the scale using chunking in the experimental classes (Figure 3), whereas through translation, dictionary and definition as discrete items in the control classes.

1. a raft of answers**2.** unsettling feeling **3.** suffer from amnesia**4.** It is unlikely to**5.** place emphasis on **6.** through the lens of**7.** bear this in mind **8.** don't know by heart **9.** rely on the internet for memory **10.** detrimental effect

Figure 3. Chunks

In the third week, the same scale was re-administered at each group, and in the fourth week the researcher analyzed the gathered data and deliver reflective essay papers (Appendix B) to the experimental group. In the final week pattern coding was pursued over the reflection papers. During the data analysis, the researcher primarily took the total scores of pretest and entered them in SPSS version 22 and then those of the posttest for each group. After screening the data set, participants were specified as control and experimental group in the program, which was followed by operating the descriptive analysis of the scores (e.g. extracting separate mean scores of each test). Following descriptive analysis, assumption tests, namely normality of data distribution was checked through Kolmogorov-Smirnov Test, and then outliers were controlled. Upon ensuring the normality and the lack of outliers (if not ensured, non-parametric tests will be activated) paired samples t-test was run to compare pretest and posttest of each group and see if there is a significant difference. Then, homogeneity test (Levene's test) was performed to control the homogeneity of variances; upon ensuring the homogeneity of both groups independent sample t-test was performed to compare the posttest means of both groups and see if there is a significant difference.

Findings

The results from this study reflect the comparative performance of the experimental group, which received vocabulary instruction through chunking, and the control group, which used traditional translation and definition methods. The data analysis involved several statistical tests to assess the impact of chunking on vocabulary acquisition.

1. Descriptive Statistics

Table 1: Descriptive Statistics for Pretest and Posttest Scores

Group	Test	Mean Score	Standard Deviation
Experimental	Pretest	46.3	4.8
Experimental	Posttest	75.1	5.4
Control	Pretest	45.9	5.0
Control	Posttest	62.7	6.0

Both groups showed improvement from pretest to posttest. However, the increase was significantly greater in the experimental group, indicating that chunking had a more pronounced positive effect on vocabulary acquisition.

2. Normality Test (Kolmogorov-Smirnov Test)

Group	Test	p-value
Experimental Group	Pretest	$p = 0.22$
Experimental Group	Posttest	$p = 0.25$
Control Group	Pretest	$p = 0.19$
Control Group	Posttest	$p = 0.23$

The p-values for all tests are above 0.05, confirming that the data for both groups is normally distributed. No significant outliers were identified in the datasets.

3. Paired Samples t-test

Group	t-value	p-value
Experimental	11.45	< 0.001
Control	7.68	< 0.001

Both groups demonstrated a significant improvement in vocabulary knowledge post-intervention. However, the higher t-value for the experimental group suggests that chunking had a greater effect on vocabulary retention and usage.

4. Homogeneity of Variances (Levene's Test)

	f-value	p-value
Levene's Test Results	1.14	0.31

Since the p-value is greater than 0.05, the assumption of homogeneity of variances holds true, indicating that the variances of the two groups are equal.

5. Independent Samples t-test

To compare the posttest scores of the experimental and control groups:

	t-value	p-value
Independent Sample t-test	6.21	< 0.001

The independent t-test results indicate a statistically significant difference between the posttest scores of the experimental and control groups, with the experimental group showing superior performance.

The analysis indicates that chunking as a vocabulary learning technique significantly outperformed traditional methods. The experimental group's posttest mean was substantially higher than that of the control group, supported by statistical tests showing significant improvement (paired samples t-test) and significant differences between the two groups (independent t-test).

Discussion

Chunking, despite attracting concerted research efforts since its conception, has not been explored enough with regard to its potential function as a vocabulary acquisition technique, as is indicated in the literature review. The current study thus endeavored to unravel the inherent nature of vocabulary processing by overtly experimenting chunking as a learning strategy. In the researcher's opinion at the end of the study much more scholarly emphasis was placed on the way human brain processes words, thus raising consciousness about chunking among stakeholders. Moreover, in the researcher's opinion chunking will receive the deserved focus both by the interested researchers and language practitioners regardless of the findings of this study which should be extended through more longitudinal investigation and more varied learner groups.

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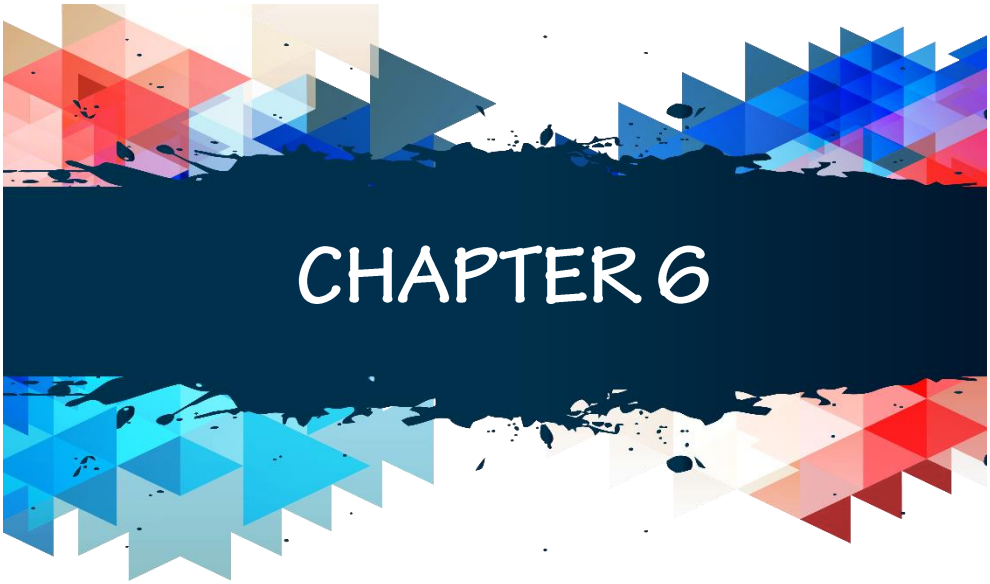

Enhancing Foreign Language Acquisition Through Tthe Integration Of Self-Referenced Rubric-Based Self-Assessment in Writing Instruction

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Introduction

Proficient writing skills are a cornerstone of academic success and lifelong achievement. For middle school students, developing strong writing abilities is crucial as it forms the foundation for future academic accomplishments and professional endeavors (Yavuz-Erkan & Iflazoglu-Saban, 2011). This challenge becomes even greater when students are tasked with mastering writing in a second language (L2), which involves navigating additional complexities (Yavuz-Erkan & Iflazoglu-Saban, 2011).

In today's globalized context, the ability to convey ideas and knowledge coherently through writing has transcended academic necessity to become a vital communication and self-expression tool (Erman-Aslanoglu, 2022). Writing serves as both a fundamental skill and a key measure of academic success, enabling individuals to connect across linguistic and geographic barriers (Safa, 2018). As students advance in their academic journeys, teachers play a pivotal role in nurturing their progress through well-designed writing tasks and evaluations. These evaluations not only assess growth but also help develop the writing skills necessary for future success (Tante, 2018). Effective assessment methods are integral to the teaching and learning process, providing opportunities for constructive and actionable feedback that guides students' improvement and accommodates diverse learning styles (Tosuncuoglu, 2018). However, conventional, less interactive assessment methods often fall short in supporting students' development. Traditional feedback, such as brief or vague comments on assignments, may leave students confused and unable to effectively improve their skills (Özdemir, 2016). To empower students to learn from their mistakes, teachers need to provide clear assessment guidelines and actionable feedback that encourages reflection and growth (Widiastuti, 2021).

However, traditional assessment methods, often limited to brief and sometimes cryptic comments on students' papers, may not be as effective in aiding students' progress. These conventional approaches can leave students puzzled, and responsible for deciphering feedback and embarking on the journey of self-improvement (Özdemir, 2016). To empower students to learn from their mistakes and actively work on enhancing their writing skills, teachers must provide clear guidelines before assessment and offer constructive feedback (Widiastuti, 2021).

To address these challenges, educators increasingly turn to rubrics as reliable tools for structured and transparent assessment. Rubrics not only standardize evaluation but also provide clarity, helping students understand expectations and

improving consistency in feedback (Bui & Vuong, 2022). Their effectiveness extends across diverse educational settings, making them an indispensable tool in evaluating learners' writing skills (Andrade, 2005; Brookhart, 2013; Stevens & Levi, 2013). Middle school represents a critical stage for developing writing skills, where effective assessment methods can have a profound impact. Rubric-based self-assessment (RBSA) emerges as a promising strategy for enhancing writing skills and fostering learner autonomy. This chapter aims to contribute to the existing knowledge by investigating the potential of RBSA in improving middle school students' writing abilities.

Rubrics in Education

Andrade (2000) describes a rubric as a document that outlines the expectations for an assignment by listing criteria and describing levels of quality ranging from excellent to poor. Essentially, a rubric acts as a set of structured guidelines that ensures equitable and objective evaluation of students' work. Without rubrics, grading can become arbitrary and inconsistent. While rubrics are commonly used for grading, Andrade, Du, and Wang (2008) emphasize their utility in teaching specific skills to students.

Rubrics are often defined as "descriptive scoring schemes developed by teachers or evaluators to guide the analysis of the products or processes of students' efforts" (Moskal, 2000, p. 22). Similarly, Mertler (2001, p. 189) describes rubrics as "scoring guides consisting of specific pre-established performance criteria used in evaluating student work on performance assessment." These definitions underline rubrics' dual purpose as both evaluative and instructional tools. Andrade (2000) identifies two key components of rubrics: a set of criteria and quality levels. Meanwhile, Popham (1997) expands this definition to include three primary elements: standards, quality indicators, and grading methods. Together, these elements ensure consistency and transparency in the evaluation process. The essential elements consist of:

- ***Criterion***: A list of all the criteria that students are expected to meet in an assignment. Meeting these criteria is indicative of reaching educational objectives.
- ***Descriptors:*** Expressions that define each level of performance.
- ***Degree***: The upper and lower points of qualifications that teachers use to mark students' assignments.
- ***Standard***: Represents descriptive data outlining how the criteria should be followed to the degree of a successful performance.

Rubrics offer a range of benefits in education. Li (2018) highlights that rubrics clarify teacher expectations, identify strengths and weaknesses, and enhance self-evaluation skills in students. While their primary use is to evaluate assignments, rubrics are also valuable for improving academic performance by providing objective, detailed feedback that fosters self-assessment.

Rubrics can be categorized into two types: Analytic Rubrics and Holistic Rubrics. An analytic rubric involves the teacher scoring separate, individual parts of the product or performance first and then summing the individual scores to obtain a total score (Mertler, 2001). This type of rubric is often employed when a focused response is required. Analytic rubrics are valuable for detailed assessment of students' assignments, allowing teachers to identify specific strengths and weaknesses (Yamanishi et al., 2019). Unlike holistic rubrics, analytic rubrics provide clear and specific definitions for each criterion. The analytical scoring scale, being criterion-referenced, is well-suited for evaluating different aspects of writing skills (Bacha, 2021). On the other hand, a holistic rubric requires the teacher to score the overall process or product as a whole, without judging the parts separately (Mertler, 2001). It is employed when some errors can be tolerated in the process, as long as the overall quality is high. Holistic rubrics are deemed more appropriate when students are asked to formulate a response without a definite right answer (Nitko, 2001). Holistic scoring, as Wiseman (2011) notes, is a global approach to the text, recognizing that writing is a single entity best captured by a single scale, assessed by experienced readers using their skilled impressions. One distinctive aspect of holistic rubrics is that the rater does not make corrections to the paper; instead, they are expected to read and rate the paper in two minutes or less (Minick, 2010).

Rubrics, as meticulously crafted systematic tools, play a fundamental role in delineating specific criteria and performance expectations crucial for the comprehensive assessment of tasks, assignments, or projects (Li & Zhang, 2020; Panadero & Alonso-Tapia, 2013). The significance of rubrics is underscored by their structured nature, providing educators and students with a clear and transparent framework that facilitates objective evaluation (Andrade, 2005; Moskal, 2000). This multifaceted nature positions rubrics not only as evaluative instruments but as essential guidelines shaping objective assessment practices in education.

At the core of rubrics is the establishment of explicit and predefined standards against which the quality of student work is measured. These standards encompass a spectrum of factors, ranging from content comprehension to presentation skills, creating a holistic framework that guides the evaluation

process (Brookhart, 2013). The structured format of rubrics not only assists educators in articulating expectations clearly but also empowers students with a roadmap for success in meeting these expectations.

Defined by their structured nature, rubrics play a pivotal role in facilitating objective evaluation, as each criterion is explicitly outlined, leaving minimal room for ambiguity (Ozdemir, 2016; Panadero & Romero, 2014). This transparency is essential in ensuring fairness and consistency in the assessment process. Educators can employ rubrics as a tool for precise and standardized evaluation, thereby reducing subjectivity in grading and offering constructive feedback to students.

The multifaceted nature of rubrics positions them as indispensable guidelines for objective assessment in education. By breaking down complex tasks into specific criteria, rubrics offer a nuanced approach to evaluation that transcends a simplistic binary assessment of right or wrong. This approach allows for a more comprehensive understanding of students' strengths and areas for improvement (Stevens & Levi, 2013). Drawing on the work of Andrade (2005), her emphasis on the importance of rubrics in enhancing the quality of assessment practices aligns with the broader scholarly discourse on the subject. Furthermore, Moskal's (2000) research highlights the role of rubrics in promoting transparency and clarity in evaluation. Brookhart's extensive contributions, particularly in the realm of formative assessment, emphasize the significance of structured evaluation frameworks in fostering effective learning environments (Brookhart, 2013).

Self-Assessment in Education

Self-assessment, in the educational context, is a reflective and evaluative process in which students actively engage to evaluate their own work, skills, or understanding. Rooted in the principles of metacognition, it encourages learners to think about their thinking, promoting a deeper understanding of their strengths, weaknesses, and learning processes (Boud, 1995). This introspective activity goes beyond the traditional teacher-centric assessment model, placing the responsibility on students to actively participate in the evaluation of their academic progress.

Central to self-assessment is the concept of metacognition, the awareness and understanding of one's own thought processes. When students engage in self-assessment, they not only reflect on the outcomes of their work but also gain insights into how they approach learning tasks. This metacognitive awareness cultivates a sense of autonomy, empowering students to take charge of their

learning journey (Zimmerman, 2000). By fostering a deeper understanding of their learning styles and strategies, students can adapt and refine their approaches to enhance overall academic performance.

The role of self-assessment extends beyond traditional assessment methods, such as exams or quizzes. While these traditional methods provide valuable insights, self-assessment adds a qualitative dimension to the evaluation process. It encourages students to consider not only the correctness of their answers but also the process of arriving at those answers. This holistic approach aligns with contemporary educational paradigms that emphasize not just what students know but how they know it (Nicol & Macfarlane-Dick, 2006).

Self-assessment equips students with the tools to actively monitor and regulate their own learning progress. By setting criteria for success and critically evaluating their work against these benchmarks, students become proactive learners. This process goes hand-in-hand with goal-setting, as students can adjust their learning strategies based on their self-assessment outcomes. The ability to regulate one's learning is a crucial skill that extends beyond the classroom and into lifelong learning (Zimmerman, 2000).

Rubric-Referenced Self-Assessment (RRSA)

Rubric-referenced self-assessment is a pedagogical approach where students engage in self-evaluation using predefined criteria outlined in rubrics. In essence, it merges the structured guidance of rubrics with the reflective process of self-assessment, empowering students to critically evaluate their work based on explicit criteria. This practice not only promotes metacognition but also positions students as active participants in the assessment process, fostering a deeper understanding of their own learning (Panadero & Alonso-Tapia, 2013).

Key Components of RRSA:

1. Structured Guidance of Rubrics: RRSA leverages the inherent structure of rubrics, which systematically delineate specific criteria and performance expectations. These predefined standards serve as a roadmap, offering clear benchmarks against which students can measure the quality of their work. The rubric, in this context, acts as a scaffold, providing students with a well-defined framework for assessment (Phuket & Othman, 2015).
2. Reflective Self-Assessment: The reflective self-assessment aspect encourages students to delve into a metacognitive process (Heidarian, 2016). Beyond merely evaluating the correctness of their work,

students engage in thoughtful reflection on how they approached the task, the strategies employed, and the overall quality of their output (Bui & Vuong, 2022). This reflective component adds a qualitative dimension to the evaluation process.

3. Empowering Students: RRSA positions students as active participants in the assessment process. By involving them in the evaluation using established criteria, this approach goes beyond traditional assessment methods (Minick, 2010). It empowers students to understand not only what is expected but also why certain standards are set. This active engagement cultivates a sense of ownership over their learning journey (Li, 2018).

Pedagogical Benefits of RRSA:

1. Promoting Metacognition: The reflective nature of RRSA promotes metacognition, enabling students to think about and understand their own thinking processes. This heightened awareness enhances their ability to regulate their learning, contributing to improved academic performance and a deeper understanding of the subject matter (Panadero & Alonso-Tapia, 2013).
2. Active Participation in Assessment: RRSA transforms students from passive recipients of assessment feedback to active contributors in the evaluation process. This active participation fosters a sense of responsibility and accountability, essential attributes for lifelong learners (Klenowski, 2009).
3. Deeper Understanding of Learning: By engaging in the dual processes of structured assessment guided by rubrics and reflective self-assessment, students gain a more profound understanding of their learning strengths, weaknesses, and progress. This holistic comprehension contributes to ongoing skill development and academic growth (Turgut & Kayaoglu, 2015).

Validity and Reliability of Rubrics

Validity refers to the extent to which an assessment accurately measures what it is intended to measure (National Council on Measurement in Education, 1999). For a rubric to be valid, tit must align with the purpose of the assessment; thus, teachers should explicitly state the assessment's purpose and clearly define how learners are expected to demonstrate proficiency (Moskal & Leydens, 2000). To ensure rubric validity, teachers should carefully align the rubric categories with

the curriculum they have taught, ensuring relevance, fairness, and alignment with the assessment's purpose (Broad, 2003). Before use, rubrics must undergo a reliability test, ensuring consistent ratings when use by different researchers (Andrade, 2005). Andrade (2005) suggests that rubrics improve when compared to published standards, shared with other teachers, or scored by colleagues on student work.

Rubric validity relies on three types of evidence:

1. Content-Related Evidence: Ensures rubric categories align with the curriculum and instructional objectives.

2. Structure-Related Evidence: Assesses whether the rubric is suitable for evaluating complex processes like reasoning or problem-solving.

3. Criterion-Related Evidence: Demonstrates the correlation between rubric scores and other relevant outcomes or assessments (Wu et al., 2014).

Reliability, on the other hand, refers to the consistency of scoring across different evaluators or over time. For rubrics to be reliable, they must produce consistent results regardless of who conducts the evaluation (Andrade, 2005). Reliability is often tested by comparing rubric scores across different teachers or raters, ensuring fairness and consistency in assessment.

To enhance both validity and reliability:

- Rubrics should undergo peer reviews to ensure alignment with educational standards.
- Teachers should pilot rubrics and refine them based on feedback and performance.
- Clear training on rubric use can minimize subjectivity and improve inter-rater reliability.

The Importance of Writing as a Skill in Foreign Language Teaching

Writing is an essential skill that students develop from their earliest academic years, progressively advancing in complexity as they grow. It is crucial for success in school and for expressing thoughts and ideas (Erman Aslanoglu, 2022). Writing involves several steps, such as organizing thoughts, forming ideas, designing, and editing. These skills are considered higher-order thinking abilities that stimulate metacognition (Earl & Katz, 2006). Writing plays a vital role in academic success as it reinforces vocabulary, and grammatical structure, and enhances reading, listening, and speaking skills. Competence, a broader term,

includes knowledge, skills, and attributes (Ratminingsih et al., 2018). Knowledge encompasses facts, procedures, and theories, while skills involve doing something well through practice and training. Attributes are inherent characteristics expressed through thoughts, actions, and feelings. Writing competence, therefore, reflects a learner's knowledge, thoughts, and feelings acquired through writing.

Instructors have recognized the significance of writing in language learning (Heidarian, 2016). Writing contributes to language development and fosters creativity (Fahed Al-Serhani, 2007). Learning to write in a foreign language is challenging, and many students struggle with this skill (Phuket & Othman, 2015). To address these difficulties, teachers should provide clear instructions and details on writing activities. The effectiveness of writing instruction and student development depends on the teaching style and assessment standards (Klenowski, 2009; Ene & Kosobucki, 2016). Devoting enough time to writing assessment criteria is crucial for successful outcomes (Ene & Kosobucki, 2016).

Some teachers may find assessment types complicated and time-consuming, leading to a reluctance to perform written assessments (Li, 2018; Weigle, 2007). Some teachers may not see writing assessments as their responsibility (Hamp-Lyons, 2003). As a result, assessments may lack systematic approaches, with teachers grading students based on personal preferences. Zhang (2012) observed that teachers' subjective views influenced assessment results, focusing mainly on grammatical errors and vocabulary while overlooking organization, content, and structure. This limited evaluation method hindered student development, as learners couldn't improve their writing competence.

Integration of RRSA into Writing Lessons

The integration of Rubric-Referenced Self-Assessment (RRSA) into the realm of writing skills development represents a dynamic and innovative approach that intertwines structured assessment with reflective self-evaluation. This section delves into the synergistic relationship between RRSA and the enhancement of writing skills, exploring how this pedagogical strategy contributes to metacognitive development, fosters student agency, and optimizes the learning environment.

Metacognitive Development Through RRSA: At the heart of the integration lies the promotion of metacognitive skills. RRSA encourages students not merely to produce written content but to engage in thoughtful reflection on their writing processes and outcomes. The systematic use of rubrics as evaluative tools provides a structured framework for students to assess their work against

predefined criteria. This reflective process cultivates metacognition by prompting students to consider their writing strategies, identify areas for improvement, and develop a deeper understanding of their own learning (Panadero & Alonso-Tapia, 2013).

Fostering Student Agency: The integration of RRSA empowers students as active participants in their learning journey. By involving them in the assessment process using established criteria, RRSA goes beyond traditional evaluation methods. It positions students as stakeholders in their own academic progress, instilling a sense of responsibility and ownership over their writing skills development. This shift from passive recipients to active contributors enhances student agency and engagement (Andrade, 2005).

Optimizing the Learning Environment: RRSA not only serves as a tool for individual skill assessment but also contributes to the overall optimization of the learning environment. As students engage in self-assessment, they become more adjust to the expectations of quality writing. The structured nature of rubrics fosters a shared understanding between educators and students regarding the criteria for successful writing. This shared understanding contributes to a positive and collaborative learning atmosphere, where both teachers and students work collaboratively towards common goals (Andrade et al., 2008).

Enhanced Feedback Mechanism: Furthermore, the integration of RRSA enhances the feedback mechanism in the writing instruction process. By involving students in the evaluation of their work, educators can provide more targeted and constructive feedback. This personalized feedback, coupled with the structured criteria from rubrics, offers students clear insights into their strengths and areas for improvement, promoting a continuous cycle of refinement and growth in their writing skills (Panadero, 2016).

In all, the integration of RRSA into writing skills development transcends conventional assessment methods by fostering metacognitive development, promoting student agency, optimizing the learning environment, and enhancing the feedback mechanism. This innovative pedagogical strategy aligns with contemporary educational paradigms that prioritize student engagement, self-directed learning, and the cultivation of essential skills for academic and lifelong success. The subsequent sections of this thesis will explore the practical applications and outcomes of this integrated approach in the context of middle school writing instruction.

Studies on the Integration of RRSA into Writing Instruction

Empirical Studies

Andrade et al.'s (2008) seminal work delves into a critical facet of middle education—investigating the impact of rubric-referenced self-assessment (RRSA) on the writing skills of young students. Andrade's study is particularly noteworthy for its emphasis on using predefined rubrics as a scaffold for self-assessment and its potential to enhance writing abilities among middle school students. In her study, Andrade introduces a self-assessment model, serving as a guide for students on how to effectively use rubrics to evaluate their own writing. The inclusion of a modeling component underscores the significance of providing explicit examples to support students in comprehending the intricacies of the self-assessment process.

To elaborate further, it has been noted that Andrade explores the role of criteria generation, involving students in understanding and establishing the criteria for assessing their writing. This participatory approach empowers students to actively contribute to the assessment process, fostering a sense of ownership over their learning. Central to Andrade's investigation is the utilization of predefined rubrics as a reference point for self-assessment. The study delves into how the structured nature of rubrics influences students' ability to objectively evaluate their writing, providing a tangible framework for analysis and improvement.

Andrade's findings suggest that RRSA positively impacts students' ability to critically evaluate their writing. When equipped with rubrics, students can better discern the strengths and weaknesses of their work, leading to improved self-awareness and a deeper understanding of writing expectations. Furthermore, RRSA, guided by rubrics, contributes to the enhancement of writing skills among middle school students. Observable improvements may encompass various aspects of writing, such as organization, clarity, and adherence to specific criteria. The significance of Andrade's research lies in its advocacy for the integration of RRSA in middle education. Positive outcomes observed in the study open avenues for further exploration, stimulating discussions on the importance of providing structured tools, like rubrics, to young learners for fostering independent assessment skills.

Beyond the immediate implications, Andrade's work suggests potential refinements in writing instruction strategies in middle education. As a foundational piece in the realm of RRSA and middle school writing, her study provides a springboard for subsequent research. It encourages educators and

researchers to delve deeper into effective pedagogical practices for nurturing writing skills in young students. In essence, Andrade's work is a cornerstone for future research, urging a deeper understanding of effective pedagogical approaches for fostering independent assessment skills in young learners, and that underscores the essence of the current study.

Panadero and Alonso-Tapia's (2013) contribution significantly advances our understanding of self-regulated learning through a thorough review of Zimmerman's Cyclical Model. This review extends beyond its specific focus on rubric-referenced self-assessment (RRSA) to explore the broader realm of self-regulation, a fundamental aspect of effective learning. Published in 2013, this review offers valuable insights into the cognitive and metacognitive processes that students employ to regulate their learning, with implications for improving writing skills. The authors likely provide a detailed overview of Zimmerman's Cyclical Model, a well-known framework in educational psychology for understanding self-regulated learning. The review is expected to cover the cyclical phases of forethought, performance or volitional control, and self-reflection, emphasizing the interconnectedness of these phases in students' self-regulatory processes.

Additionally, the work delves into the cognitive and metacognitive processes embedded in Zimmerman's model, exploring how students set goals, plan learning strategies, monitor progress, and reflect on their performance. These processes play a crucial role in self-regulated learning and are likely discussed in the review, emphasizing their relevance to the development of writing skills. Despite the primary focus on self-regulated learning, the review may draw connections between Zimmerman's model and the use of rubrics in self-assessment. This linkage could clarify how the structured guidance provided by rubrics aligns with the self-regulation process. The review may also explore how the cognitive and metacognitive processes identified in Zimmerman's model manifest in writing tasks, including activities like brainstorming, drafting, revising, and evaluating writing against specific criteria.

Panadero and Alonso-Tapia's review holds significance by providing a theoretical foundation for understanding self-regulated learning and its potential impact on writing skills. The insights gained may guide educators in developing strategies to foster self-regulation in students, thereby improving writing proficiency. Furthermore, the work sets the stage for future research, encouraging a deeper exploration of how self-regulation aligns with specific writing tasks and instructional approaches. In summary, this review serves as a valuable resource for educators and researchers interested in the broader context of self-regulated

learning and its application to the development of writing skills, offering a theoretical framework that informs instructional practices.

Panadero and Jonsson's review, published in 2013, revisits the application of scoring rubrics for formative assessment, providing a comprehensive examination of their utility in educational practices. This work holds particular relevance to rubric-referenced self-assessment (RRSA) and the formative development of writing skills. The review likely offers nuanced insights into how the integration of rubrics into self-assessment contributes to the formative aspects of writing skill development. The review likely begins by providing an extensive overview of scoring rubrics, examining their historical development, purposes, and widespread use in educational contexts. This foundational section establishes the groundwork for understanding the multifaceted roles that rubrics play in assessment practices.

Panadero and Jonsson's work is expected to delve into the formative assessment perspective, exploring how scoring rubrics can be leveraged as tools for ongoing feedback and improvement. This section may discuss the inherent qualities of rubrics that make them conducive to formative assessment practices. Additionally, the review likely revisits prior research studies that have explored the use of scoring rubrics for formative purposes. This includes an examination of empirical evidence, methodologies, and findings from diverse educational settings. Insights from these studies contribute to a comprehensive understanding of the effectiveness of rubrics in formative assessment.

Given the relevance to RRSA, the review may specifically address how scoring rubrics are integrated into self-assessment practices. This section could explore the dynamics of students using rubrics to assess their own work, emphasizing how this process aligns with the formative nature of assessment, fostering continuous improvement in writing skills. In terms of relevance to formative writing skill development, Panadero and Jonsson's review likely offers insights into how the use of scoring rubrics contributes to formative writing skill development. This could involve discussions on how rubrics provide clear criteria for assessment, guide feedback, and empower students to take an active role in shaping their writing proficiency over time.

Moreover, the review may highlight the role of rubrics in facilitating feedback loops and iterative improvement in writing. By understanding how formative assessment practices, guided by rubrics, influence writing skills development, educators gain valuable perspectives on refining instructional strategies. Panadero and Jonsson's review likely holds significance in informing educators

about the effective use of scoring rubrics in formative assessment. It may offer practical insights into designing rubrics that align with formative writing instruction goals, promoting continuous student growth. Furthermore, the review may suggest avenues for future research, identifying areas where additional investigation is needed. This could include exploring the intersection of scoring rubrics, self-assessment, and formative writing skill development in diverse educational contexts.

Black and Wiliam (1998) conducted a seminal investigation into the intersection of formative assessment and the development of writing skills, offering profound insights into the efficacy of formative assessment strategies and their impact in educational settings. Their work, published in 1998, intricately focuses on formative assessment as a dynamic process that surpasses conventional summative evaluation. The authors underscore the paramount importance of continuous, classroom-based assessment practices in augmenting student learning outcomes. Within their study, Black and Wiliam emphasize the critical role of feedback in the formative assessment process, highlighting the necessity for timely, specific, and actionable feedback to effectively guide students throughout their learning journey.

Moreover, the research delves into a comprehensive exploration of various formative assessment techniques, meticulously examining their contributions to the development of writing skills. The valuable insights derived from Black and Wiliam's research establish a robust foundation for comprehending the broader landscape of formative assessment and its profound implications for writing instruction. This body of work serves as a cornerstone, offering indispensable guidance for educators and researchers seeking to integrate effective formative assessment practices into their pedagogical approaches seamlessly. Aligned with the contemporary discourse on fostering writing skills development in diverse educational settings, the study remains a pivotal resource in advancing the understanding and application of formative assessment in writing instruction.

Conducting a thorough exploration into the convergence of formative assessment and writing skills, Sadler's (1989) study presents a pivotal examination of the role played by assessment in the learning process. Published in 1989, Sadler's research stands as a seminal contribution to the field, highlighting the paramount importance of formative assessment practices. The study delves into the integration of formative assessment within the writing curriculum, showcasing its efficacy as a potent tool for fostering student engagement and improvement.

Sadler's work advocates for a departure from traditional summative evaluations, advocating for the embracement of assessment as an ongoing, interactive process crucial for supporting learning. Through a meticulous analysis of classroom dynamics and student-teacher interactions, the research illuminates the nuanced ways in which formative assessment significantly contributes to the development of writing skills. The study delves into the practical implications of formative assessment, providing valuable insights for educators seeking effective strategies to nurture writing proficiency in students.

The findings from Sadler's research serve as a foundational framework, offering a comprehensive understanding of the dynamic relationship between formative assessment and the cultivation of writing skills. This research provides educators with a roadmap for navigating the evolving landscape of writing instruction, positioning Sadler's study as an indispensable resource in the ongoing pursuit of effective formative assessment practices in writing education

In the realm of formative assessment strategies and their influence on writing skills, Crooks (1988) presents a pioneering study that meticulously examines the role of assessment in shaping the learning process. Published in 1988, Crooks' research stands as a cornerstone in the field, highlighting the transformative potential inherent in ongoing assessment practices. The study delves into the intricacies of formative assessment, portraying it as a dynamic and continuous feedback loop that effectively guides students toward improvement.

Crooks underscores the interactive nature of formative assessment, contending that it transcends mere evaluation to become an integral part of the learning journey. By scrutinizing the practical applications of formative assessment within the context of writing skills development, the study illuminates the nuanced ways in which timely and constructive feedback fosters improvement. Crooks' work not only provides valuable insights into effective pedagogical practices but also stimulates a reconsideration of the role assessment plays in nurturing writing proficiency. Educators and researchers can leverage the seminal findings of Crooks' research to inform their approaches to formative assessment in writing instruction. This study emphasizes the continual growth and refinement of student writing abilities, serving as a guide for those dedicated to enhancing the role of formative assessment in fostering proficient writing skills.

Studies on Benefits of Using Instructional Rubrics in Writing Classrooms

Developing proficiency in English writing poses some challenges for many students, particularly for those who are learning it as a foreign language (FL)

(Alish et al., 2019; Phuket & Othman, 2015). The gradual development of writing skills requires EFL students to engage in regular writing practice, coupled with constructive feedback to comprehend mistakes and weaknesses (Bui & Vuong, 2022). In recent years, the role of teachers in writing classes has evolved from mere evaluators to facilitators who actively communicate with students to enhance their work and comprehension. Rubrics play a pivotal role in facilitating this transition, providing students with guidelines on mechanical and content expectations before undertaking writing assignments (Andrade, 2000).

Schirmer and Bailey (2000) noted that learners grapple with writing challenges rooted in their struggles with English itself. Writing, especially in a FL, presents a complex task, demanding additional effort from learners to become proficient. Fluent spoken language skills don't automatically translate to proficiency in written language (Schirmer and Bailey, 2000, p. 52). To address this, Schirmer and Bailey (2000) identified the use of writing assessment rubrics as an effective strategy to enhance learners' writing skills. The study found improvements in various aspects of writing, such as organizational structures, clarity of topics and content, and the development of stories with clear descriptions. However, some traits, such as maintaining consistent text structure, using grammatically correct sentence structures, and demonstrating understanding of the audience, did not exhibit improvement.

Previous literature on rubric use in writing classes highlights four major benefits: enhanced assessment objectivity, time savings, use of rubrics as instructional tools, and facilitation of peer and self-assessment (Andrade, 2000; Moskal, 2000; Jonsson & Svingby, 2007). Firstly, Andrade (2000) emphasized that using rubrics during grading minimizes subjectivity, leading to more objective evaluations. Similarly, Jonsson and Svingby (2007) noted that rubrics not only enhance assessment objectivity but also improve scoring reliability across assignments and raters. Therefore, using rubrics during marking enables teachers to be more objective and fairer (Spandel, 2006).

The second benefit is time savings. Employing rubrics streamlines the grading process, allowing teachers to provide detailed feedback and impacting classroom preparation (Bui & Vuong, 2022; Chowdhury, 2018). Rubrics not only reflect teachers' knowledge of the assignment but also communicate expectations to learners. Goodrich (1997) suggested that rubrics enable quicker assignment grading, with teachers circling necessary comments on the rubric instead of writing them on paper.

The third benefit is the use of rubrics as instructional tools. This ensures that learners clearly understand assignment expectations, fostering greater satisfaction and learning (Reddy & Andrade, 2010). Also, instructional rubrics enhance learners' metacognition, encouraging critical thinking and improving writing skills. A study by Andrade and Du (2005) found that students using rubrics reported higher grades and better-quality work.

Finally, using rubrics allows learners to enhance their self- and peer-assessment skills. Self-assessment helps learners identify mistakes and improve their writing skills (Chowdhury, 2018; Sadler & Good, 2006). It offers them opportunities to enhance their writing skills and address issues in their own and peers' work. Andrade (2000) suggested that learners using rubrics better understand content and criteria, applying them to other writing assignments even without the rubric in front of them. Hafner and Hafner (2003) found that providing rubrics improved learners' rankings of presentations.

However, a challenge in using writing rubrics is their static nature, failing to address specific student needs. To enhance effectiveness, rubrics need to be dynamic and modified to suit diverse writing tasks (Hoerr, 2018). One approach involves developing student-generated rubrics, empowering learners to contribute to the rubric creation process (Skillings & Ferrell, 2000). This collaborative effort resulted in improved metacognitive skills and clearer expectations, leading to better writing outcomes.

Studies on the Use of Rubrics in Assessment

The use of rubrics in assessing students' work has become a prevalent and compelling method, drawing significant interest from educators. Moskal (2000, p. 22) defines rubrics as descriptive scoring schemes created by educators to guide the analysis of students' efforts in products or processes. These scoring tools consist of specific criteria for writing performance, typically covering areas like vocabulary, content, mechanics, organization, and language use. Rubrics play a crucial role in assessment by clarifying teachers' expectations, guiding students in self-assessment, and helping them recognize their strengths and weaknesses. As students utilize rubrics for feedback, they strive to meet their teachers' expectations and enhance their performance. "When used as part of a formative, student-centered approach to assessment, rubrics have the potential to help students develop a 'vision of success' as well as 'make dependable judgments about the quality of their work'" (Andrade & Du, 2005, p. 1). Andrade and Du (2005) conducted a study involving fourteen students, revealing that the use of

rubrics contributed to higher-quality work, reduced anxiety, and increased focus among learners.

Scoring rubrics serve the purpose of providing students with a description of expectations at each level or category, aiming to facilitate improvement in their future performance. Andrade (2000, p.13) emphasizes that "rubrics are also teaching tools that support student learning and the development of sophisticated thinking skills." Rubrics, therefore, not only assess but also instruct. In a student-centered classroom, the use of rubrics may aid learners in developing a thinking process to understand their mistakes and work on improvement.

Turgut and Kayaoglu (2015) conducted a quasi-experimental research study involving 38 students to explore the effects of using rubrics as an instructional tool on writing performance. The results indicated that students in the treatment group outperformed those in the control group, emphasizing the value of rubrics in understanding mistakes and implementing strategies for improved writing skills.

Similarly, Bing (2016) investigated the effects of self-assessment on EFL writing skills, involving 36 undergraduate, non-English major students. The study demonstrated that students could self-assess in line with teachers' assessments, leading to enhanced writing skills. This suggests a positive impact of self-assessment on learners' writing abilities.

Reynolds-Keefer (2010) also researched the impacts of rubrics on students' learning attitudes and future teaching practices. The study, involving 45 students aspiring to become teachers, revealed a generally positive attitude toward rubric use. However, some students expressed increased anxiety, feeling pressured to produce high-level writing. Despite uncertainties about rubric creation, students expressed a positive outlook on using rubrics in their future careers.

Similarly, Kim and Steffen (2018) explored the impact of rubric-referenced self-assessment on Korean EFL learners' writing skills, involving 19 students. The findings indicated positive effects on writing skills, learning strategies, and attitudes, reinforcing the beneficial impact of rubrics. Collectively, research on rubrics demonstrates improvements in learners' thinking quality, enhanced performance, and a better understanding of content (Andrade & Du, 2005; Panadero & Romero, 2014).

Identified Gaps and Limitations in the Existing Research:

One notable limitation in the existing body of research revolves around a discernible bias towards middle and high school students, with a limited focus on

middle school students. The majority of studies addressing Rubric-Referenced Self-Assessment (RRSA) and writing skills development tend to center on the experiences of older students. This glaring gap in literature dedicated to the unique context of middle school students poses a potential challenge to the broader applicability and generalizability of the findings. Recognizing the distinctive developmental needs and challenges of middle school students becomes imperative for a comprehensive understanding of the impact of RRSA on their writing skills.

Another critical limitation identified in the literature pertains to the sparse exploration of long-term effects. While existing research offers valuable insights into the immediate and short-term impacts of RRSA on writing skills, there is a noticeable gap in understanding its sustained influence over an extended period. The absence of comprehensive studies tracking the long-term development of writing proficiency throughout middle school and beyond hinders the establishment of a holistic understanding of the enduring effects of RRSA. Addressing this limitation is crucial for informed decision-making in educational practices.

Furthermore, the literature highlights the variable implementation strategies of RRSA in writing instruction. The diverse ways in which RRSA is integrated into the curriculum stress the need for a deeper understanding of the factors influencing its effectiveness. While literature offers glimpses into specific approaches, a comprehensive analysis of varied implementation strategies is lacking. This limitation hampers the ability to draw conclusive insights into the most effective methods of incorporating RRSA into writing instruction. A more in-depth exploration of the contextual and situational factors that shape the implementation of RRSA is essential for refining its application and maximizing its impact on writing skills development in middle school students.

Conclusion

In conclusion, the literature underscores the significance of Rubric-Referenced Self-Assessment (RRSA) as a potent pedagogical tool. RRSA is depicted as a method capable of empowering students by amalgamating the structured guidance of rubrics with the introspective process of self-assessment. Studies, notably Andrade's work in 2008, accentuate the positive impact of RRSA on students' writing skills. Through fostering metacognitive development and self-regulation, RRSA emerges as a promising approach to nurturing a deeper understanding of one's writing processes and outcomes.

Examining the landscape of writing skills development in middle school reveals a progressive trajectory. Foundational skills, such as letter formation, evolve into more advanced stages involving the coherent expression of complex ideas. Literature by Graham and Harris (2005) and Berninger (2012) accentuates the continuous growth process in writing proficiency during these formative years. This developmental continuum emphasizes the importance of providing targeted and scaffolded writing instruction to support students at various stages of their learning journey.

The integration of RRSA into writing instruction emerges as a multifaceted and dynamic domain, as highlighted in the exploration of relevant studies. Research by Andrade, Du, and Wang (2008) contributes insights into the integration of predefined rubrics into the writing curriculum for self-assessment purposes. This integration is shown to enhance student writing outcomes by providing a structured framework for assessment and fostering a deeper understanding of writing criteria. The diverse approaches and methodologies observed in these studies underscore the adaptability and potential versatility of RRSA in enhancing the writing instruction process.

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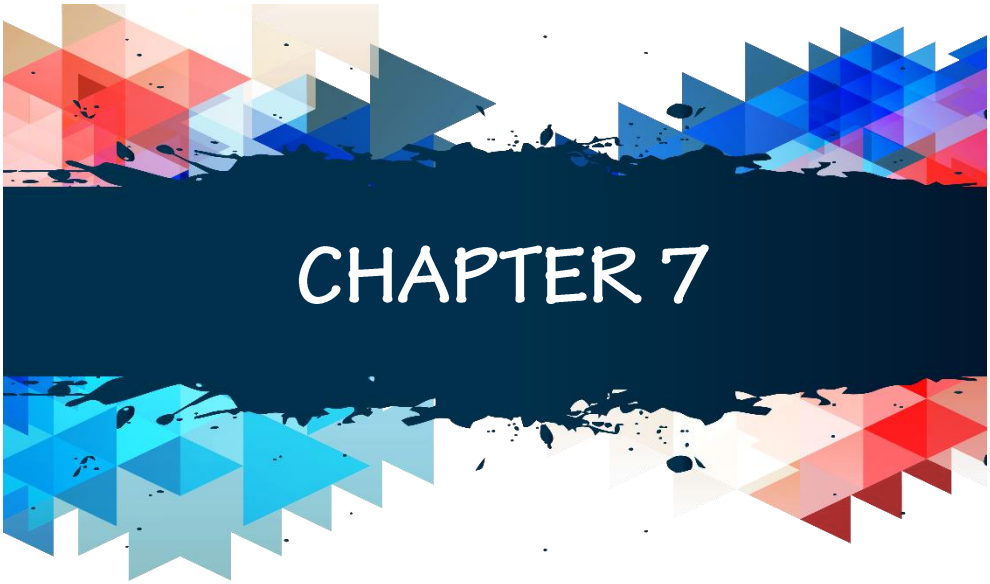

Cooperative Learning Approach: A Paradigm Shift

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INTRODUCTION

The lecture method continues to be used intensively in our country as a magical and sacred teaching method in the teaching of all disciplines and subjects. Although student-centred approaches based on constructivism have been gradually integrated into the curriculum since the 2004-2005 academic year, the expected change in the classrooms has not been at the desired level. The change expected from schools here is the transition from teacher-centred teaching to student-centred learning. This transition can be considered a paradigm change as it brings serious changes to all elements in the school and classroom environment. It is not easy to keep up or integrate with such radical change. Constructivism, on which the cooperative learning model is based, is based on the philosophical belief that "people construct their understanding of the real world based on their own experiences." In other words, the individual creates his own understanding as a result of interaction with the environment (Warrick, 2001). In this approach, the transmitter and active role of the teacher has been replaced by the role of guiding learning and learning together with the students. Some of the changes that occurred in the teaching and learning process with the paradigm shift are shown comparatively in Table 1.

Table 1. Comparison of teacher-centred approach and student-centred approach

Teacher-centred approach	Student-centred approach
Teachers are the source of knowledge and know everything right.	Teachers are not the source of knowledge and some of what they know may be wrong.
The knowledge in the textbooks is absolutely correct. Scientific knowledge does not change.	Scientific knowledge is not definitive and may change over time.
There is mostly teacher-student interaction.	Student-student interaction is at the forefront.
The teacher teaches the subject	The student learns the subject.
The responsibility for student learning belongs to the teacher.	Responsibility for learning belongs to the student.
Teachers and administrators decide on the subject to be studied and how to study it.	Students also have a say in what is learned and how it is learned.
Only the teacher makes the evaluation	Students participate in the evaluation process. There is peer and self-assessment.
Extrinsic motivation is the dominant type of motivation and is tried to be created by the teacher.	Teacher and students work together to ensure intrinsic motivation.
Questions and activities usually have one correct answer. Students learn by repetition.	Activities and questions with different solutions are used. Students try to go beyond what they have learned and develop their thinking skills.

Lecture is the only prevailing teaching method.	Multiple teaching paths/methods are used
The focus is on cognitive outcomes based on test scores.	Affective outcomes such as desire and empathy are also evaluated.
Learning activities are limited to the classroom and school environment.	Learning activities are linked to students' daily lives.
Individuals try to learn important knowledge through memorization. Knowledge is the goal.	In cooperative groups, students learn together. Knowledge is a tool.
The teacher acts as if she/he knows everything	Teacher and students learn together.

As seen in Table 1, the student-centred approach requires the student to leave the passive listener position in the classroom and be active both physically and mentally. In the student-centred approach, the understanding that the teacher is not the authority of knowledge and that knowledge is questionable and changeable comes to the fore. In particular, changing and developing perceptions about science and scientific knowledge contribute to student-centred learning approaches becoming popular all over the world. The idea that "scientific knowledge is fixed and unchangeable" has evolved into the belief that scientific knowledge can change as a result of new research findings and reinterpretation of existing knowledge. The idea that "If a theory is tested and confirmed by different scientists, it becomes a law" is carried by some of the social studies teacher candidates (Çınar & Köksal, 2013) and science and technology teachers (Ayvacı & Nas, 2010) in our country. Since laws are considered as a definitive and unchangeable type of knowledge, the belief that all types of scientific knowledge should be transformed into laws comes to the fore in the minds of teachers. A teacher's epistemological belief, in other words, her/his perspective on knowledge, affects her/his beliefs about how science and scientific knowledge should be taught. Therefore, the teaching style of a teacher with the idea that scientific knowledge is certain and unchangeable differs from that of a teacher with the idea that knowledge can change. While it may have been possible to transfer existing knowledge to students a long time ago, it is impossible today because of the fact that there is so much knowledge today and it is increasing exponentially. For this reason, rather than transferring knowledge, learning the ways of accessing knowledge and gaining the skills of where reliable

and valid knowledge is and how to access it when needed are more important. As can be understood from here, the teacher's belief about knowledge and the constantly changing and developing structure of knowledge direct the teacher to student-centred learning approaches. Moreover, these approaches advocate the understanding of what the student can do with the knowledge he has, rather than how much knowledge he has. As seen in Table 1, in classes where the traditional approach is used, questions and activities with a single correct answer are included, while in student-centred approaches, activities and questions with different solutions are included. It should not be forgotten that the only correct answer is that it makes the student dependent on the teacher and books. In this approach, the belief that "the only source of knowledge is the teacher and the teacher knows all the answers" is dominant for the student (Tsai, 2000). Breaking habits and gaining new habits is a difficult process for everyone. Therefore, it is not easy to change the usual teacher-centred methods and techniques in the learning-teaching process. Moreover, one teacher changing his teaching habits is not enough to bring about change in all schools. All teachers need to participate in this process and change their habits. It is important for all teachers in the schools to come to the same understanding and for the new approach to become the school culture so that students can adapt to the new understanding. Since the student thinks result-oriented with a pragmatist mentality, all teachers, administrators and even parents must be consistent and decisive in applying contemporary teaching approaches. While academic success is the only goal in traditional classrooms, it is one of the goals in student-centred approaches. For this reason, it is not enough to consider cooperative learning only as a struggle to increase academic success. Because, in addition to increasing academic success, the cooperative learning strategies also provides students with many skills such as self-esteem, developing positive relationships within the group, being able to work collaboratively, and taking responsibility for learning. It is not the right approach to only look at success and ignore other benefits. In other words, teachers should evaluate all student skills that are thought to contribute to collaborative learning. Knowledge or skills that are not included in the evaluation will naturally not improve. This situation becomes even more important, especially in exam-oriented education

systems. If changes are made in teaching approaches, methods and techniques, measurement and evaluation approaches should naturally change as well. Using contemporary teaching methods and techniques together with traditional measurement and evaluation approaches will not achieve the desired results. In addition to students' academic success, affective and psychomotor outcomes should also be included in the evaluation. It should not be overlooked that the affective domain serving as a bridge between the cognitive domain and the psychomotor domain.

Teachers should devote their lesson time to discovering students' differences rather than directly transferring knowledge (Gillia, 2016). A teacher who discovers the differences, needs and interests of his/her students will know his students better and will be able to create more productive learning environments. In this way, the teacher's role as a transmitter of knowledge will be replaced by preparing productive learning environments and helping and guiding the student by learning with him. The focus of student-centred learning is on the student's first-hand experience and learning by doing. According to John Dewey (1938), education should be based on problem solving and daily experiences, and each student's experiences and problem-solving approach should be evaluated individually in the process. Since it is the teacher who is active in the teacher-centred approach, it is naturally the teacher who is constantly observed by the students. In student-centred approaches, teachers have the opportunity to observe their students more.

As can be seen in Table 1, in student-centred approaches, the importance of associating new concepts with daily life is emphasized. It is claimed that concepts associated with daily life are more meaningful and permanent (Yadigaroğlu, Demircioğlu & Demircioğlu, 2017). It even contributes to increasing motivation for the course and adaptation to daily life and the environment (Pınarbaşı et al., 1998). Choosing in-class activities and examples from the student's environment will increase students' interest and curiosity and contribute to them being more active in the lesson. Student-centred approaches reject rote learning and require students to fully understand the subject they are studying and why they have to learn it. Associating it with daily life makes the learned subjects

no longer a necessity, answers why they need to be learned, and makes learning a necessity.

Student-centred approaches expect the teacher to step out of the role of transmitter of knowledge and become a designer of learning activities and learning environments that will activate the student at the highest level. Active learning means that students participate in learning activities both mentally, emotionally and physically. One of the most efficient methods that will enable students to be active in learning process is cooperative learning. In cooperative learning, students actively work both cognitively and affectively with their peers on the problems, topics, tasks and written resources given to them. The serious change here is that the student stops being a passive listener and becomes active. However, no learning activity can be either entirely passive or active. The degree or duration of the student's activeness during the course can be shown as evidence of the effective use of the cooperative learning method.

Collaboration is a key competence that is indisputably and vitally important in today's knowledge society. Including maximum collaboration in classrooms is extremely important for permanent and meaningful learning to occur. Cooperative learning is not just about dividing students into appropriate groups and asking them to work collaboratively. It is a much more complex and difficult process than that. Dyson, Griffin and Hastie (2004) claim that a teacher needs 3 years or more to use the cooperative learning method correctly and effectively and to feel comfortable in the application process. In other words, teachers should develop their skills in using cooperative or contemporary learning methods and techniques effectively. Skill is not knowing how to do a job, but being able to do it (Johnson et al., 1994). To make a lesson most productive in cooperation, it is necessary to get to know the students. For this reason, teachers should improve themselves on how the cooperative learning method should be applied and devote a significant part of their time to discovering the differences of their students rather than transferring knowledge. It is very difficult for a teacher who does not know his students to gain efficiency from cooperation.

Cooperative Learning Method

Cooperative learning is referred to as "cooperative learning", "team learning", "learning communities", "collective learning", "collaborative learning" in the international literature (Bielaczyc & Collins, 2009; Kilgore, 1999; Slavin, 1980; Laal & Ghodsi, 2012; Varma-Nelson & Coppola, 2005) while in Turkiye it is referred to as "işbirlikli öğrenme" (Açıkgöz, 1992: Senemoğlu, 1998) and "kubaşık öğrenme" (Çalışkan,1999).

Cooperative learning can be considered the pioneer of student-centred education reform with its constantly developing and expanding structure with new research data that has a place in all levels of education and many disciplines. According to Johnson, Johnson and Smith (2006), cooperative learning is a learning environment in which students in small groups work together in cooperation to maximize both their own learning and the learning of their friends in the group. According to Laal and Ghodsi (2012), it is an activity in which individuals take responsibility for the task assigned to them during group work and constantly interact to achieve a common goal. When the different definitions in the literature are evaluated together, it can be defined as a learning method in which students who come together as a heterogeneous group contribute to each other's learning to achieve a common goal and group success is rewarded (Bowen, 2000; Doymuş et al., 2009; Saban, 2000). In the process, group members interact, discuss and support each other to complete the task given by the teacher, solve the problem, and learn the subject or concept (Li and Lam, 2003). The cooperative learning method is widely used in teaching many different subjects from pre-school to university and in increasing socialization among students (Cohen, 1994). The teacher's task in cooperative learning is to determine goals, structure and plan activities, and divide students into groups where they can work together towards a common goal (Slavin, 2012).

Student interaction with each other is fundamental to collaborative learning. Learning takes place effectively as a result of interactions between students. Social interaction supports cognitive development that results in learning. According to Piaget, environments based on social

interaction give students the opportunity to assimilate and adapt the new knowledge they are trying to learn by associating it with their previous knowledge (Blake & Pope, 2008). In fact, the formation of cooperative groups by individuals with different characteristics is important for students to contribute to each other. According to Vygotsky's theory, children advance their knowledge from their interactions with adults or smarter children. In fact, it is emphasized in Vygotsky's theory that what the child can learn on his own is limited, so he must learn in a group (Barnett, 2019).

Compared to teacher-centred teaching approaches, the cooperative learning method offers a more social classroom environment that offers more intense interactions (especially peer interactions). Within this social structure, students have the opportunity to learn not only from the teacher but also from their peers. It should not be overlooked that this social learning setting not only contributes to students' academic success, attitude, self-esteem, and permanence of knowledge, but also helps them acquire many social skills such as listening, explaining, researching, and communication over time (Johnson & Johnson, 2003). For teachers who see academic success as a single and correct goal, such collaborative activities may be seen as a waste of time and workload. The question here is whether students should memorize the existing content or develop many skills to access knowledge. Another question is “Is reaching knowledge a goal?” Or is it a tool that should be used to gain skills? In the short term, individuals' ability to memorize knowledge should not be seen as an indicator of success. Instead, long and challenging skill acquisition studies should be adopted and seen as valuable. Another important issue in cooperative learning is the concept of leadership. Leadership does not belong to one student within the group, but rather is a concept shared among all individuals. As students specialize in the subjects assigned to them, they lead other group members in their subjects. They have a say in their own subject. In cooperative group studies, students are responsible for their own learning as well as the learning of their groupmates (Antil, Jenkins, Wayne, & Vadasay, 1998). Therefore, they are obliged to teach their subjects to their other friends.

As a result, cooperative learning should not be perceived as a single learning or teaching method and it should be understood that not all group work is cooperative learning. The cooperative learning approach includes many methods and techniques. Due to its developing and expanding structure with new research studies, it is very difficult for teachers to master the sub-methods and techniques it contains and to choose the most appropriate technique for the class, subject and curriculum and apply it effectively. Here, the teacher's belief in the method and its effectiveness and his perception of self-efficacy in applying the method are important for the dissemination and success of the method.

Main Components of Cooperative Learning Method

Cooperative learning groups have some characteristics that distinguish them from traditional group studies. These are given in Figure 1.

Figure 1. Characteristics of Cooperative Learning Groups

As seen in Figure 1, cooperative groups must have 5 characteristics: "positive interdependence", "individual accountability", "face-to-face promotional interaction", "social skills" and "group processing" (Johnson et al., 1994).

1. Positive interdependence

It is the adoption of the idea that "Unless all members of the group are successful, none of them can be successful" (Johnson, Johnson & Smith, 2006). In cooperative learning, group success is important and evaluated rather than individual success. Individual studies should be done meticulously, but it should be known that they will not be sufficient. Individuals must feel the need to get support from each other in order for the task assigned to the group to be successful. In other words, they should be aware that they are responsible for each other's learning. It should be adopted that individual evaluation is not sufficient, therefore group evaluation should also be done. This awareness of responsibility and belonging can be expressed as positive interdependence.

2. Individual accountability

Group success in cooperative learning can occur when group members do the task assigned to them in the best way possible. In other words, success can be achieved as a group when each individual completes the assigned tasks at the level of expertise (Açıkgöz, 1992). The individual should both perform the assigned task in the best possible way within the group and support other members to reach similar levels of expertise (Johnson & Johnson, 1999). In the evaluation phase of cooperative learning, individual evaluation is also made in addition to group success. They should take themselves to the highest level by getting support from the group, not only on the subject assigned to them, but on all issues for which the group is responsible. It should not be forgotten that the sum of individual evaluations It should not be forgotten that the sum of individual evaluations indicates group success. As a result, what is required from the individual with individual responsibility is to learn both his/her own subject and the subject of his/her peers in a meaningful way and to contribute at the highest level to his/her peers doing similar studies.

3. Face-to-face promotional interaction

One of the most important features that distinguish cooperative learning environments from other traditional structures is that face-to-face student interactions are the focus of studies. Here, the interactions expected from students are to be mutually supportive and encouraging towards a common goal (Saban, 2000). In terms of support and encouragement, students are expected to compensate for each other's shortcomings, encourage and help each other.

4. Social skills

Within the framework of this principle, students are expected to have a number of social skills that contribute to the harmony of the group or community and to use them effectively. Establishing healthy communication and relationships within the group, trusting each other, mutual empathy, and developing the concepts of self-confidence and self-sufficiency are some of the social skills required to be successful as a group (Buzludağ, 2010; Saban, 2000). Being developed in these skills brings group success, and collaborative work naturally contributes to the development of these skills. It is important to have these and similar skills in order to establish healthy relationships in daily life. When evaluated from this perspective, it can be said that cooperative learning contributes to the daily lives of individuals.

5. Group processing

Evaluating the learning process is important in cooperative learning methods. In this process, what works well in the process of reaching the determined goal, whether the actions of each individual are useful or useless, what is disrupted, what situations need to be changed or continued, the degree to which the goals are achieved are evaluated from time to time by the group members and precautions are taken (Johnson & Johnson, 2003; Johnson et al., 1994; Saban, 2000).

Cooperative Learning Techniques

As mentioned earlier, since cooperative learning is used in almost all disciplines, there are many techniques for its implementation. Some of these techniques are discussed in this section.

1. Learning together

In this technique developed by Johnson and Johnson (1999), sharing the resources related to the subject among individuals, making the distribution of topics according to the characteristics of individuals and group reward are considered important. Groups consisting of individuals ranging from 2 to 6 can be formed by considering the variables of academic success, gender, race and talent, and time, infrastructure and resources. Before giving the topic to the groups, the teacher asks them to choose a group leader. Each group divides the topic into subtopics, taking into account the number of individuals in the group, and divides the subtopics according to their interests and curiosities. Each individual investigates her/his subtopic thoroughly from different sources. The collected data and materials are shared mutually within the group. In turn, each

student explains and discusses his/her subject with the other members of the group. After the mutual learning and teaching process is completed, a presentation is made to the class by the group. Finally, the teacher makes evaluations and determines the group performances.

2. Student Team-Achievement Divisions

In this technique, students are first divided into groups of 4 according to their gender, achievement and ethnicity. After the groups appoint a leader and a presenter, the teacher presents the topic and the students study the topic in groups. This process continues until each student in the group has mastered the subject. Once all group members have reached the desired level of expertise, they are tested individually. They cannot help each other in this process. Students' test scores are compared with their previous averages. Students are rewarded in proportion to the extent to which they exceed their previous average performance. These test scores are then summed to determine the group score. Groups that meet specified criteria are rewarded. The process from teacher presentation to group reward is repeated. This process takes 3-5 class hours (Slavin, 1986).

3. Teams-Games-Tournament

In this technique, the teacher first forms cooperative heterogeneous groups and distributes their topics. Each group researches the topic as a group. Here, discussions are held on the questions and problems given by the teacher. Since each individual will be a representative of their team, they strive to prepare the individual who will participate in the tournament. Every week, a different student from the group competes with a student from other groups and represents their own group. Therefore, everyone acts responsibly in each other's learning. It is important that the academic achievements of students selected for the tournament from different groups are equal. Points earned during the tournament are written as group points. After the tournaments are completed, the total points obtained determine the first team. It is claimed that the technique is effective on students' success in mathematics, science and language (Slavin, 1995).

4. Team Assisted Individualisation

Students first take a pre-test and are ranked according to their scores. They then progress according to their own learning pace. They are divided into heterogeneous groups of 4-5 students according to the scores they get from the exam. Other variables (gender, ethnicity) may also be taken into account when creating groups. The origin of this technique was developed by Slavin and his colleagues based on its mathematical content (Slavin et al., 1986). However, it is

claimed that it can also be applied in other disciplines and grades (Aktan & Budak, 2021). In general, team members work individually. All materials (worksheets) necessary for their work are arranged by the teacher. As a result of the work, group members check each other's work and their answers to the questions on the worksheet. If there are problems, they try to solve them mutually and make up for their shortcomings. They receive support from the teacher when necessary. Final tests for the unit are administered and usually scored by students. Teammates cannot help each other in this exam. Each week the number of topics accomplished by all group members is determined. Teams that perform above a predetermined standard criterion are rewarded (Slavin, 2010).

5. Group Investigation

In this technique developed by Sharan and Sharan (1992), it is important to develop the social and affective characteristics of individuals. The teacher divides the unit into subtopics according to the number of students in the group and gives them to the groups. The teacher forms 2- to 6- member groups. Topics are arranged in a way that encourages positive interdependence among individuals. Groups work collaboratively with an inquiry-oriented approach. Groups also divide subtopics into individual tasks and carry out the necessary activities to prepare group reports. Multifaceted interactions of individuals are encouraged. In order to contribute to this process, practices can be carried out to increase social and communication skills among individuals before the application. Each group then prepares and presents a presentation to the entire class. During the process, the teacher walks around the classroom and intervenes in problems immediately (Yazman, 2013).

6. Academic Conflict

Academic Conflict is another cooperative learning technique developed by Johnson and Johnson in the 1970s to identify and correct mental contradictions in individuals regarding the subject (Johnson, Johnson & Stanne, 2000). In this technique, students' thinking skills improve as they actively engage in rational and critical thinking to discover their mental contradictions. The teacher first determines a topic that contains contrasts, and then directs his/her students to research the topic intensively. The students are divided into two groups. While one group investigates one aspect of the subject, the other group investigates the opposite aspect. Each group researches its topic in detail, collects data and learns. Each group prepares a presentation by organizing their data with supporting evidence to explain to the opposing group. While one group gives a presentation, the other group listens and takes notes. After both groups complete their

presentations, they change roles. This time, they learn the other dimension of the subject and present it again each other. What is expected from students here is to learn both aspects of the subject with the same efficiency. After the presentations, the groups create a written document covering the entire topic. As a result, it is essential that students learn the entire subject. After the studies are completed, the teacher gives an exam to all students individually regarding the entire subject.

7. Think-Pair-Share

It is a technique developed by Lyman (1981) within the framework of the cooperative learning approach to ensure that students are especially mentally active in the classroom. The application of the technique is carried out in three steps. In the first step (think), the classroom teacher gives students a question or problem situation that requires thinking at the level of analysis, synthesis or evaluation. Students think about the question or problem for a certain period of time. This thinking process is carried out by all students simultaneously. Each student determines the most correct result for himself/herself. In the second step (pair), each student pairs up with a desk mate to share and discuss their thoughts.

In the last step (share), the common result from the matches is shared and discussed in small groups or with the whole class. Thought and discussion are the focus from beginning to end of the process. In this way, each student is constantly active during the course. This technique can be applied to different crowds of classes and subjects. This technique encourages students' participation in discussions and improves their skills in developing arguments and making criticism in small groups and for the whole class (Sampsel, 2013). However, preparing environments that encourage students to form critical and creative thoughts, discuss them with each other, and create effective answers is a time-consuming process, as in all student-centred practices.

8. Dual Control Technique

In this technique, the application begins by forming heterogeneous groups of 4 students, consisting of sub-groups of two people (Kagan, 1992). The focus of the technique is for students to supervise each other and identify their deficiencies. The teacher presents the basic concepts in the subject and solves questions related to the subject. Then, (s)he gives the worksheets (s)he prepared for the subject to the groups. Sub-groups of two solve the questions on the worksheet. After the questions on the worksheet are solved, sub-groups of two students exchange the worksheets among themselves. Each group checks the other group's worksheet. The results are checked again with the answer key and discussed. Finally, the teacher gives students individual exams on the concepts

studied. After the exam, each individual's score is determined. The group success score is determined by adding up the points. The results are compared with previously created criteria and groups whose performance exceeds the criterion are rewarded (Öztürk, 2020).

9. Jigsaw Techniques

Jigsaw learning technique, which was first created by Aronson and his colleagues in 1978, was improved as a result of the studies carried out by subsequent researchers in different disciplines and subjects. Different variations of the technique have emerged. There are 6 Jigsaw techniques that have been developed and accepted to date. These techniques, which are generally the same but differ in the application process, are called "Jigsaw" (Aronson et al., 1978), "Jigsaw II" (Slavin, 1986), "Jigsaw III" (Stahl, 1994), "Jigsaw IV" (Holliday, 1995), “Reverse Jigsaw” (Hedeen, 2003) and “subject jigsaw” (Doymuş, 2007). Detailed explanations of each technique are given below.

i) Jigsaw I Technique

This technique, which is a form of application of the cooperative learning method, was first developed by Elliot Aronson in the early 1970s. In the technique, students are first divided into heterogeneous groups and form main groups. Then, the teacher gives the topic, which he divides into sub-topics, to the groups. Each group shares the topic among group members. The individual who takes up the subject conducts in-depth research on the subject, with the awareness of individual responsibility. In this process, the teacher provides all the necessary materials to the students. After completing their research, students move into expert groups. Expert groups are formed by bringing together students from each main group who study the same subject. In expert groups, students share their knowledge with group members and discuss to increase their expertise on the subject. Once the expert groups have completed their work, they return to their main groups. They teach the subjects they are experts in to other members of the group. In the same way, they learn the subjects of other members of the group from them. Finally, students are given an individual exam. As a result of the exam, each individual's score is calculated and summed within the group. The most successful group is determined and rewarded by the teacher.

ii) Jigsaw II Technique

Slavin (1986) developed this technique by making some changes on the Jigsaw I technique. As in the teams-games-tournament and student team-achievement divisions, students work together in heterogeneous groups of 4-5

people. In this technique, the entire unit is given to the group instead of a separate topic for each individual in the group. All students read the unit from the provided sources by the teacher. In this process, each individual in the group chooses a sub-topic of the unit according to their interests. The choice of topic is left to the students themselves. In groups, individuals who choose the same subject come together to form expert groups. In expert groups, individuals expand and improve their knowledge and skills on the subject. They then return to their original groups and teach their subjects to the rest of their friends. Afterwards, they take the exam individually. The group score is obtained by adding up the scores of each individual from the exam. As a result of the ratings, the group with the highest performance is determined and rewarded (Slavin, 1995).

iii) Jigsaw III Technique

In this technique, students work together as in the Jigsaw II technique. As can be understood from here, the technique was structured by Stahl (1994) on the Jigsaw II technique. The teacher divides the unit into sub-topics according to the number of students in the group and gives it to the groups. Groups share subtopics within themselves. The individual who takes up his/her subject does the necessary reading and research within the framework of his subject. Then, individuals working on the same subject in each group come together to form expert groups. They increase their expertise on their subject in expert groups. Then, they return to their main groups and teach their friends the subjects they specialize in. Teacher-made questions are used to increase individuals' expertise on subjects. The questions prepared by the teacher are used for competition between groups. Individuals mutually selected from the groups compete among themselves over questions. Individuals who are successful in the competition are rewarded. Other students can answer questions that neither side can answer during the competition by asking to speak. Points can be given to individuals who know the correct answer to the question, and points can be deleted if the answer is incorrect. It is stated that such studies are important for students to better understand the unit (Holliday, 2000). In the final stage, individuals are subjected to individual evaluation.

iv) Jigsaw IV Technique

This technique was developed by Holliday in 1990 and explained in 9 stages (Holliday, 2002). In the first stage, heterogeneous groups of 3-7 people are formed, taking into account the students' gender, achievement, race and skills. After the groups are formed, the teacher introduces the new topic or concepts. Here, the course teacher can use a resource guide or a preparation set (Hunter,

1984). In this technique, the focus is on interaction between students and productive group work. During the process, the teacher can makes the students practice such as asking thought-provoking questions, giving a problem situation, showing a section from the relevant movie or the entire movie. Apart from these, different practices can also be performed. The main purpose of using such practices is to draw individuals' attention to the subject or concepts being studied (Holliday, 2000). In the second and third stages, worksheets are given to students. The worksheets contain questions that guide the research. Individuals, who receive the worksheets, move into expert groups and work together to find answers to questions, discuss among themselves and reach common conclusions. Working in expert groups to maximize their expertise on their subject is similar to other jigsaw techniques (Stahl, 1994). The technique differs from Jigsaw II and III in the fourth stage. At this stage, individuals who specialize in their subjects in expert groups take an exam prepared by the teacher. The purpose of this exam is to check whether each student has mastered the subject assigned to him or her. Once the results are evaluated, everyone returns to their original groups. The fifth stage is implemented in the same way as Jigsaw II and III. Here, students return to their original groups and teach the subjects they are experts in to the rest of the group. They try to make them as experts as themselves. The sixth stage of the technique is different from Jigsaw II and III techniques. Here the teacher tests the groups again. In the seventh stage, activities are carried out to increase the expertise of the students. A tournament based on mutually answering questions can be organized between groups. Successful individuals may be given awards. Other students in the class can answer questions that cannot be answered in the tournament. While one point is awarded for each correct answer, points can be deducted for incorrect answers. After the points are added up, the group with the highest score is determined first. In the eighth stage, the entire class is tested and evaluated. At the last stage, the teacher can have some additional practices done if he/she wishes. Especially when deficiencies are detected, these deficiencies can be tried to be eliminated with additional activities.

v) Subject Jigsaw Technique

Subject jigsaw technique, which is accepted as one of the techniques of the cooperative learning method, was developed by Doymuş (2007) and consists of 4 stages. In the first stage, heterogeneous groups consisting of 2-6 people are formed (Doymuş, 2022). Academic means of students is taken into account while creating groups. At this stage, the teacher explains how the process will work. In the second stage, the unit to be covered is divided into subtopics by the teacher, as in many other collaborative techniques. Care is taken to ensure that the number

of subheadings is equal to the number of students in the groups. Sub-topics of the unit are given to the main groups determined. Each student conducts research on their subject, collects data and creates a written document. Then, the teacher randomly selects one student from each group. The selected student presents his/her knowledge on the subject to the class. In the third stage of the technique, topic merging is performed. Two different sub-topics and students studying these topics come together to form an expert group. This process is done for all groups. Expert groups specialize by researching two subtopics assigned to them. They complete their work by preparing a final report. The teacher calls a student from the group to present the prepared group report and makes a presentation. During and after the presentations, discussions are held to eliminate deficiencies. After this process, the fourth and final stage is started. At this stage, a test is applied to the whole class, including the topics studied (Doymuş, 2007).

Benefits of Cooperative Learning Methods and Techniques

The most important contribution of cooperative learning to individuals is that they gain the ability to collaborate, which has an important place in daily life and business life, by working towards common goals with their peers. Today, the way to make progress in almost every business branch depends on individuals' ability to work in collaboration with people from different disciplines. Another important contribution of cooperative learning is its contribution to individuals' ability to take responsibility for their own learning. An individual who takes responsibility for his own learning will seek guidance from his teacher where he needs it in his own learning struggle, rather than waiting for his teacher to provide knowledge in the classroom. Over time, the individual transitions from the expectation of "the teacher explains the subject, I will understand it" to the thought of "the teacher helps me understand the subject." In cooperative learning environments, students are more active both mentally and physically compared to traditional environments. In the process, they discuss, exchange ideas and communicate with their peers with a questioning approach, in line with a common goal as much as possible. This contributes to the development of students both mentally and functionally. In discussions aimed at reaching consensus in heterogeneous small groups formed with a collaborative approach, students are able to speak more and find more opportunities to explain their ideas. While in regular classes, giving students feedback and the opportunity to speak is limited due to time, in small groups, students can receive immediate feedback and have time to express themselves. A student who cannot receive immediate feedback and cannot express himself adequately may become disengaged from the course and develop a negative attitude towards the course. It is emphasized that students

who receive regular and instant feedback are more motivated to study (Tarhan, Ayyıldız, Öğünç, & Acar Şeşen, 2013). It can be said that the self-confidence of students who work collaboratively in small groups, express their thoughts freely, get knowledge from their friends, and inform their friends about the subject they are experts in has also improved.

It is known that in traditional approaches, where teachers are active and students are passive listeners, students generally memorize concepts and forget the memorized knowledge over time or cannot recall it in their minds. It is emphasized in the literature that collaborative learning supports conceptual learning and that the knowledge learned in small groups is more permanent than that learned with traditional approaches (Demiral, 2012; Koç, 2015; Yang & Dindar, 2015). As can be understood from here, the cooperative learning approach provides significant benefits to individuals working in small groups in terms of permanence of what is learned. Since the student reaches knowledge as a result of his own efforts, it is not surprising that his learning is more permanent.

When cooperative learning approaches are applied correctly and efficiently, students can gain many skills such as reading, self-confidence, understanding, researching, summarizing, making sense, narrating, explaining, getting support when encountering problems, listening to their peers, discussing, making decisions, noticing different thoughts about the same problem, evaluating events from different perspectives. In fact, individuals working in heterogeneous small groups can also gain these skills from each other, because they struggle to both learn from and teach each other in the process (Alexander & Wyk, 2012).

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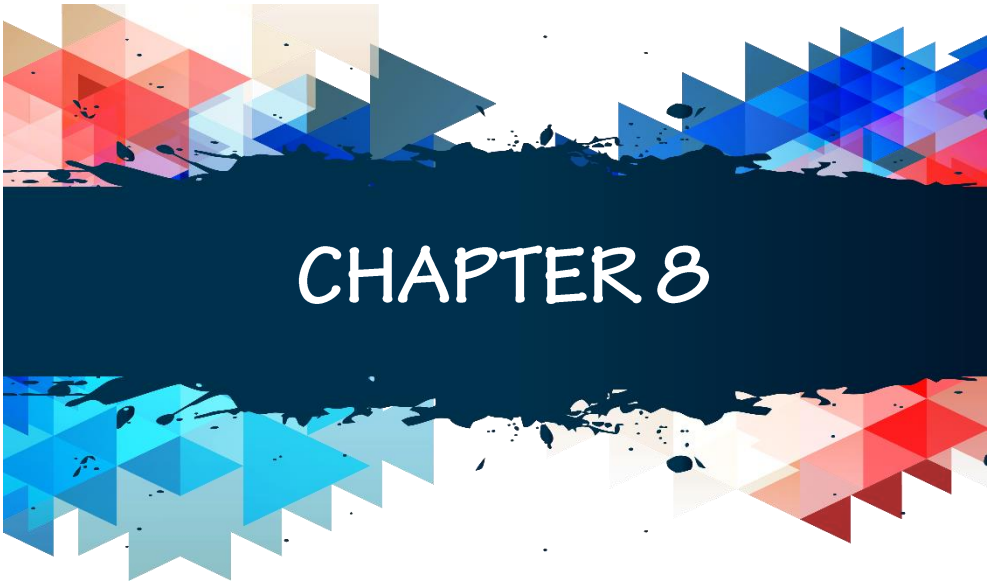

EFL Writing and Lexical Bundles: A Corpus-Based Study on Formulaic Expressions

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Introduction

The subject of this article is lexical bundles, also known as n-grams. Learning these phrases, which are easily and frequently used by natives, has very positive effects for those learning a language as a foreign language.

Granger and Paquot (2008) assert that Biber et al. (1999) established lexical bundles, a novel category of phraseological unit that can solely be identified using computer technology. Lexical bundles are corpus-derived sequences of words that regularly repeat within a specific register, such as formal writing and casual speech. In contrast to collocations, lexical bundles may consist of a greater number of words; however, they must be continuous and maintain the same form. As stated by Ekinci and Ekinci (2020), these word combinations preserve their consistent structure. This robust discovery process has revealed facets of phraseology that were previously inaccessible.

Biber et al. (1999) characterized lexical bundles as simple patterns of word structures that frequently co-occur in natural discourse and compiled a comprehensive list of such bundles. These prefabricated sequences appear in speech as verbal and clausal units (e.g., I don't know, What's the problem with ...) and in writing as noun and prepositional phrases (e.g., the effect of, in the case of ...).

According to Millar's (2009) study using the eye-tracking methodology, learning and using these formulaic phrases provides naturalness for language learners, but on the contrary, it causes a lack of communication.

Hyland (2008) stated that these formulaic phrases belong to a certain linguistic genre and that their natural use shows that the person is fluent in the language context of that environment, whereas the opposite situation shows that the person is new or unfamiliar with that language context.

Granger (2002), in a study called Contrastive Interlanguage Analysis, stated that the linguistic phrases written by those learning English as a foreign language are different from those used by native speakers. In such studies, language learners have been found to overuse, underuse, or misuse certain formulaic phrases (see Altenberg & Granger, 2001; Cortes, 2002; Hyland & Milton, 1997; Rica-Peromingo, 2009).

Granger and Paquot (2008) indicate that the distributional/frequency-based method shifts the focus away from pragmatics and toward stylistics or rhetoric. Although they acknowledge the significance of pattern formulations, corpus

analysts place equal attention, and in many instances even more emphasis of value, on the method of writing that involves multiple word units.

Granger and Paquot (2008) assert that research on lexical bundles concentrates mainly on the academic writing genre, pinpointing frequently occurring sequences of n words with defined frequency and dispersion. The sequences are derived from the learner corpus, examined for structure and function, and then juxtaposed with lexical bundles from native or expert reference corpora.

Methodology

This article seeks to identify the lexical bundles employed in the students' paragraphs as indicators of formulaic language. The research is founded on the examination of a unit task assignment given to students following the completion of the unit. The researcher instructed students to compose a paragraph on the subject of "attractive food." The researcher consolidates the written paragraphs from preparatory students via email into Word-format documents. The texts pertain to an academic genre. Students composed their assignments in the classroom during the session. They were permitted to utilize dictionaries where needed. Word documents are converted into text format to create a computerized corpus. The analysis is performed using the Antconc (Anthony, 2024) software program.

Learner Corpus consists of paragraphs written by 22 students. As illustrated in Figure 1, this learner corpus, which is quite small in volume because it is based on only one unit assignment, consists of 6278-word tokens and 993-word types. Since all paragraphs are combined into a single file, the number of files/ranges appears as 1, which means how many files a type of lexical bundle appeared in.

Figure 1: The learner Corpus

Corpus name: my_corpus attractive food.db

Description

Category	Description
full_name	my_corpus attractive food
short_name	my_corpus attrac
file_count	1
token_count	6455
type_count	1225
encoding	utf_8_sig
token_definition	[\p{L}]+
ignore_header	False
ignore_items	False
number_replace	False
format	raw_files
indexer_type	type
indexer	simple_word_indexer

The researchers made a few parameter settings while using the Antconc program to perform the analysis. For instance, the researchers adjusted the n-gram size to 2, 3, 4, and 5, respectively, and conducted a step-by-step search of lexical bundles. Additionally, we searched for slots in 3, 4, and 5 n-gram size queries, as the slots section activates when the n-gram size is 3 or more.

Analysis Findings

As seen in Table 1, 2-word phrases are produced in large numbers. However, since this process is completely automatic by the computer program, each phrase in the results may not be very meaningful or suitable for the target outcomes (e.g., we are, is also, our eyes, so we, etc.). Here, after the computer process, another manual process is required. In this case, we can eliminate the unnecessary or non-meaningful ones and make the results more meaningful for the target outcomes by reducing the number. Furthermore, owing to publishing page constraints, the tables in this study are presented in a reduced fashion.

Table 1: 2-word size n-grams

Type	Rank	Freq	Range	NormFreq	NormRange
the food	1	44	1	6869.633	1.000
the taste	9	20	1	3122.560	1.000
for example	16	13	1	2029.664	1.000
make food	16	13	1	2029.664	1.000
some people	16	13	1	2029.664	1.000
the most	20	12	1	1873.536	1.000
the world	20	12	1	1873.536	1.000
important for	26	11	1	1717.408	1.000
according to	28	10	1	1561.280	1.000
because of	28	10	1	1561.280	1.000
i think	28	10	1	1561.280	1.000
one of	28	10	1	1561.280	1.000
taste of	28	10	1	1561.280	1.000
depends on	39	9	1	1405.152	1.000
attractive food	50	8	1	1249.024	1.000
even if	50	8	1	1249.024	1.000
our life	50	8	1	1249.024	1.000
taste buds	50	8	1	1249.024	1.000
if we	61	7	1	1092.896	1.000
my opinion	61	7	1	1092.896	1.000
a lot	72	6	1	936.768	1.000
appearance of	72	6	1	936.768	1.000
care about	72	6	1	936.768	1.000
more attractive	72	6	1	936.768	1.000
some of	72	6	1	936.768	1.000
such as	72	6	1	936.768	1.000
that’s why	72	6	1	936.768	1.000

For instance, as indicated in Table 1, the phrase “the food + ...” is the most commonly utilized two-word expression; alternatively, we may consider the phrase “according to + ...” located further down, or any other targeted phrase, and direct our students’ focus to these structures by highlighting their application in sentences, among other methods.

Following the pattern “the food + ...”, an auxiliary verb (is, are, etc.), a modal (can, etc.), a predicate verb (look, smell, etc.), or a conjunction with a noun/noun phrase/pronoun typically occurs, and the topic may be further substantiated by providing further examples using these structures. Presented below are a few examples:

Table 2: “the food + …” bundle

the dish . We eat with our eyes first, so if	the food	is not pleasing to look at then we
like these important things. We should not forget one thing.	The food	is not just food. There are things that
body can be more attractive for them. To summarize whether	the food	is attractive or not depends on these factors,
but if it’s not so, we don’t want. Even if	the food	is fresh and not seeming fresh, we still
know that although the portions are small in expensive restaurants,	the food	is very expensive because the service is splendid.
you can cook it. İf you use all ingredients flawlessly	the food	can be great. And it is not only
smell and taste make food attractive because the smell of	the food	can say too much about ingredients and taste.
It does not matter how delicious it is. I think	the food	in the Mediterranean culture is very delicious. Because
attractive. İf we create color harmonies on the dining table,	the food	looks better to our eyes. It is a
eat. It is responsible for triggering people to taste; however,	the food	looks or smells. It’s like a person
taste it and he or she has a prejudice against	the food	and its taste, but there are many dishes

attractive colors you to buy it. The other factors of	the food	are shapes and sizes of the meals could
life beautiful and livable. Therefore, we cannot just look at	the food	as a vital need. Food does not just

It is observed that following the form "according to + ..." a noun, noun phrase, pronoun, or "that + sentence" typically follows, and the subject can be further substantiated by providing further examples using similar structures.

Table 3: "according to + …" bundle

food section different, so you need to offer special flavors	according to	the customer profile, if the customer likes bitter
are used to. Because the types of food are shaped	according to	the person's taste. Some prefer very spicy food
is a good choice to choose large or small dishes	according to	the size of food. Also, the color of
eat. The last one is a presentation of the food	according to	the surveys, people not only care for the
don't want to eat a dish that doesn't look good.	According to	the visual and presentation, the taste of the
from human to human and everyone should prepare special meals	according to	their pleasure. First of all, eating is a
for survival is food. People choose a lot of food	according to	their taste, and the main reason for this
thing is the presentation. Presentation, and use plates is essential.	According to	me, presentation should be plain. Meals should not
look at then we are unlikely to even try it.	According to	most people, the presentation of food is more
what is over in a country their eating habits changing	according to	that Asians have lot of seafood so they

The quantity of 3-word phrases is less than that of 2-word phrases; however, there remains an excessive number to list comprehensively here. The number of phrases in the table 4 is determined by elimination. The program now provides a table for phrases consisting of three or more words, facilitating the rapid acquisition of the "word + word" structure, where "+" denotes an additional word. Presented below are several examples:

Table 4: 3-word size n-grams

Type	Rank	Freq	Range	NormFreq	NormRange

the taste of	3	9	1	1405.372	1.000
the food is	4	8	1	1249.219	1.000
in my opinion	5	7	1	1093.067	1.000
make food attractive	5	7	1	1093.067	1.000
one of the	5	7	1	1093.067	1.000
a lot of	11	6	1	936.914	1.000
some of us	11	6	1	936.914	1.000
there is no	11	6	1	936.914	1.000
according to the 14	5	1		780.762	1.000
give importance to	14	5	1	780.762	1.000
is very important 14	5	1		780.762	1.000
it depends on	14	5	1	780.762	1.000
the appearance of 14	5	1		780.762	1.000
the most important	14	5	1	780.762	1.000
with our eyes	14	5	1	780.762	1.000
on social media 28	4	1		624.610	1.000
appearance of a 45	3	1		468.457	1.000
as a result	45	3	1	468.457	1.000
care about the	45	3	1	468.457	1.000
first of all	45	3	1	468.457	1.000
in addition to	45	3	1	468.457	1.000
in my culture	45	3	1	468.457	1.000
it is very 45	3	1		468.457	1.000
over the world	45	3	1	468.457	1.000

presentation of food	45	3	1	468.457	1.000	
smell and taste	45	3	1	468.457	1.000	
the color of	45	3	1	468.457	1.000	
the presentation of	45	3	1	468.457	1.000	
to sum up	45	3	1	468.457	1.000	
very important for	45	3	1	468.457	1.000	
what makes food	45	3	1	468.457	1.000	

Table 5: 3-word sized slots examples

Type	**Rank**	**Freq**	**Range**	**NormFreq**	**NormRange**	**S1_TT**	**S1_Ent**
the + of	1	53	1	8276.077	1.000	0.585	0.919
of + food		2	20	1	3123.048	1.000	0.45
0.732							
to + food		11	11	1	1717.676	1.000	0.545
0.916							
make + attractive	19	8	1	1249.219	1.000	0.25	0.544
are + of	25	7	1	1093.067	1.000	0.857	0.976
in + opinion		25	7	1	1093.067	1.000	0.143
0.0							
is + for		25	7	1	1093.067	1.000	0.857
0.976							

Table 5 indicates that the phrase “the + of” is the most commonly utilized bundle. Upon examination of the examples, it is evident that a noun should occupy the position indicated by (+) in this structure. This table indicates the potential for creating numerous new bundles on this topic.

Table 6: “the + of” lexical bundle examples

that doesn’t look good. According to the visual and presentation,	the taste of	the food is curious. Besides the visual,
also important to the presentation and appearance as much as	the taste of	the dishes because people are not tasting
appearance as well as being delicious. If someone doesn’t like	the appearance of	a food, he or she doesn’t want
we may all agree that we eat with our eyes.	The appearance of	a plate is the first impression of
presentation of food is more important than the taste. Secondly,	the color of	food affects us psychologically. If it seems
or small dishes according to the size of food. Also,	the color of	the plate can be in harmony with
Briefly as I understand, while some people only care about	the flavors of	the food the other part of them
everyone has the same taste. And we need to try	the flavors of	different cultures. How To Make a Magnificent
be mixed. Everything should be organized. Mixed plates bother me.	The presentation of	the food is not very important to
admire the taste, not every place we come across. Besides,	the attractiveness of	food reflects not only its beauty but
foods. In conclusion, each food has a different taste. And	the beauty of	food depends on the quality of ingredients,
the taste is bad, you cannot please customer. What determines	the beauty of	the taste of the dish? How is
I don’t normally eat that much, I’m finishing them all.	The effect of	letters on the feeling of hunger is
element, taste plays a major role in its attractiveness and	the effect of	that dish, because no matter how perfect
it ahead. Also smell and taste make food attractive because	the smell of	the food can say too much about
is very important to influence the attractiveness of balance in	the combinations of	dishes. As a result, everyone loves to
most important element in life. It is very important for	the continuation of	life, but it should not be forgotten
lost. Well, what makes food so attractive? Firstly, we noticed	the decoration of	food then the taste of it. if
dish attractive. The food taste is variable. “Beauty is in	the eye of	the beholder.” This expression sums up. Our

much, I'm finishing them all. The effect of letters on	the feeling of	hunger is also the letter S. The
the previous ones, mix many dishes and create new products.	The harmony of	combinations creates scrumptious dishes and can even
in my opinion, whichever way you choose, you will witness	the influence of	foods on mental health and we had
Everyone's likes are not the same. We like different things.	The kind of	tongue we have can affect our choices.
impress with its taste but also its presentation, service and	the location of	the place where you eat the food
us can be different from the photos they show on	the menus of	the restaurants. That's why we should never
rest for twenty minutes. Then you put the meat in	the middle of	the tray, and you should spread tomato
a different taste. And the beauty of food depends on	the quality of	ingredients, the service of foods and the
tastes, attractive smells, health concepts…I think these all are	the results of	our respect for food and the decisions
the beauty of food depends on the quality of ingredients,	the service of	foods and the person's taste. 22 students
and sizes of the meals could be attractive, for instance,	the shape of	the food draws your interest by bringing
good choice to choose large or small dishes according to	the size of	food. Also, the color of the plate
as red and orange in their logos. Nutrition, which is	the source of	our life, is very important. That's why
it tastes different from what we are used to. Because	the types of	food are shaped according to the person's

As can be seen, the "is + for" structure utilizes the (+) component with an adjective or adverb.

Table 7: "is + for" lexical bundle examples

likes sugar you should far from bitter flavors. Shortly, food	is important for	people to stay alive, but present people
in a dish are meant by two reason first one	is especially for	flavor for example while your mother cooking
us happy, sad or giving us another emotions also it	is essential for	our health. preferences in food choices variety

make. Magic of Foods As all of us know, food	is indispen-sable for	both our health and hobby. Some people
the most attractive factor that motivates people to eat. It	is responsible for	triggering people to taste; however, the food
great. And it is not only for this food, it	is valid for	all foods. In conclusion, each food has

Table 8 presents several examples of significant 4-word bundles in reduced form. Table 9 presents the allocated slots, while the followings (10, 11, 12, 13, 14) illustrate some examples of the bundle structures.

Table 8: 4-word size n-grams

Type	Rank	Freq	Range	NormFreq	NormRange
we want to eat		1	5	1	780.884 1.000
food is not just	2	4	1		624.707 1.000
make the food attractive	2	4	1		624.707 1.000
part of our life		2	4	1	624.707 1.000
the taste of the		2	4	1	624.707 1.000
all over the world		6	3	1	468.530 1.000
eat with our eyes	6	3	1		468.530 1.000
makes the food attractive	6	3	1		468.530 1.000
one of the most	6	3	1		468.530 1.000
the appearance of a		6	3	1	468.530 1.000

Table 9: slots for 4-word size n-grams

Type	Rank	Freq	Range
the + of the	1	19	1
the + of food	2	10	1
we + to eat	3	7	1
the taste + the	4	6	1
not + to eat	9	4	1

of + food is		9	4	1
part + our life		9	4	1
is very + for		9	4	1
it is + for		9	4	1
part of + life		9	4	1
a + role in		27	3	1
all over + world	27	3	1	
is very + because	27	3	1	
it is + important	27	3	1	

Table 10: “the + of the” examples for 4-word size n-grams

that doesn’t look good. According to the visual and presentation,	the taste of the	food is curious. Besides the visual,
food according to the surveys, people not only care for	the flavors of the	food but also, they care appe- arance
even welcome to say something bad about the taste or	the appearance of the	food. Also leaving food on our
the taste is bad, you cannot please customer. What determines	the beauty of the	taste of the dish? How is
or small dishes according to the size of food. Also,	the color of the	plate can be in harmony with
dish attractive. The food taste is variable. “Bea- uty is in	the eye of the	beholder.” This expression sums up. Our
impress with its taste but also its presentation, service and	the location of the	place where you eat the food
us can be different from the photos they show on	the menus of the	restaurants. That’s why we should never
rest for twenty minutes. Then you put the meat in	the middle of the	tray, and you should spread tomato
we care about the color of it because color is	the one of the	most important things which make the
be mixed. Everything should be organized. Mixed plates bother me.	The presentation of the	food is not very important to
and sizes of the meals could be attractive, for instance,	the shape of the	food draws your interest by bringing
it ahead. Also smell and taste make food attrac- tive because	the smell of the	food can say too much about
on the feeling of hunger is also the letter S.	The use of the	letter creates a feeling of hunger
which trigger us to eat. How everything looks, tastes, smells,	the vibe of the	place where we are, who we’

Table 11: “the + of food” examples for 4-word size n-grams

are unlikely to even try it. According to most people,	the presentation of food	is more important than the taste.
makes us happy. So, both appearance and taste are effective.	The presentation of food	is just as important as its
location of the place where you eat the food change	the taste of food.	Even a bouquet of flowers on
of good is another important element. People want to like	the taste of food.	By our nature, delicious things are
admire the taste, not every place we come across. Besides,	the attractiveness of food	reflects not only its beauty but
foods. In conclusion, each food has a different taste. And	the beauty of food	depends on the quality of ingredients,
presentation of food is more important than the taste. Secondly,	the color of food	affects us psychologically. If it seems
lost. Well, what makes food so attractive? Firstly, we noticed	the decoration of food	then the taste of it. if
good choice to choose large or small dishes according to	the size of food.	Also, the color of the plate
it tastes different from what we are used to. Because	the types of food	are shaped according to the person’s

Table 12: "is very + for" examples for 4-word size n-grams

WHAT MAKES FOOD ATTRACTIVE Firstly, food choices	is very important for	our lives because they play a
why food is the most important element in life. It	is very important for	the continuation of life, but it
not busy with America they are all fast foods it	is very bad for	yourself speaking of fast food how
recommend you not to decide before you try it. Food	is very essential for	our lives. We must eat to

Table 13: "it is + for" examples for 4-word size n-grams

making us happy, sad or giving us another emotions also	it is essential for	our health. preferences in food choices
good. Different Tastes Food is a part of our life.	It is important for	us. Everyone's taste changes from culture
is the most attractive factor that motivates people to eat.	It is responsible for	triggering people to taste; however, the
be great. And it is not only for this food,	it is valid for	all foods. In conclusion, each food

Table 14: "a + role in" examples for 4-word size n-grams

Good-looking catering is important, but smell and taste play	a big role in	making food attractive. Food presentation and
choices is very important for our lives because they play	a key role in	some aspects by making us happy,
t care about appearance. As the second element, taste plays	a major role in	its attractiveness and the effect of

Table 15 indicates that only two structures are present in five-word bundles. This situation is also associated with the students' proficiency in foreign languages. At higher levels, the use of longer word bundles is expected to increase. This is likely attributable to the limited volume of the subject and sample. A comprehensive corpus review involving a greater number of subjects and participants is likely to reveal more bundles consisting of five or more words.

Table 15: 5-word size n-grams

Type		Rank	Freq	Range
that makes the food attractive	1	3	1	
when we want to eat		1	3	1

Table 16: "that makes the food attractive" examples for 5-word size n-grams

to say about this is that I think the thing	that makes the food attractive	is the smell, I still
and whether it is fresh so one of the features	that makes the food attractive	is that it is homemade.
food. To sum up, there is more than one thing	that makes the food attractive.	And everyone's choice is different

Table 17: "when we want to eat" examples for 5-word size n-grams

But everyone agrees with some things about food. For example,	when we want to eat	something, we want to look
the same taste in their own hands. That's why sometimes	when we want to eat	out, we go to places
us like homemade foods, some of us like ready-cooked.	When we want to eat	out, there are some factors

Conclusion

The investigation of lexical bundles in language learning underscores their crucial contribution to improving fluency and naturalness in communication among foreign language learners. The examination of a small-size learner corpus, student-generated paragraphs, regarding "attractive food" reveals the common occurrence of formulaic expressions, underscoring their frequency and functional significance in scholarly writing. The findings reveal that learners effectively employ common two-word and three-word bundles; however, there exists a significant gap in the utilization of longer phrases, indicating a need for further development in this domain. Focusing on the instruction of lexical bundles enables educators to enhance students' language proficiency, thereby improving the coherence and contextual appropriateness of their speech and writing. The integration of lexical bundles into language instruction facilitates fluency and enhances comprehension of language nuances across different contexts.

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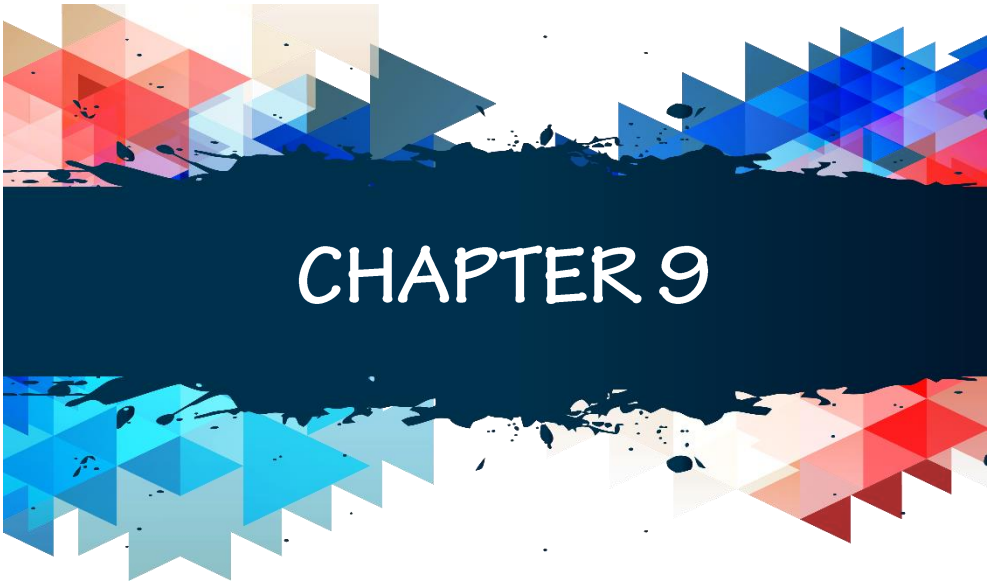

Bridging the Gap Between General and Professional Language A Corpus-Based Approach to DaF

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Germany's increasingly diverse workforce has elevated language integration as a key priority in national policy discussions. For immigrant jobseekers, proficiency in the German language is more than a tool for basic communication; it serves as a gateway to professional opportunities and societal inclusion (Aksakal & Schmidt-Verkerk, 2019; Finn, 2022). However, traditional language teaching methods often fail to meet the specific linguistic demands of professional environments. This chapter examines how corpus-based methodologies can transform German as a Foreign Language (DaF) instruction to better prepare immigrant jobseekers for workplace integration.

The integration of information technologies into education has revolutionized teaching methods, with corpus technologies emerging as a powerful tool in foreign language instruction. Text corpora, such as the Leipzig Corpus of Modern German (Wortschatz Universität Leipzig) (Goldhahn et al., 2012) and the DWDS (Digitales Wörterbuch der deutschen Sprache) (Klein & Geyken, 2010), provide authentic linguistic resources for creating targeted learning materials. Programs like QuAX-DaF (Quantitative Analyse von Texten für Deutsch als Fremdsprache) (Jach, 2020), which enable statistical text processing, allow educators to analyze language use and design tasks that align with real-world communication needs.

This approach emphasizes the dual focus required by immigrant jobseekers: general language skills and professional language proficiency. By leveraging extensive text corpora, educators can create materials that address specific professional contexts, such as workplace communication, technical vocabulary, and industry-specific grammar.

A pedagogical experiment conducted at Kazan Federal University highlights the effectiveness of corpus-based methodologies in teaching German. Sixty students participated, and statistically significant improvements were observed in the experimental group compared to the control group. Tasks included working with concordances, building lexical and collocation profiles, and compiling thematic dictionaries. These activities resulted in a 6% increase in students achieving a high level of lexical and grammatical skill formation, a 7% improvement at the average level, and a 13% reduction in the number of students with low proficiency (Mukhamadiarova, 2021).

The results underscore the potential of corpus-based linguodidactics to enhance DaF instruction. By integrating corpus technologies into teaching, educators can better align learning outcomes with the linguistic and professional needs of immigrant jobseekers. This chapter advocates for the broader adoption

of these innovative methods to facilitate language acquisition, professional success, and social integration for Germany's immigrant population.

Job-Related Language Promotion: A Cornerstone of Integration Policy in Germany

The Federal Government of Germany has made job-related language promotion a central pillar of its integration policies, recognizing the critical role of language proficiency in fostering both individual employability and broader societal cohesion. This emphasis is formally implemented under § 45a of the Residence Act (Federal Ministry of the Interior and Community, n.d.), providing a robust legal framework to address the unique linguistic demands posed by professional environments. Building on the foundational Integration Course system established by the Immigration Act of 2005, job-related language promotion reflects a growing recognition of the limitations of general language instruction in preparing migrants for the complexities of the labor market. The original Integration Course system, aimed at developing general German language proficiency up to the B1 level of the Common European Framework of Reference for Languages (CEFR), primarily supported migrants' basic communication and cultural orientation. However, the evolving economic landscape and increasing sector-specific demands necessitated a more targeted approach, resulting in the development of job-related language programs.

These programs are overseen by the Federal Office for Migration and Refugees (BAMF) and managed collaboratively by the Federal Ministry of the Interior (BMI) and the Federal Ministry of Labour and Social Affairs (BMAS). While the BMI focuses on general language promotion, the BMAS addresses advanced language needs through sector-specific courses tailored to professional contexts (Federal Office for Migration and Refugees, n.d.-a). This collaborative effort ensures that both integration and workforce demands are met, aligning individual learners' needs with Germany's economic priorities. Courses cater to various professions, including healthcare, engineering, commerce, and retail. For instance, healthcare professionals learn medical terminology and effective patient communication, while technical workers are trained in workplace safety language and the comprehension of technical documentation. Retail and customer service courses emphasize practical skills such as managing client interactions and resolving complaints. This sector-specific training not only equips participants with the necessary language skills but also fosters workplace integration, contributing to higher retention rates and satisfaction among migrant workers.

A distinctive feature of job-related language promotion is its bridging role between general proficiency and job-specific communication. For migrants who have completed general language courses but lack the nuanced vocabulary and pragmatic skills needed for professional interactions, these courses provide a critical pathway to workplace readiness. By incorporating authentic materials and real-life scenarios, the programs build confidence and competence, enabling participants to navigate complex workplace environments effectively. Early evaluations of these programs indicate positive outcomes, including improved workplace performance and greater confidence in professional settings. However, challenges persist, such as limited accessibility for migrants in remote areas or those with financial constraints. Additionally, ensuring sufficient funding and resources, as well as balancing standardized curricula with the need for customization across diverse professions, remains an ongoing concern.

Looking forward, several strategies could enhance the impact of job-related language promotion. Expanding digital access through online modules or virtual classrooms could address geographic and scheduling barriers. Strengthening partnerships with industry stakeholders would allow course content to be continuously refined to meet evolving labor market demands. Furthermore, tracking long-term outcomes, such as job placements and career advancements, would provide valuable insights into the effectiveness of these programs and help identify areas for improvement. Overall, job-related language promotion represents a cornerstone of Germany's integration strategy, underscoring the vital connection between language proficiency and economic participation. By empowering migrants to contribute meaningfully to the workforce and fostering their long-term social inclusion, these programs play a pivotal role in addressing both integration and workforce development challenges. Continued investment and innovation in this area will be critical for sustaining its success in an increasingly diverse and dynamic labor market.

The Role of Language in Labor Market Integration

Germany's increasingly diverse workforce has placed language integration at the forefront of national policy discussions, emphasizing the critical role of linguistic skills in both personal and professional success. For adult migrants, language proficiency is a key determinant of successful employment and career advancement, enabling access to job opportunities and the effective navigation of workplace dynamics (Grünhage-Monetti et al., 2017). Beyond facilitating basic communication, mastery of the language allows migrants to build rapport with colleagues, comprehend technical instructions, and participate in the professional decision-making processes essential to workplace integration. Without these

skills, even highly qualified individuals may struggle to secure employment that aligns with their expertise, limiting their upward mobility and impeding their broader social inclusion.

Recognizing these challenges, programs such as the Language for Work Network (LfW) have been instrumental in promoting work-related language learning. These initiatives focus on equipping migrants with practical linguistic skills tailored to the needs of specific professions, supporting their transition into the workforce and enhancing their overall employability (Grünhage-Monetti et al., 2017). The LfW program, in particular, emphasizes task-based learning and real-life scenarios, such as drafting workplace emails, engaging in team discussions, or adhering to safety protocols. This targeted approach ensures that language instruction directly addresses the communicative demands migrants are likely to encounter in their roles, bridging the gap between general proficiency and workplace fluency.

The emphasis on work-related language training is especially critical in light of Germany's growing need for skilled workers, which has been exacerbated by demographic changes and economic demands. As industries such as healthcare, engineering, and information technology face labor shortages, the ability to integrate linguistically proficient migrants into these fields has become a national priority (Hochleitner & Roche, 2019). Language-sensitive training programs, designed to align with specific occupational requirements, play a pivotal role in meeting this need. For example, in healthcare, professionals are trained not only in medical terminology but also in empathetic communication with patients and families. Similarly, in technical professions, workers are taught to understand and use complex instructions, ensuring workplace safety and efficiency. These tailored programs not only prepare migrants for employment but also contribute to their long-term retention and career progression within their chosen fields.

However, achieving effective language integration requires addressing several challenges. Migrants often face barriers such as limited access to training programs, time constraints due to employment or family obligations, and financial limitations. Moreover, the diversity of migrants' educational backgrounds and professional experiences necessitates flexible and individualized approaches to language instruction. Policymakers and educators must collaborate to ensure that programs are accessible, inclusive, and responsive to the evolving demands of the labor market. Digital solutions, such as online learning platforms and mobile applications, could further expand access to language training (Ercanlar, 2023), especially for migrants in remote areas or those balancing multiple responsibilities.

The role of language in labor market integration extends beyond individual outcomes; it has broader implications for Germany's economy and social cohesion. By providing migrants with the linguistic tools to contribute meaningfully to the workforce, language programs foster greater productivity and innovation within industries while reducing skills mismatches and underemployment. Additionally, these initiatives promote a sense of belonging and inclusion, empowering migrants to participate fully in the cultural and social fabric of their new communities. For Germany, the continued prioritization of language integration, coupled with ongoing investments in work-related language training, will be essential to addressing labor market challenges and building a more inclusive society.

Job-Related Language Courses and the CEFR Framework

Job-related language courses in Germany aim to advance participants' German proficiency beyond the foundational B1 level, aligning with the Common European Framework of Reference for Languages (CEFR) (Council of Europe, n.d.). The CEFR is a globally recognized standard that categorizes language proficiency into six levels, from A1 (basic user) to C2 (proficient user), with each level representing progressively advanced competencies (Goethe-Institut, n.d.-a). These courses are specifically tailored to meet the needs of individuals seeking employment in academic and professional fields, including medical practitioners, specialist healthcare workers, and those in vocational sectors such as commerce, technology, and retail. Additionally, they cater to participants in general integration courses who have not yet achieved B1-level proficiency, bridging the gap between foundational language skills and the specific linguistic demands of professional environments (Federal Office for Migration and Refugees, n.d.-b).

Participants in job-related language courses benefit from a structured curriculum that emphasizes real-world application and workplace readiness. The courses incorporate exposure to authentic materials, practice opportunities tailored to professional scenarios, and personalized instruction designed to address sector-specific language needs. For instance, healthcare professionals may learn medical terminology and patient interaction techniques, while retail workers focus on client communication and managing transactions. These efforts culminate in assessments such as Start Deutsch 1 (SD1) and Start Deutsch 2 (SD2), which validate learners' abilities to use German effectively in practical contexts, thereby easing their transition into the labor market (telc GmbH, n.d.; Goethe-Institut, n.d.-b).

Recent policy developments have underscored the Federal Government's commitment to integrating migrants into Germany's workforce. The introduction of specialized professional language courses, or Berufssprachkurse, represents a significant shift from a general integration focus to a dual emphasis on language acquisition and occupational readiness (Federal Office for Migration and Refugees, n.d.-a). These courses are critical for addressing linguistic barriers that hinder access to employment and equipping migrants with the tools needed to succeed in specific professional sectors (Migrationsberatung, n.d.). By focusing on the practical application of German in workplace settings, these programs enhance participants' employability and empower them to contribute meaningfully to the economy.

In parallel with government initiatives, educational institutions have adapted their curricula to address the linguistic needs of a multicultural workforce. This includes integrating sector-specific language training to enhance employability and align education with labor market requirements (Hochleitner & Roche, 2019). At the same time, policies are evolving to recognize the value of multilingualism alongside German proficiency, acknowledging that a multilingual workforce better reflects the realities of Germany's diverse society. Scholars argue that a multilingual approach not only enriches the cultural landscape but also fosters greater inclusivity and innovation in the workplace (Pfaff, 2011; Stevenson, 2015).

Despite these advancements, challenges persist. One significant issue is the tension between an emphasis on monolingualism in education and the reality of a multilingual society. Migrants may feel pressured to conform to a singular linguistic standard, marginalizing their native languages and, in some cases, hindering their sense of identity and inclusion (Pfaff, 2011; Stevenson, 2015). Addressing this tension requires a balanced approach that values German proficiency while supporting the maintenance of migrants' native languages. By fostering a more inclusive environment, Germany can better leverage the linguistic diversity of its workforce as a strength rather than a limitation.

Aligning language instruction with professional needs not only supports individual migrants' occupational development but also enhances broader societal integration. Programs that integrate work-related language learning with policies supporting multilingualism have the potential to transform Germany into a truly inclusive society. This approach strengthens the labor market by equipping migrants with the linguistic tools necessary for meaningful participation in an evolving economy while promoting a vision of diversity as an asset rather than a challenge.

Corpus-Based Approach

The corpus-based approach in language instruction, particularly in the context of German as a Foreign Language (DaF), leverages large collections of authentic written and spoken texts to enhance learning outcomes. This methodology, which gained prominence with the development of advanced corpus analysis tools in the late 1970s, has become a cornerstone of modern linguistics and language education. By analyzing patterns, frequencies, and contexts in real-world communication, corpus-based approaches allow educators to design instruction that is both targeted and contextually relevant. This bridge between theoretical knowledge and practical application ensures that learners gain language skills directly aligned with real-life demands (Frankenberg-Garcia, 2014; Lee et al., 2020).

A key advantage of this methodology is its ability to highlight high-frequency vocabulary and phrases specific to professional or academic domains. Corpora provide educators with detailed information about words and expressions that are most commonly used in particular fields, enabling the prioritization of content that meets learners' immediate needs (Vyatkina, 2016). Additionally, corpus analysis reveals authentic communication patterns, such as sentence structures, discourse markers, and interactional norms, making it possible to teach language that aligns with natural workplace or academic usage (Lee et al., 2020). Another critical function of corpus-based instruction is the documentation of domain-specific language, such as technical terms, compound nouns, and lexical bundles, which are essential for professions like engineering and healthcare (Kogan et al., 2018). Moreover, corpus data offers valuable insights into register variations, helping learners adapt their communication to different formal and informal contexts (Frankenberg-Garcia, 2014). Finally, the approach supports Data-Driven Learning (DDL), where learners interact directly with corpus data. This method enhances comprehension and retention by exposing learners to multiple examples, fostering both immediate learning gains and long-term mastery of language structures (Vyatkina, 2016; Frankenberg-Garcia, 2014).

To implement corpus-based methodologies effectively in DaF instruction, educators must align them strategically with pedagogical objectives and learner-specific factors. Research indicates that factors such as vocabulary proficiency, strategy use, and working memory significantly influence learners' ability to manage the cognitive demands of data-driven learning environments (Lee et al., 2020). A successful implementation involves several critical strategies. First, educators need to select and develop targeted corpora that align with learners' goals. For instance, the Kod.ING corpus, designed for engineering students, has

demonstrated success in improving academic writing skills through the teaching of German compound nouns and lexical bundles (Kogan et al., 2018). Second, Data-Driven Learning activities, such as analyzing concordances or creating lexical profiles, have proven particularly effective. While computer-based activities often result in immediate learning gains, paper-based exercises are more conducive to long-term proficiency development (Vyatkina, 2016). Third, corpus data can inform the creation of context-driven learning scenarios, such as drafting technical reports or conducting workplace dialogues, which equip learners with practical, career-oriented skills.

Assessments in corpus-based learning must also align with practical needs, measuring learners' ability to apply language skills in authentic contexts. For example, corpus-informed tests can evaluate learners' proficiency in composing academic texts or participating in professional communication scenarios (Frankenberg-Garcia, 2014). Moreover, integrating corpus-based methods with traditional approaches ensures a balance between theoretical instruction and practical application. This blended approach enables learners to develop a deeper understanding of language mechanics while applying their skills in real-world situations. Teacher training is another essential component of successful implementation. Educators require both technical proficiency in using tools like AntConc and Sketch Engine and access to domain-specific corpora. Providing training resources and support empowers teachers to integrate corpus-based methods seamlessly into their classrooms.

By employing these strategies, educators can create robust learning environments that combine corpus data with learner-centric approaches. The outcomes include not only improved proficiency in both general and domain-specific German but also enhanced academic and professional success. The corpus-based approach ultimately transforms DaF instruction, equipping learners with the tools to navigate complex linguistic landscapes while meeting the practical demands of their academic and professional lives.

Corpus-Based Methods in Applied Linguistics: Applications, Benefits, and Challenges

Corpus-based methods have fundamentally transformed applied linguistics, particularly in the creation of teaching materials, grammar references, and dictionaries, while significantly enhancing language teaching and learning practices across various proficiency levels. By analyzing large collections of authentic texts, these methods provide empirical insights into language use, enabling educators to design instructional resources that are more relevant,

effective, and data-driven (Paquot, 2018; Roslim et al., 2020; Zhou, 2023). Despite certain challenges in their implementation, corpus-based approaches remain central to contemporary language pedagogy, offering unparalleled opportunities for innovation and learner-centered instruction.

One of the most significant contributions of corpus-based methods is their role in developing targeted teaching materials. Through the analysis of authentic language data, educators can identify high-frequency vocabulary, common collocations, and grammatical patterns tailored to the specific needs of learners (Staples & Anthony, 2023). This data-driven approach ensures that syllabi, textbooks, and classroom exercises reflect real-world language use, enhancing their practicality and relevance (Paquot, 2018; Roslim et al., 2020). For example, corpus-informed grammar books and dictionaries offer precise and comprehensive descriptions of language in context, addressing gaps in traditional prescriptive methods and making these resources more applicable to learners' needs (Cobb & Boulton, 2015; Zhou, 2023). Additionally, learner corpora provide deeper insights into language acquisition processes, allowing educators to design personalized teaching materials. For instance, domain-specific corpora have been effectively used to teach German compound nouns and lexical bundles to engineering students, resulting in significant improvements in their academic writing skills (Kogan et al., 2018; Zhou, 2023). This alignment of instructional content with authentic language usage underscores the practical and learner-centered nature of corpus-based methods.

Corpus-based methods also play a pivotal role in enhancing teaching methodologies across a broad spectrum of language skills, including grammar, vocabulary, reading, writing, speaking, and listening. Their flexibility allows educators to meet the diverse needs and proficiency levels of learners. Empirical research demonstrates that corpus-based grammar instruction produces better learning outcomes compared to traditional methods by using authentic examples to clarify complex grammatical rules, fostering a deeper and more intuitive understanding (Jacobs & Isaac, 2024; Jung, 2024). In vocabulary teaching, corpus analysis enables educators to identify frequently used collocations and usage patterns, which can then be incorporated into systematic and impactful exercises. These exercises help learners develop a more natural command of the language (Movsesyan, 2021). Moreover, Corpus-Based Learning (CBL) transforms classroom dynamics from teacher-centered to student-led, empowering learners to engage directly with corpus data. This approach enhances critical thinking, analytical skills, and learner autonomy, leading to greater engagement and long-term retention (Tolmasova, 2022; Jung, 2024). Specialized corpora have also

been utilized to support professional and academic skill development. For example, corpus-informed materials have been shown to improve leisure reading comprehension (Tolmasova, 2022) and enhance advanced writing skills through lexicogrammatical insights (Staples & Anthony, 2023). These applications demonstrate the comprehensive and practical framework that corpus-based methods offer for modern language education.

Despite their numerous advantages, corpus-based methods are not without challenges. One significant obstacle is the technical barrier they pose, as implementing these methods often increases teacher workload and requires a level of corpus literacy that many educators may lack. Comprehensive training in the use of corpus tools, such as concordancers and frequency analyzers, is necessary to empower teachers to use these methods effectively (Jung, 2024). Furthermore, the pedagogical mediation of corpus data is crucial. Raw corpus data can be overwhelming and difficult for learners to interpret, necessitating careful adaptation by educators to make the insights accessible and meaningful. This highlights the need for clear frameworks and guidelines to maximize the pedagogical value of corpus-based insights (Paquot, 2018; Roslim et al., 2020). Another challenge lies in selecting appropriate reference corpora and balancing the authenticity of corpus data with its relevance to learners' needs. While authentic examples provide a realistic learning experience, they must also be accessible to learners to ensure effective instruction (Roslim et al., 2020). Addressing these challenges is essential for fully leveraging the potential of corpus-based methodologies in language education.

Overall, corpus-based methods have significantly bridged the gap between real-world language use and classroom instruction. They enable the creation of teaching materials, grammar references, and dictionaries that are empirically grounded and contextually relevant (Zhou, 2023). Additionally, innovations such as Data-Driven Learning (DDL) and Corpus-Based Learning (CBL) foster greater learner autonomy and critical engagement with language data, enhancing outcomes across all proficiency levels (Cotos, 2017; Staples & Anthony, 2023). While challenges such as technical difficulties and the need for pedagogical mediation remain, the potential of corpus-based approaches to advance language education is immense. With ongoing professional development for educators and clearer strategies for implementation, corpus-based methods can further solidify their role as a cornerstone of modern language pedagogy (Jung, 2024).

Integrating **Corpus**-Based Pedagogy into Teacher Education Programs

The integration of corpus-based pedagogy into teacher education programs represents a crucial step in equipping educators with the skills required for modern language instruction. As technology becomes increasingly central to education, corpus-based methodologies offer innovative approaches that emphasize the importance of corpus literacy. This literacy, defined as the ability to access, analyze, and apply corpus data within pedagogical contexts, is essential for educators to fully exploit the potential of corpus linguistics in the classroom.

Developing corpus literacy is vital for teachers aiming to adopt data-driven instructional methods. It requires an understanding of corpus construction, proficiency in utilizing corpus tools, and the ability to interpret data to inform teaching practices. Without these foundational skills, educators may find it challenging to transition from traditional methods to corpus-based approaches or to effectively integrate corpus insights into their lessons. Research highlights the transformative impact of structured training on teacher trainees, demonstrating that tools such as concordancers and frequency analyzers empower educators to design materials that are both innovative and empirically grounded (Ma et al., 2021; Xodabande & Nazari, 2022). Through such training, teachers can develop the capacity to create instructionally relevant materials that reflect authentic language usage.

Structured training in corpus-based pedagogy offers numerous benefits, significantly enhancing educators' teaching effectiveness and professional competence. Exposure to authentic language data allows teacher trainees to understand grammar and vocabulary within real-world contexts. By identifying patterns such as high-frequency vocabulary, collocations, and discourse markers, educators can design materials that align with practical language use (Liu et al., 2024; Schmidt, 2022). Corpus-driven activities also promote discovery learning, fostering interactive and engaging lessons compared to traditional approaches. This hands-on approach encourages critical thinking and analytical skills, enabling educators to explore language patterns alongside their students, thus fostering collaborative and stimulating learning environments (Liu et al., 2024; Tolmasova, 2022).

Moreover, corpus-based pedagogy enhances teachers' professional communicative competence and pedagogical skills, preparing them to address the diverse needs of their classrooms. Teachers frequently report increased confidence and competence in using corpus methods to design innovative instructional practices tailored to specific learning contexts (Чухно & Tuchyna,

2024; Ma, 2024). For instance, corpus tools can support the development of domain-specific teaching materials, such as resources for professional English or advanced academic writing. This ensures that learners acquire language skills relevant to their personal, academic, or professional goals (Cotos, 2017; Kogan et al., 2018).

Teachers generally express positive perceptions of corpus-based pedagogy, noting its long-term value in creating effective and engaging learning environments (Latif, 2020; Çalışkan & Gönen, 2023). These perceptions underscore the transformative potential of corpus methodologies in language education. However, maximizing their impact requires the use of comprehensive and reflective approaches that strengthen educators' corpus literacy and pedagogical skills. One effective strategy is a two-step training model, beginning with classroom-based instruction and followed by online collaboration. This approach has proven successful in simultaneously developing corpus literacy and practical teaching applications (Ma et al., 2021). Hands-on activities, such as searching for authentic language examples, designing lesson plans, and analyzing learner corpora, are also essential for building confidence and ensuring the effective application of corpus methodologies in real-world scenarios (Çalışkan & Gönen, 2023). Reflective practices, such as diary writing and group discussions, further enhance teachers' understanding of corpus-based approaches and encourage ongoing professional development (Schmidt, 2022; Şimşek & Can, 2023).

Despite these benefits, implementing corpus-based pedagogy is not without challenges. Technological barriers, including limited access to resources and insufficient digital skills among educators, can hinder its effective integration into teaching practices (Чухно & Tuchyna, 2024). Resistance to change also presents a challenge, as some teachers may lack confidence in their abilities or be unaware of the advantages offered by corpus-based methods (Farr & Riordan, 2024). Additionally, a research-practice gap persists: despite extensive evidence supporting the effectiveness of corpus-based pedagogy, its classroom implementation remains inconsistent. This gap often stems from accessibility issues, inadequate training, and the perceived complexity of using corpus tools (Foll, 2024).

To overcome these obstacles, teacher education programs must integrate corpus methodologies systematically into their curricula. This includes extensive exposure to corpus tools and concepts during training, enabling educators to implement these approaches effectively in their classrooms (Şimşek & Can, 2023). Ensuring access to digital tools, providing comprehensive professional

development opportunities, and fostering collaborative research initiatives are critical for overcoming technological and pedagogical challenges. Reflective practices should also be incorporated into training to encourage continuous self-improvement among educators.

By addressing these challenges, teacher education programs can make corpus-based pedagogy a cornerstone of 21st-century language instruction. This forward-looking approach equips teachers with the skills to design evidence-based, innovative teaching practices that align with authentic language use. In turn, students benefit from enhanced learning outcomes, gaining the linguistic tools necessary for academic, professional, and personal success in an increasingly interconnected world. Sustained support and innovation will ensure that corpus-based pedagogy continues to evolve, enriching the field of language education and meeting the demands of diverse learners and educators.

Corpus-based pedagogy has emerged as a transformative approach in language teaching, leveraging linguistic corpora to enhance learning outcomes and foster learner autonomy. This methodology is particularly effective in areas such as vocabulary acquisition, grammar understanding, and writing skills development. By providing learners with access to authentic language data, corpus-based methods not only enrich the learning experience but also empower students to engage in data-driven, autonomous learning.

One of the key strengths of corpus-based pedagogy is its ability to provide authentic language input. Research has shown that exposure to real-world language use through corpora significantly enhances vocabulary acquisition and retention. For instance, Iranian EFL learners demonstrated improved vocabulary retention when taught using corpus-based methods (Ashkan & Seyyedrezaei, 2016). Similarly, studies in China highlight that the successful integration of corpora into teaching practices depends on careful planning and methodological alignment (Bin-kai, 2012). This underscores the dual importance of corpus tools and the pedagogical strategies used to implement them effectively in the classroom.

Practical Applications of Corpus-Based Pedagogy in the Job-Related Language Courses

Corpus-based pedagogy also encourages a shift from traditional teacher-centered approaches to more learner-centered, discovery-based learning methodologies. Data-driven learning (DDL), a central feature of corpus-based teaching, empowers students to analyze authentic linguistic data, identify patterns, and derive rules independently. This active engagement fosters critical

thinking, self-correction, and greater autonomy among learners (Cotos, 2014; Смирнова, 2017). Furthermore, DDL has been shown to improve writing skills by allowing students to analyze corpora for error correction and stylistic refinement (Xiu-hui, 2016). In professional contexts, corpus-based pedagogy enables learners to develop specialized vocabulary and discourse patterns, preparing them for effective communication in specific job roles (Almutairi, 2016; Chambers et al., 2011).

Despite its advantages, implementing corpus-based pedagogy poses several challenges. Educators often face technological barriers, including limited access to corpus tools and a lack of training in their effective use (Farr, 2024; Frankenberg-Garcia, 2010). Additionally, there is often resistance to change among teachers, stemming from a lack of confidence or awareness regarding the potential benefits of corpus-based methods (Latif & Muhammad, 2020; ÖZBAY & KAYAOĞLU, 2014). To address these challenges, comprehensive teacher training programs are essential. Such programs should focus on building corpus literacy and equipping educators with practical strategies to incorporate corpora into their teaching practices (Huang, 2023; Boulton, 2010).

Looking ahead, the integration of corpus-based pedagogy into teacher education programs represents a forward-thinking approach to preparing educators for modern language instruction. By fostering corpus literacy and promoting hands-on, reflective training, these programs empower teachers to design innovative, evidence-based instructional practices. This not only enhances teachers' professional competencies but also improves student learning outcomes by exposing learners to authentic and contextually relevant language use.

As the field of applied linguistics continues to grow, addressing challenges such as technological barriers, resistance to change, and the research-practice gap will be critical. Collaborative research, accessible resources, and curriculum-wide integration of corpus-based methods will play key roles in overcoming these obstacles. With ongoing support and professional development, corpus-based pedagogy can become a cornerstone of 21st-century language education, equipping both teachers and learners to thrive in an increasingly globalized world.

Conclusion

The integration of corpus-based methodologies into German language instruction, particularly for professional and workplace communication, represents a transformative advancement in addressing the linguistic demands of Germany's evolving workforce. This comprehensive exploration of practices, policies, and outcomes highlights not only the substantial progress achieved but

also the critical pathways forward for enhancing language education in professional contexts.

Corpus-based approaches stand out for their unique ability to bridge the gap between general language proficiency and the specific communication needs of professional environments. By harnessing authentic linguistic data and advanced technological tools, these methodologies deliver targeted and effective instruction. Programs like the Language for Work Network and job-related language courses, aligned with the Common European Framework of Reference for Languages (CEFR), demonstrate the efficacy of structured approaches in facilitating migrant integration into Germany's workforce.

Empirical evidence, such as the Kazan Federal University experiment, underscores the potential of corpus-based teaching methods to enhance both general language skills and profession-specific communication abilities. These data-driven approaches not only improve linguistic competencies but also foster learner engagement and confidence in real-world applications. Furthermore, Germany's cohesive integration of corpus-based pedagogy with comprehensive migration policies showcases a strategic alignment of educational innovation with workforce development goals.

However, challenges persist that demand sustained attention. Technological barriers, the need for extensive teacher training, and the complexities of balancing standardized curricula with profession-specific requirements remain significant hurdles. Ensuring equitable access to high-quality educational resources across diverse regions and demographic groups is also a pressing issue. These challenges highlight the importance of addressing systemic inequities while refining methodological frameworks.

Looking ahead, several priorities emerge for the continued development of corpus-based methodologies. The expansion of digital platforms and tools can address accessibility concerns and provide flexible learning options for diverse learners. Strengthening partnerships between educational institutions and industry stakeholders will ensure that language instruction adapts to the rapidly evolving demands of the workplace. Equally critical is ongoing investment in teacher training and professional development, equipping educators with the skills to fully harness corpus-based methods.

Germany's approach to language integration offers valuable lessons for other countries navigating similar challenges. The integration of clear policy frameworks, evidence-based teaching methodologies, and targeted professional language instruction sets a global benchmark for fostering workforce inclusivity.

Adapting this model to different socio-economic and cultural contexts can provide effective solutions for diverse linguistic landscapes.

In conclusion, while significant progress has been made in developing effective professional language instruction, ongoing innovation and adaptability will be essential. The dynamic nature of work, coupled with demographic shifts, demands flexible educational approaches that balance standardization with customization. Corpus-based methodologies, supported by robust policy frameworks and advanced technologies, provide a promising foundation for meeting these challenges. Success will hinge on maintaining accessibility and quality, empowering educators, and equipping learners to thrive in professional environments.

The future of professional language instruction lies in the continued refinement of these approaches, particularly through technological integration, enhanced teacher preparation, and closer alignment with workplace needs. By maintaining this forward-looking focus, Germany can not only sustain its leadership in language integration and workforce development but also inspire global advancements in inclusive and effective education.

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Teachers' Views on the Use of Metaphor in English Language Teaching

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Introduction

With the development of science and technology, the world is getting smaller and communication between societies is increasing. Today, the goal of contemporary education is to raise individuals who interpret information, realize and develop themselves, think critically and creatively, solve problems, adapt to changing conditions and communicate effectively (Acat and Ekinci, 2005). In line with this goal, the ability to use both the mother tongue and a valid foreign language at a good level has gained importance.

Foreign language teaching, where English is at the forefront, is very important in today's education systems. In order to communicate with this world, English teaching must be efficient and individuals must learn English at a skill level (Duyar and Özkan, 2020).

Basic language skills that provide the functions of understanding and expressing the language are given meaning and shaped through words. The richer the vocabulary a person has in both his mother tongue and the foreign language he learns, the better he can understand what he reads and listens to, and express himself effectively and accurately (Köktürk, 2021). According to Wilkins, who defends the importance of vocabulary teaching in foreign languages; Without grammar, something can be said, but without words, nothing can be said. Despite the importance of words in language learning, teaching vocabulary has not been given as much importance as teaching grammar for years, and the view that words can be learned through experience has been accepted (Thornbury, 1991; Schmitt, 2012; Başören, 2015). However, when it was realized how difficult it is to communicate without sufficient and qualified words and that students who are new to a foreign language can communicate only with words without grammar, emphasis was placed on studies in the field of teaching vocabulary (Cunningsworth, 1995).

Before the 1950s, words were given to students in lists with their meanings written across them in the native language, and then it was advocated that words should be taught in a semantic context (contex) rather than on their own. In the methods accepted since the beginning of the 19th century, the words learned were limited to words in literary works. Students were asked to find the meanings of words. First, listening and speaking should be done, then reading and writing. After the 1970s, it was advocated that teaching words in a communicative context would be more beneficial (Demirel, 2007; McDonough, Shaw, 1996).

With the paradigm shift in education from a teacher- or subject-centered approach to a student-centered approach, foreign language teaching has shifted

from a teacher-centered approach to learner-centered practices, and the use of student-centered methods and techniques suitable for meaningful learning has come to the fore (Harmer, 1991). For example, according to the constructivist learning approach, learning and remembering become easier when students associate new information with a pre-existing schema in their minds and connect it to old information. In teaching processes carried out in accordance with this understanding, it is aimed to ensure active participation of students in the course (Arslan and Bayrakcı, 2007).

Similar to the applications that have evolved into student-centered paradigms in education, the use of metaphors has also come to the fore as one of the effective tools in learning words specific to a language. Metaphors are an inseparable part of thinking and reasoning that is not mostly based on similarity, that characterizes not only words but also concepts, and that aims to explain certain concepts better, not only for artistic and aesthetic concerns. Metaphors do not only make our thoughts clearer and more interesting, they also shape our perceptions and understandings. In this respect, metaphors play an important role in learning words specific to a foreign language (Lackoff and Johnson, 2003).

Metaphor is a linguistic tool and symbolic language structure that associates abstract concepts with known concrete concepts in understanding an abstract, complex and theoretical structure (Taşdemir and Taşdemir, 2001). For metaphor, it allows us to see a concept we want to understand from different perspectives by reconceptualizing it within the whole of concepts belonging to another meaning (Arslan and Bayrakcı, 2006).

Metaphors are the most important tools of thoughts (Kesen, 2010). In recent years, it has been suggested that metaphor, which is a mental concept, has an important place both in the verbal and intellectual worlds, and that in this respect, metaphor is not only a type of language but also an important part of our daily lives, consciously or unconsciously, in terms of thought and language (Yağız, 2004). Metaphors are powerful mental tools that individuals use to understand and explain quite abstract, complex and theoretical phenomena (Gürol and Donmus, 2010). According to Wahyudi (2007), metaphors have become effective tools in explaining new concepts to the reader in the light of this information by generating or interpreting new meanings of abstract or difficult concepts (Matterson, Jones, 2000:34). Taşdemir and Taşdemir (2011) divide metaphor into two as “word metaphors”, where words are used outside their literal meanings, and “idea metaphors”, where ideas are used outside their literal meanings.

In the learning process, when a concept is learned by comparing it to another concept, a metaphor is used. These two concepts do not have to be very similar to each other; just knowing one makes it easier to understand the second. Metaphors are symbols and the emotional intensity of symbols is higher than normal words, and they make it easier to connect the relationship between these two concepts through associations (Yousefi, 2005).

The associations created by metaphors vary from person to person. However, a person's perspective on the world is possible through language, which is the window of the society they live in. In foreign language teaching, it is only possible for certain linguistic expressions to combine facts in the brain through associations. In the foreign language learning process, words can be presented to the person with sentences or sentence patterns, making associations possible. Metaphors used in the teaching process are quite useful in putting these associations to work.

Metaphors take thoughts to the next level and act as a bridge between two gaps (Wright, Sundberg, Yarbrough, Wilson, Stallworth, 2002). The creative, innovative and interactive role of metaphor is that students establish similarities between their prior knowledge and new knowledge (Botha, 2009). In line with these definitions, as Groth and Bergner (2005) also stated, “metaphor is a window”, which is also a metaphorical definition. “Metaphors contain much deeper meanings than they express” (Sennett, 1980 as cited in: Çelikten, 2006). Since the metaphors used are based on the personal experiences of individuals, Miller (1987) also defined them as “the language of experiences” (Saban, 2004).

Metaphor is often used as a linguistic tool between elements to create a mental combination. In the process of creating a metaphor, a comparison is made between two well-known and less-known things in the mind. For this reason, metaphor plays an important role in language learning and teaching as a conceptual and cognitive tool (Miao, 2023).

After Lakoff and Johnson's (2003) study titled "Metaphors We Live By", the importance of metaphors in linguistics and language teaching has increased. They revealed that metaphors are the basic language element that forms thought and language. For this reason, cognitive linguists accept metaphors as a natural element of language.

Since metaphors enable individuals to see certain concepts with other concepts, they play a very active role in students' development of different perspectives. Metaphors are a cognitive tool used for storing new information and recalling it with evokers when necessary (Güven and Güven, 2009). In order to

increase academic success in English language teaching and to ensure that the information learned is permanent, the metaphor language teaching method is very important in terms of students turning the words they learn at school into permanent learning through metaphors and producing products. At the same time, it is expected that the appropriate and correct use of metaphors will positively affect students' success and attitudes towards the lesson/learning.

Since metaphors play an important role in understanding how language and thoughts are structured, they are also considered important in language learning and teaching. According to today's understanding, learning occurs by storing new information in previously existing schemes through analogy. Students can obtain more meanings than words can create thanks to metaphors. Thus, it provides creative support to students while the language is being structured. Metaphorical language allows us to express abstract and difficult concepts in a concrete way (Yağız and Yiğiter, 2007). Maoting (2021), in his study investigating the applicability of vocabulary teaching based on conceptual metaphor and the concrete effects of vocabulary teaching under the guidance of ontological metaphor, structural metaphor and orientational metaphor, concluded that metaphors contribute to the elimination of problems that exist in the vocabulary teaching process and the development of students' cognitive acquisition competencies.

It is thought that this study, which focuses on the results of using metaphors both as a linguistic element and as an effective method in teaching vocabulary, will provide feedback to program developers with its findings on the learning-teaching process, to English teachers with its results on the qualities of the activities in the learning-teaching process, and to educational experts, academicians and language teaching at universities with its general results, and will contribute to a certain extent.

Purpose of the Study

The purpose of the study is to determine teachers' opinions on the effectiveness of metaphor, a mental concept, in teaching English words. In line with this basic purpose, the following questions were sought in the study.

1. What are the opinions of English teachers on the effectiveness of metaphor in teaching English words?

2. What are the similarities and differences between the opinions of English teachers teaching at primary, secondary and high school levels regarding the use of metaphor in teaching English words?

Assumptions of the Study

This study was conducted based on the following assumptions:

1. It was assumed that the English teachers in the study group responded to the questions sincerely.

2. It was assumed that the opinions of the experts consulted regarding the content validity of the data collection tool used were sufficient.

Limitations of the Study

The limitations of this study are listed below:

1. The research is limited to the literature that can be accessed in terms of theoretical framework.

2. It is limited to the teaching of words in English courses at primary, secondary and high school levels as a subject area.

3. It is limited to the "Interview Form" as a data collection tool.

4. It is limited to English teachers working at primary, secondary and high school levels in the 2023-2024 academic year as a data source.

Methodology

Research Model/Design

This study, which was structured to determine teachers' views on the use of metaphor in teaching English vocabulary, is a descriptive study in which the qualitative research method was adopted. Since the aim of this study was to provide detailed meaning to a phenomenon and examine it, the phenomenological design, one of the qualitative research methods, was adopted.

Phenomenology is a qualitative research design that deeply examines events, experiences or situations that we encounter in our lives but do not have detailed information about or do not think about much (Creswell, 2009). In general, it investigates direct experience gained from a theoretical perspective. The feelings, perceptions and thoughts of the participants about the experience they have lived and how they structure these and create a conscious situation for themselves are examined in phenomenology studies (Van Manen, 2007).

In the light of this information, the phenomenology, one of the patterns belonging to the qualitative research method, was adopted in this study, which was conducted to reveal in detail the views and experiences of English teachers on the use of metaphor in learning English words.

Study Group

In this study, criterion sampling and easily accessible case sampling, which are among the purposeful sampling methods, were used to determine the study group. In purposeful sampling, criteria that are assumed to be important for selection are determined and the sample selected according to these criteria is considered to represent all the characteristics of the research universe (Tavşancıl and Aslan, 2001). On the other hand, easily accessible case sampling provides speed and practicality to the research. The researcher selects a situation that is close and easy to access (Yıldırım and Şimşek, 2008). Accordingly, the study group of the research consisted of a total of 18 English teachers who work in public schools at the primary school (6), secondary school (6) and high school (6) levels and use metaphors in their lessons.

Data Collection

Semi-structured interview technique was used to obtain data for the purpose of the research. In the process of preparing the semi-structured interview form, firstly the literature on the research topic was scanned and by using the data obtained from the literature, a semi-structured interview form consisting of a question pool and probes belonging to the questions was prepared. The prepared draft interview form was evaluated in terms of expression, content and suitability for the purpose within the framework of expert opinion, and after the necessary corrections were made, the interview form was finalized. The prepared interview form was applied to three teachers who were not in the study group for the purpose of preliminary application and after the necessary corrections were made, it was made ready for the final application.

In the process of collecting data on teachers' opinions on the use of metaphor in teaching English, the participants were informed about the subject and purpose of the interview in advance and then the interviews were conducted.

The interviews were conducted in the schools where the participants worked by making an appointment and the data collection process lasted three weeks. The interviews were conducted face-to-face and sincerely in a quiet and calm environment. The interviews, which lasted approximately 20-25 minutes, were recorded with the permission of the participants. The recorded interviews were then transcribed, the transcripts were sent to the participants to obtain their approval and then analyzed. In this way, the teachers' views and experiences regarding the use of metaphors in teaching English were tried to be determined in detail.

Analysis and Interpretation of Data

In this study, interview data were analyzed using descriptive analysis and content analysis methods together. In descriptive analysis, the data obtained are summarized and interpreted according to predetermined categories. In content analysis, the basic process is to bring similar data together under certain categories, to reach concepts that can explain the obtained data, and to organize and interpret them in a way that the reader can understand (Yıldırım and Şimşek, 2008). In this study, since some data required descriptive analysis and some data required content analysis, these two analysis methods were used together.

The qualitative data analysis process includes the organization of the data, preliminary reading of the database, coding and organizing the categories, presenting the data, and interpreting them (Creswell, 2009). Accordingly, the researcher examined various sources related to qualitative data analysis for the analysis of the data and created a data analysis plan. The stages of the data analysis process (Yıldırım and Şimşek, 2008) and the work done in these stages are explained below.

Preliminary preparation: Written and verbal materials belonging to the interviews were collected and filed. The data was transferred to the computer environment by remaining faithful to the original. Then, the data analysis process was started.

Development of the Conceptual Framework: The conceptual framework was developed by examining the relevant literature and related studies and obtaining expert opinions. The developed conceptual framework was used in organizing and coding the interview questions.

Coding of the Data: The interview data were coded in words in accordance with the conceptual framework related to English language teaching and metaphors. In qualitative studies, it is possible to change and develop the conceptual framework initially created during the data analysis process. For this reason, some data that were thought to cover each other were combined while coding.

Presentation of Data: Categories were determined according to the relationships between the codes that emerged as a result of the analysis of the data. Visual forms were used in the presentation of the coding and the categories that emerged.

Interpretation of Data: The findings were interpreted according to the results of similar studies and expert opinions (Yıldırım and Şimşek, 2008).

The findings obtained from the analysis of the data were interpreted by visualizing them with tables and supported by direct quotes. In order to ensure compliance with the ethical principles of the research, direct quotes were made and instead of the real names of the teachers interviewed, they were coded as PS1…PS6 for English teachers working at the primary school level, SS1…SS6 for English teachers working at the secondary school level, and HS1…HS6 for English teachers working at the high school level.

Validity and Reliability

In qualitative research, it can be said that validity is generally related to the accuracy of scientific findings, while reliability is related to the repeatability of scientific findings. "External validity" refers to the transferability of research results to similar groups or environments, while "internal validity" refers to the adequacy of the process followed to reach the findings to reveal reality. "External reliability" reveals whether the results obtained can give the same result in similar environments, and "internal reliability" reveals whether different researchers can reach the same result with the same data (Yıldırım and Şimşek, 2008).

The studies conducted to ensure validity and reliability in this study are summarized in Table 1.

Table 1. Studies to Ensure Validity and Reliability

Validity	Internal Validity	- Obtaining expert opinion - Participant verification - Long-term interaction - Direct quotation
	External Validity	- Explanation of data collection tool and process - Explanation of data analysis process - Explanation of study group characteristics - Determination of the selection method of the study group - Description of the role of the researchers - Description of the implementation process of the study - Explanation of the rationale for the selection of the method used - Explanation of validity and reliability measures - Purposeful study group
Reliability	Internal reliability	- Preventing data loss by using a recording device - Presenting findings without comment

	External reliability	- Discussing the data appropriately in the conclusion - Checking the consistency between the data

Findings

This section includes the findings obtained from the analysis of teachers' views on the use of metaphors in teaching English vocabulary and the comments on the findings. The findings related to the analysis of the views of teachers at different levels on the importance of learning vocabulary in English are presented in the relevant tables, interpreted and supported with direct quotes.

The findings obtained from the teachers' views on the contributions of metaphor use to teaching vocabulary in English lessons are first visualized in separate tables as the views of primary school, secondary school and high school teachers, interpreted and supported with direct quotes, and then the similarities and differences between the views are interpreted.

The findings related to the views of primary school teachers on the contributions of metaphor use to teaching vocabulary in English lessons are presented in Table 2.

Table 2. Views of Primary School English Teachers on the Contributions of Metaphor Use

THEME	CODES	İD1	İD2	İD3	İD4	İD5	İD6
Contributions of Metaphor Use	Class participation		X	X		X	
	Providing Convenience			X			
	Effective Teaching				X		
	Entertainment	X			X	X	
	Persistence in Memory	X	X			X	X
	Success			X			X

As a result of the analysis of the interview data of the teachers who teach English at 6 primary school levels in the study group, different expressions were used regarding the contributions of metaphor use. When Table 2 is examined, the

views that the most common views regarding the use of metaphor in English are that it increases memorability, is fun and ensures participation in the lesson.

The views of some English teachers working at the primary school level regarding the contributions of metaphor use are given below.

> *PS1: "...it is effective because, as I said, they remember more easily, have more fun and their participation in the lesson increases as they find new metaphors..."*
> *PS2: "...I think it is useful. It both makes the lesson fun and ensures permanent learning..."*
> *PS3: "...I think the use of metaphor definitely makes teaching vocabulary easier. The more words the student can learn, the more they participate in the lesson and the more success they achieve..."*

The findings obtained from the analysis of the views of secondary school teachers on the contributions of metaphor use to teaching vocabulary in English lessons are presented in Table 3.

Table 3. Views of Secondary School English Teachers on the Contributions of Metaphor Use

THEME	CODES	OD1	OD2	OD3	OD4	OD5	OD6
Contributions of Metaphor Use	Increased Self-Confidence				X		X
	Positive Attitude	X	X	X	X		X
	Success				X		X
	Attract Attention					X	X
	Persistence in Memory	X	X	X		X	
	Entertainment	X	X			X	

As a result of the analysis of the interview data of the 6 middle school level English teachers in the study group, different expressions were used regarding

the contributions of metaphor use. When Table 3 is examined, it is revealed that the most positive attitudes towards metaphor use in English are that it increases memorability and is fun.

The opinions of some English teachers working at the middle school level regarding the contributions of metaphor use are given below.

> *SS2: "…it motivates them, now that it is more permanent, because it associates that word with similar words or because they can remember that word more easily, they have more fun in that lesson…"*
> *SS4: "… teaching with metaphor definitely makes vocabulary teaching easier. The more words the student learns and uses, the more their self-confidence increases. This positively affects their success and their perspective on the lesson. As their success increases, they participate more in the lesson…"*
> *SS5: "…it makes it permanent. I think it stays in their minds as they hear, see and use it in the lesson. They also like it. In fact, when I use the metaphors they found, they say that the teacher uses the metaphor I found and listens to the lesson more carefully…"*

The findings obtained from the analysis of the opinions of high school teachers on the contributions of metaphor use to teaching vocabulary in English lessons are presented in Table 4.

Table 4. Views of High School English Teachers on the Contributions of Metaphor Use

THEME	CODES	LD1	LD2	LD3	LD4	LD5	LD6
Contributions of Metaphor Use	Attract Attention				X	X	
	Class Participation	X	X		X		X
	Entertainment		X	X	X		
	Positive Attitude				X		X
	Persistence in Memory	X		X	X	X	
	Success		X		X	X	

When Table 4 is examined, as a result of the analysis of the data belonging to the opinions of English teachers teaching at the high school level regarding the contributions of metaphor use, it has been revealed that the use of metaphor in the high school group increases participation in the lesson the most and provides permanence in memory.

The opinions of some English teachers working at the high school level regarding the contributions of metaphor use are given below.

> *HS4: "…it is definitely striking. Since analogies are made from the student's native language, it attracts attention and enables them to establish mental connections. It enables them to actively participate in the lesson. The student is involved in the process and contributes…"*
> *HS5: "…when it is connected to Turkish, their attention increases a little more in the lesson. More words are remembered. In the tests and evaluations we make in the exam, the vocabulary is remembered more…"*
> *HS6: "…when I give the word using metaphor, of course it attracts attention, the lesson becomes more participatory. The student enjoys the experience as he participates. He succeeds as he enjoys. He enjoys as he succeeds. These are very intertwined…"*

When the similarities and differences between the opinions of English teachers working at different levels regarding the contributions of metaphor use in vocabulary teaching are examined, it is seen that the teachers have a common opinion that when metaphor is used in vocabulary teaching, the lesson is fun and success increases. However, it is also reached that it increases participation in the lesson, provides ease in teaching vocabulary, is an effective teaching and increases retention in memory at the primary school level. In the secondary school level, it is seen that vocabulary teaching is fun, becomes permanent in memory and increases success, as in the primary school level. In the high school level, it is seen that participation in the lesson increases with the use of metaphor in vocabulary teaching, as in the primary school level. In addition, it is also seen that when words are learned with metaphors, students contribute to increased self-confidence, positive attitudes and attention.

The findings obtained from the teachers' opinions on the disadvantages of metaphor use in vocabulary teaching in English lessons are first visualized, interpreted and supported with direct quotes in separate tables as the opinions of teachers at primary, secondary and high school levels, and then the similarities and differences between the opinions regarding the disadvantages are interpreted.

The findings obtained from the analysis of the opinions of primary school teachers on the disadvantages of using metaphors in teaching vocabulary in English lessons are presented in Table 5.

Table 5. Views of Primary School English Teachers on the Disadvantages of Using Metaphors

THEME	CODES	İD1	İD2	İD3	İD4	İD5	İD6
Disadvantages	Waste of Time			X		X	X
	Making It a Purpose	X		X			
	Distraction of Attention		X				
	Making Classroom Management Difficult			X		X	
	Moving Away from the Self		X				
	Noisy	X		X	X	X	

When Table 5 is examined, English teachers who teach at the primary school level stated that the disadvantages of using metaphors in the lesson are mostly noise, time loss, making classroom management difficult and distraction when it becomes the goal.

The opinions of some English teachers working at the primary school level regarding the disadvantages of using metaphors are given below.

> *PS3: "…students can make more noise than necessary to find metaphors. Sometimes they can find very irrelevant things. In such cases, we have problems with classroom management…"*
> *PS6: "…Sometimes students do not know where to stop when trying to find metaphors. They try to find metaphors for every word. Sometimes it can be a waste of time in such cases…"*

The findings obtained from the analysis of the opinions of secondary school teachers on the disadvantages of using metaphors in teaching English words are presented in Table 6.

Table 6. Views of Secondary School English Teachers on the Disadvantages of Using Metaphors

THEME	CODES	OD1	OD2	OD3	OD4	OD5	OD6
Disadvantages	Waste of Time		X	X			
	Making It a Purpose		X				
	Distraction of Attention		X	X			
	Making Classroom Management Difficult	X	X		X	X	X
	Moving Away from the Self	X					
	Noisy		X			X	

When Table 6 is examined, English teachers who teach at the secondary school level have made evaluations on the disadvantages of using metaphors in English lessons. Disadvantages such as making classroom management difficult, causing loss of time during the lesson, students' attention straying from the essence of the subject, increasing noise level in the classroom and focusing only on the use of metaphors, deviating from the main purpose of the learning process, are emphasized.

The views of some English teachers who teach at the secondary school level on the disadvantages of using metaphors are given below.

> *SS2: "…in other words, it may be difficult to find an analogy for each new word or concept. Such situations can be counted among the disadvantages. There may be more confusion and noise. More time may be needed, which turns out to be a waste of time…"*
> *SS5: "…when Turkish gets involved a little too much, it gets messy. Children try to relate everything to Turkish. In other words, we get away from the essence of the subject…"*

The findings obtained from the analysis of the views of high school teachers on the disadvantages of using metaphors in teaching English words are presented in Table 7.

Table 7. Views of High School English Teachers on the Disadvantages of Using Metaphors

THEME	CODES	LD1	LD2	LD3	LD4	LD5	LD6
Disadvantages	Waste of Time	X	X	X		X	X
	Making It a Purpose	X				X	
	Distraction of Attention	X			X		X
	Making Classroom Management Difficult		X				
	Moving Away from the Self	X					
	Noisy		X		X		

When Table 7 is examined, it is seen that the data obtained from the interviews with English teachers who teach at the high school level are the most common disadvantages of metaphor use: loss of time, making classroom management difficult, then making it a goal, distraction and moving away from the essence.

The opinions of some English teachers working at the high school level regarding the disadvantages of metaphor use are given below.

> *HS1: "…I think first of all, it can cause the subject to move away from the essence. In other words, the student can move away from the target word while trying to establish similarities. This situation can also cause loss of time…"*
> *HS4: "…actually, it has disadvantages as well as advantages. For example, I think the use of metaphor does not appeal to some students. Not every student can find a metaphor suitable for that word. In this case, they start to get bored in class and stop listening to the lesson. The student who does not listen to the lesson somehow behaves in a way that disturbs the other students, in other words, there is noise…"*

When the similarities and differences between the views of English teachers working at different levels regarding the disadvantages of using metaphors in teaching vocabulary are examined, it is seen that teachers agree that using metaphors in teaching vocabulary can cause a waste of time, students can become

distracted as a result of them making metaphor production a goal during the lesson, and this can make classroom management difficult. In addition, excessive use of metaphors can cause deviation from the essence of the subject, which can lead to increased noise in the classroom. Such a situation can cause teachers to have difficulty in controlling the flow of the lesson and students to stray from their learning goals. These views that came to the fore in the interviews emphasize that the use of metaphors should be planned and implemented carefully. The need for teachers to develop alternative methods and strategies to cope with such difficulties was also expressed in these interviews.

The findings obtained from the suggestions of teachers regarding the more effective use of metaphors in teaching vocabulary in English lessons were first visualized, interpreted and supported with direct quotes in separate tables as the opinions of primary school, secondary school and high school level teachers, and then the similarities and differences between the opinions regarding the disadvantages were interpreted.

The findings obtained from the analysis of the suggestions of primary school level teachers regarding the more effective use of metaphors in teaching vocabulary in English lessons are presented in Table 8.

Table 8. Suggestions of Primary School English Teachers for More Effective Use of Metaphors

THEME	CODES	İD1	İD2	İD3	İD4	İD5	İD6	İÖ1	İÖ2
Suggestions for Effective Use	Allocate Enough Time	X	X			X	X		X
	Use in the Right Place			X			X		
	Setting Limits	X		X		X	X		
	Preliminary Study	X	X	X	X	X	X	X	X

Table 8 shows that four codes were reached as a result of the analysis of the suggestions made for more effective use of metaphors in teaching vocabulary in English lessons. The pre-study code from these codes in the effective use category was used in common by all teachers in the study. In addition, suggestions for allocating enough time, setting limits and using it in the right place were also reached.

Some teacher suggestions for more effective use of metaphors in teaching vocabulary in English lessons are given below.

> *PS3: "…as long as both students and teachers know its limits, we can benefit from it positively… it is effective when used in the right place and at the right time, in fact, I think the most effective thing is to determine the metaphors of the words according to the outcomes before the lesson…"*
> *PS5: "… we can only get the result we want if there is enough time. It is easily reinforced, it is fun, but of course it is necessary to set limits. The easiest way to set limits is to enter the lesson with metaphors prepared in advance. In other words, when they are ready, it is processed without any problems…"*

The findings obtained from the analysis of the suggestions of secondary school teachers for the more effective use of metaphors in teaching vocabulary in English lessons are presented in Table 9.

Table 9. Suggestions of Secondary School English Teachers for More Effective Use of Metaphors

THEME	CODES	OD1	OD2	OD3	OD4	OD5	OD6
Effective Use	Allocate Enough Time	X			X		X
	Ground Use					X	
	Setting Limits	X		X			
	Preliminary Study	X	X	X	X	X	X
	More Target Language Use		X				

When Table 9 is examined, it is seen that all teachers teaching English at the secondary school level use the pre-study code belonging to the effective use category. In addition, the codes of allocating enough time, setting limits, using in the right place and using the target language more were reached.

The opinions of some teachers working at the secondary school level regarding the more effective use of metaphor in teaching vocabulary in English lessons are given below.

> *SS2: "…English-Turkish analogies should be minimized as much as possible and English-English analogies should be used. It is difficult to find them at any time, of course, to be exactly as we want, so it is best to enter the lesson prepared in advance…"*
> *SS3: "…I think metaphor can be limited to words that are very difficult or very important to learn, without straying from the essence of the subject. If it is prepared in advance, then our work becomes much easier during the lesson…"*
> *SS4: "…I actually think we need to allocate a separate time for metaphor. There should be a separate time* for using metaphors and even teaching vocabulary. If it is like this, it can be more effective…"

The findings obtained from the analysis of the suggestions of high school teachers regarding the more effective use of metaphors in teaching vocabulary in English lessons are presented in Table 10.

Table 10. Suggestions of High School English Teachers for More Effective Use of Metaphors

THEME	CODES	LD1	LD2	LD3	LD4	LD5	LD6
Effective Use	Allocate Enough Time	X		X			X
	Setting Limits					X	
	Preliminary Study	X	X	X	X		
	More Target Language Use					X	

When Table 10 is examined, four codes were reached as a result of the suggestions for more effective use of metaphor in teaching vocabulary in English lessons. Of these codes in the effective use category, the pre-study code was used by almost all teachers in the study. However, sufficient time allocation, setting limits and more target language were among the codes reached.

The opinions of some high school teachers regarding more effective use of metaphor in teaching vocabulary in English lessons are given below.

> *LD2: "…in other words, if we come up with words with pre-study, it can definitely be more effective in metaphor. It saves time. It makes classroom management easier. In fact, if students come prepared in advance, the level of creativity can be higher…"*
> *LD6: "…we cannot complete some activities in order to catch up on the topic. The use of metaphor is the same, you need to spend some time so that it works, the student can digest how it is used, its purpose, its ease…"*

When the suggestions of English teachers working at different levels regarding the effectiveness of metaphor use in teaching vocabulary are examined in terms of similarities and differences, it is seen that almost all English teachers teaching at all levels agree on the importance of allocating enough time to be able to use metaphors effectively in lessons, using them in the right places, setting certain limits during the lesson, coming to the lesson prepared after preliminary studies, and using the target language as much as possible during the lesson process.

Discussions and Conclusion

As a result of the analysis of the data obtained from the interviews with English teachers who teach at primary, secondary and high school levels, it was concluded that while teaching vocabulary through metaphors, participation in the lesson increased, word retention and recall became easier, lessons became fun and interesting, and students developed positive attitudes and became more successful in this regard. This result is similar to the result of the research conducted by Beşkardeş (2007), according to which the academic success average of the experimental group students to whom the metaphor technique was applied was higher than the academic success average of the control group students. Similar results were also reached in the research conducted by Cunninggsworth (1995), which revealed that the best way to learn words is not to find meanings from a dictionary or to memorize a list of words, but to establish relational or semantic connections between words.

As a result of the research, it was concluded that using metaphors during teaching English vocabulary can be a waste of time, the metaphor itself can become the goal rather than the meaning of the word and thus the interest can be distracted, and in this case, it can cause noise in the classroom and problems in

classroom management. In addition to these, the research has reached the conclusion that sufficient time is needed for the effective use of metaphors, that it can be more effective to produce metaphors in the right places and within certain limits, but if preliminary preparation is made, the time problem is eliminated and full efficiency can be obtained in English teaching with more use of the target language. As a result of the research, it has been determined that there are largely similarities between the opinions of English teachers who teach primary, secondary and high school levels regarding the effectiveness of using metaphors in teaching vocabulary in English teaching. As a general result of the research, it has been revealed that according to the teachers' opinions, the use of metaphors in English teaching is an effective process.

Suggestions

The suggestions developed based on the obtained results are listed below.

1. In order to increase students' success in teaching vocabulary in English lessons and to develop a positive attitude and self-confidence towards learning vocabulary, the use of metaphors in teaching vocabulary should be preferred more intensively.

2. Foreign language teaching should be made more effective and fun. New approaches, methods and techniques that will develop the feature of being creative individuals expected from today's people should be used. Teaching words using metaphors ensures that students actively and entertainingly participate in lessons during the education process and that what they learn is permanent.

In addition to these, this technique can be applied to other disciplines and studies can be produced in which the results obtained are examined controversially. New studies can also be produced regarding the opinions of teachers working in different schools, preschool and higher education in different provinces.

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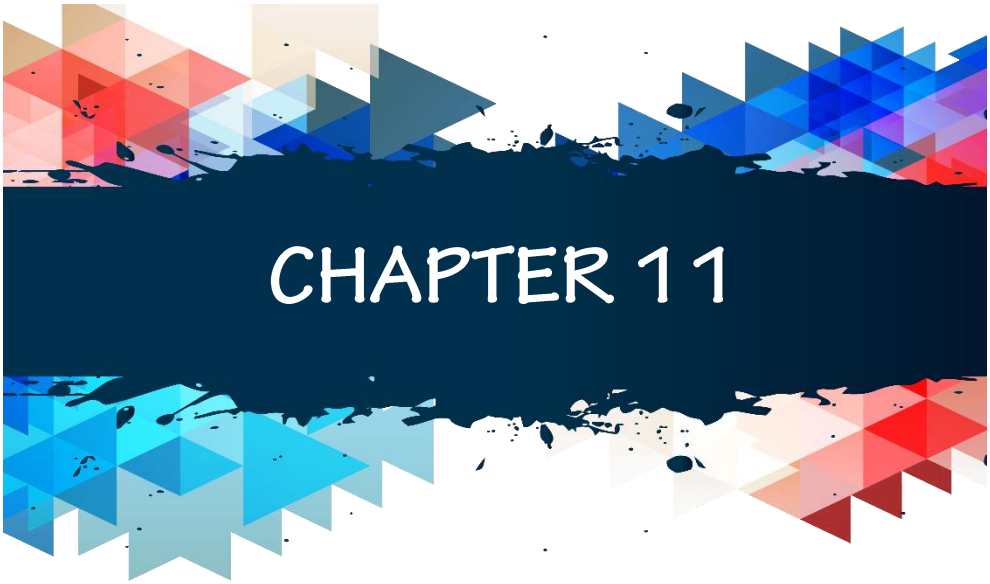

The Role of Note-Taking in Interpretation

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1. Introduction

Note-taking is a valuable strategy for interpreters embarking on careers in interpretation. In this discipline, note-taking bridges the gap between comprehension and the correct reproduction of the source message and facilitates cognitive demands and language understanding of the interpreters. As illustrated by Jiwane (2019), effective note-taking is crucial in interpretation for information management, retention of critical points, and ensuring the coherence of messages. Considering the eminence of note-taking in interpretation, this study discusses the status of note-taking in interpretation and sheds light on ways to develop proficient note-taking strategies that could help raise the quality of interpretation.

2. Note-Taking for Consecutive Interpretation

Translation and interpretation are burdensome professions as they demand processing, retaining, and rendering of language with precision and fluency. As illustrated by the researchers (Seeber, 2011; Díaz-Galaz, 2020), the tasks of interpretation involve the interpreters in handling a number of cognitive loads all at once, namely listening, comprehension, retention in memory, and speaking in a limited time with nearly no tolerance for error. Note-taking becomes an essential mechanism for managing such cognitive demands. Unlike in translation, where time can be taken to process and revise the material carefully, interpretation is usually done in real-time, particularly within consecutive and simultaneous settings. Therefore, effective note-taking allows interpreters to capture essential information quickly and organize their thoughts, which is crucial for delivering accurate and coherent messages under time pressure. As stated by Chmiel (2010), note-taking is not merely a supplemental aid but a precondition for successful interpretation.

One of the most prominent advantages of note-taking involves memory support, enabling interpreters to retain essential information without straining their memories. As defined by Kriston (2012), for interpreters, memory retention is an essential component in interpreting, which requires interpreters to listen to and process longer segments before they can deliver the message. Note-taking thus becomes a precious device, permitting interpreters to grasp information that might be hard to retain, such as numbers, names, dates, and technical terms. According to Gillies (2017), by writing down key elements, interpreters can prepare themselves to focus on comprehending and delivering the message without worrying about forgetting a particular detail. This memory support considerably reduces the cognitive effort required for a complete and accurate delivery of the interpretation.

In addition, note-taking enhances accuracy and completeness in interpretation. One of the challenges in interpretation is ensuring that the message is accurately conveyed without omissions or misrepresentations. Note-taking helps interpreters capture details that might otherwise be missed, allowing for a more faithful rendering of the original content. By recording keywords, technical terms, and specific phrases, interpreters ensure their interpretations remain faithful to the original message. As Kuang and Zheng (2023) stated, this attention to details is particularly valuable in high-stakes settings, such as legal or medical interpreting, where accuracy is critical and even minor omissions can have serious consequences.

Another advantage of taking notes is that it reduces cognitive load, so interpreters focus on comprehension instead of mental retention. Interpreting is a highly concentrative activity, often leading to increased cognitive load since interpreters have to perform fast and simultaneous tasks of listening, processing, and delivering messages. Note-taking acts as an external tool by reducing this burden, thus allowing interpreters to reserve more energy to comprehend the source text. As a result, note-taking eases mental demands and thus enables interpreters to deliver the message consistently at the same level of accuracy without overwhelming themselves (Wang, 2018).

Note-taking also reinforces consistency in delivering messages, which forms the basis of interpretation. It helps interpreters keep track of the same or similar terms and phrases that must be used throughout the message for consistency. By making a note, the interpreters do not allow any non-required diversion in terms or phrases, thus maintaining the message cohesive and uniform for the listener. As stated by Erton and Tanbi (2016), this consistency is especially valuable in specialized fields, such as legal, medical, or technical interpreting, where the words may carry great importance.

In addition, as interpreters practice note-taking, they build confidence and feel more professionally prepared. Interpretation requires confidence, or else uncertainty can disrupt the flow of communication. For this reason, the acquisition of a structured note-taking system equips interpreters with ways to cope with demanding situations, making them feel more confident and less anxious. Moreover, as interpreters develop their note-taking skills, they are better prepared for interpreting in real-life situations and can enter professional environments competently and confidently (Mashady, Fatollahi & Pourgalavi, 2015).

In summary, note-taking provides significant advantages for interpreters that range from memory support and structural organization to accuracy, confidence, and adaptability. As interpreters practice and make note-taking skills their own, they build a tool to increase the quality and dependability of their interpretations. As identified by Liu, Luo and Wang (2023), by incorporating note-taking into their practice, interpreters can better manage the complexity and rapid pace of interpreting work and convey accurate, clear, and professional messages in various interpreting contexts.

3. Developing Effective Note-Taking Strategies

Effective note-taking is an ability demanding practice, guidance, and continuous refinement. As Kuang and Zheng (2022) specify, interpreters might improve their cognitive efficiency, memory, and processing abilities by participating in training programs that emphasize note-taking skills. This training encourages interpreters to experiment with various note-taking styles until they find a system serving as a practical aid for their cognitive and linguistic strengths. According to Marani and Tabrizi (2018), frequent practice allows interpreters to perfect their skills, increase their speed and show greater accuracy in performing particular tasks.

Another critical component of note-taking is the creation of a symbolic language where the interpreter develops a library of symbols and shorthand notations that allow him/her to capture vital information quickly and accurately. As stated by Chmiel (2010), this has been a handy toolkit in high-stakes interpreting, where swift and accurate information capture is crucial. According to Yuan (2022), developing a symbolic language allows the interpreter to acquire complex information more and more quickly. They underline that shorthand symbols and abbreviations are essential in fast-paced interpreting. In these settings, interpreters can maintain high speeds while retaining their output's accuracy thanks to symbolic language and abbreviations.

Integrating digital note-taking tools into interpretation is another strategy to enhance the interpreters' success. While traditional pen-and-paper techniques are common, digital note-taking utilizing applications facilitates options for categorizing and tagging notes in a manner that they become accessible and editable with ease for future use. These digital tools support interpreters in systemizing notes coherently, thus providing them with a strategy to manage demands arising during interpretation (Ekinci, Ekinci & Şanverdi, 2023; Kuang & Zheng, 2023).

4. Conclusion

In conclusion, note-taking is one of the essential competencies that interpreters should acquire. It enhances accuracy, memory support, and cognitive organization. The systemic training for effective note-taking strategies would help interpreters manage their profession's complex demands. The acquisition of these strategies prepares interpreters for professional practice and empowers them to engage deeply with language. Guided by practice, personalization, and digital tools, interpreters may build note-taking systems that will support them throughout their careers, enhancing the quality and reliability of their interpretations. Whether through symbols, shorthand, or digital methods, note-taking is a crucial skill underpinning effective language transfer.

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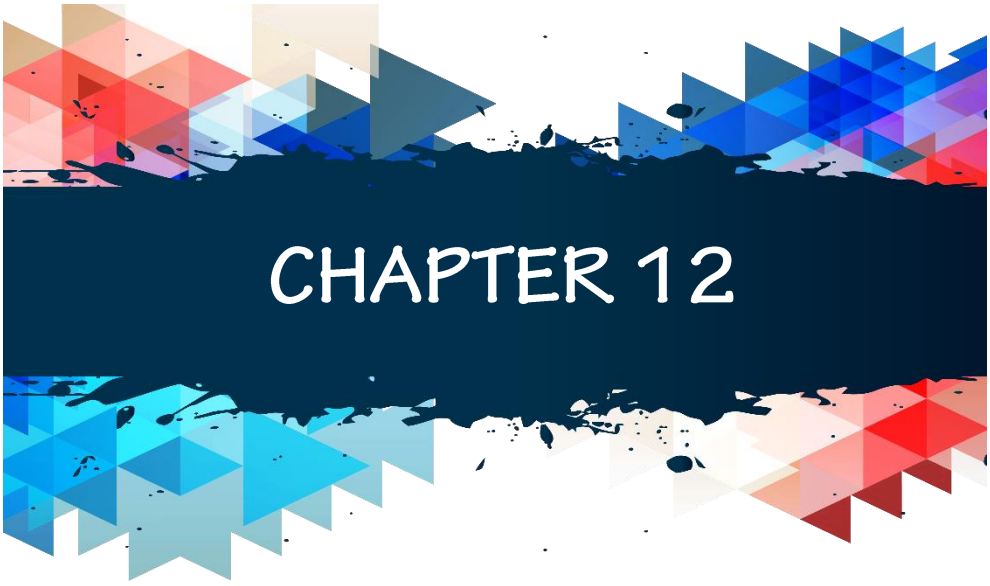

The Quality of the Relationship Between Teachers and Students as A Predictor of Bullying Behaviors in High Schools: A Review on Pisa 2022 Data

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1. INTRODUCTION

Peer bullying has become one of the biggest social problems encountered in schools and other educational settings around the world in recent years (Rigby, 2003; Heavens, 2009). This problem, which is especially common among children, causes significant psychological and social problems for both victims and bullies. Peer bullying is defined as the intentional and repeated physical, verbal, or emotional violence of an individual or group of children against another child (Olweus, 1994; Farrington, 1993; Nansel, 2001). In this process, the aggressor usually has more power or advantage than the victim and takes advantage of this imbalance to continue the acts of bullying (Catalano et al., 2014). The basis of peer bullying is based on the imbalance of power between the parties. Bullies often feel stronger physically, economically, socially or cognitively, and they consciously target children who they see as more vulnerable than themselves (Koç, 2006). This power imbalance allows bullies to feel safe and continue their bullying acts. Bullying takes place in two basic forms, direct and indirect (Siyez & Kaya, 2011). Direct bullying involves physical or verbal attacks on the victim. For example, one child hitting, teasing, insulting or giving derogatory nicknames to another can be counted among the examples of direct bullying (İrfaner, 2009). These types of actions cause the bullying to leave effects on the victim that are immediately visible. On the other hand, indirect bullying involves behaviors that are more covert and aimed at damaging social relationships. In this type of bullying, the victim is usually excluded from the group, gossip is spread about him, or he is removed from his social circle (Coloroso, 2003). Indirect bullying causes the victim to reduce their social status and isolate them from society.

In recent years, with the rapid development of technology and children spending more time on digital platforms, a new type of bullying called cyberbullying has emerged in addition to traditional bullying (Kowalski et al., 2014). Cyberbullying can be defined as children's deliberate and persistent display of harmful behaviors towards their peers through the internet, social media, mobile devices and other digital tools (Smith et al., 2008). This type of bullying has significant psychological effects on victims and can sometimes have even more devastating consequences than physical bullying, because bullying on digital platforms can continue for a long time and spread to a wide audience (Slonje & Smith, 2008). Cyberbullying is anonymized due to digital environments that hide the identity of individuals and allow individuals who engage in bullying behavior to evade legal and social sanctions (Patchin & Hinduja, 2006). Cyberbullying generally includes negative behaviors such as

insulting, threatening, humiliating, spreading rumors or disclosing private information (Tokunaga, 2010). The fact that cyberbullying can spread rapidly in environments with a large user base, such as social media platforms, causes serious problems in the victims' social relationships and triggers psychological problems such as loneliness, depression, anxiety and low self-esteem (Hinduja & Patchin, 2010).

The reasons that form the basis of peer bullying; It is a complex structure that emerges from the combination of individual, family, social and environmental factors. On an individual level, low self-esteem, lack of empathy, aggressive personality traits, and low social skills increase children's susceptibility to bullying (Olweus, 1994). In particular, children who feel inadequate and have a fear of failure tend to compensate for these feelings with bullying (Seals & Young, 2003). The factors related to family are also one of the major causes of bullying. Domestic violence, a family environment devoid of love, and inadequate control and guidance from parents can lead children to turn to bullying (Baldry, 2003). In addition, oppressive or neglectful parental attitudes can increase bullying tendencies in children (Gökler, 2009). The social environment also plays an influential role in this process; The power struggle within groups of friends and the desire to be popular can lead children to bully (Nansel, 2001). School climate, teachers' attitudes and the prevalence of violence at school are among the other environmental factors that affect the spread of bullying behaviors (Siyez & Kaya, 2011).

In peer bullying, the roles of bully and victim can sometimes be replaced. In this cyclical situation, children who are victims of bullying tend to bully someone who is weaker than them in the future (Seals & Young, 2003). This cycle reveals a situation in which children gain experience as both bullies and victims, and are trapped between these roles. In this context, peer bullying has long-term negative effects not only on children who are bullied, but also on children who are bullied. These effects manifest as decreased subjective well-being, psychological stress, social maladjustment, and physical illnesses (Rigby, 2003). Especially in the long term, it has been determined that the victims experience serious psychological problems such as depression, anxiety and low self-esteem, their academic achievement decreases and they experience difficulties in their social relations (Olweus, 1993; Smith, 2011). In addition, research supports that children who are bullied are more prone to chronic health problems and social isolation later in life (Wolke & Lereya, 2015). Therefore, early detection and prevention of peer bullying is of great importance both for the psychosocial development of individuals and for general public health (Craig & Pepler, 2007).

In the research conducted by O'Connel et al. in 1999, it was revealed that the majority of students carried out bullying behaviors by being influenced by each other and taking the people who perform these behaviors as role models. This shows that bullying is often spread in the school environment through social learning (Bandura, 1977). It paves the way for the spread of bullying, especially in school environments where bullying behaviors are frequently seen (Salmivalli, 2010). In addition, it has been stated that even being a bystander to such behaviors reinforces the bullying cycle and supports negative social dynamics (Hawkins et al., 2001). This once again highlights the critical role of school climate and social relationships in the spread of bullying (Craig et al., 2000).

There are effective strategies for dealing with peer bullying, and many of these strategies require a strong awareness and collaboration environment in schools. At this point, it is essential that the school administration, teachers, students, parents and all other stakeholders accept the existence of the problem of bullying and raise awareness about it (Craig & Pepler, 2007). As this level of awareness increases, it becomes easier to develop effective interventions against bullying and create an inclusive climate in schools. There must be a clear understanding that bullying is unacceptable behaviour and will not be tolerated in any way. This understanding should be reinforced by establishing clear and understandable rules in school and regularly reviewing these rules (Olweus, 1993). In particular, it is important to include teachers, parents, and students in reporting processes to increase the visibility of bullying behaviors throughout the school (Smith, 2016). In addition, increasing student supervision and reporting of bullying-related behaviors creates opportunities for early intervention and helps protect students (Cross et al., 2011).

The most effective strategy in combating peer bullying is to create a positive communication environment in schools (Öztürk, 2001). Healthy and open communication channels should be established between all stakeholders in the school and the interaction between teachers, students and parents should be strengthened (Espelage & Swearer, 2004). Teachers play a key role in receiving feedback about bullying by establishing trusting relationships with students (Rigby, 2003). In this context, teachers' empathy, understanding and open communication with students facilitate the recognition of bullying behaviors and faster intervention (Bradshaw, 2015). Students feel more comfortable sharing sensitive issues such as bullying with teachers with whom they have developed trusting relationships, which paves the way for timely reporting of bullying incidents and taking necessary measures (Saarento et al., 2013). It is important that teachers act not only as observers or interveners in the fight against bullying,

but also as role models. Strengthening teacher-student communication plays a critical role in developing empathy towards bullying and conflict resolution skills (Jennings & Greenberg, 2009). Therefore, teachers can reduce the risk of bullying by creating a positive atmosphere in the classroom and encouraging open lines of communication between students. In particular, proactive communication strategies and in-class social emotional learning activities stand out as an effective approach to combat bullying (Olweus, 1993).

It is stated that the quality of the relationship between teacher and student is a factor affecting peer bullying (Holt et al., 2020). Victims or witnesses of bullying may often hesitate to share such incidents. However, a trusting teacher-student relationship allows students to feel safe and tell their teachers about the negative situations they experience (Thornberg, 2011). Thus, strong teacher-student communication not only identifies incidents of bullying, but also ensures that these incidents are dealt with effectively and that students receive emotional support. The quality of the relationship between teachers and students is crucial for students to recognize, report and develop defense mechanisms against bullying incidents. In cases where victims can confidently express their problems with bullying to their teachers, it becomes possible to recognize these incidents earlier and to put effective intervention strategies into action (Mishna et al., 2006). The quality of the teacher-student relationship affects not only the students who are bullied, but also the students who exhibit bullying behaviors. When bullying students receive positive modeling and guidance from their teachers, they may tend to change such negative behaviors (Thornberg, 2011). Research shows that teachers creating a positive social climate in the classroom can significantly reduce the rates of peer bullying (Olweus, 1993; Espelage & Swearer, 2004; Smith, 2011). In addition, it has been found that bullying incidents are less common in schools with a fair and consistent teacher-student relationship (Roland & Galloway, 2004). It has been observed that peer bullying behaviors gradually decrease in environments where a strong relationship is established by teachers to provide students with empathy, social skills and problem-solving skills (Garner, 2010). Previous research shows that the student-teacher relationship at school is related to bullying behaviors. On the other hand, there is a limited number of studies on the subject in Turkey. In particular, more research is needed to understand the relationship between the quality of student-teacher relationships and the frequency of bullying behaviors in high schools.

The aim of this study is to examine the relationship between peer bullying and the quality of teacher-student relationships in high schools. Thus, it is aimed to

determine the effects of the quality of teacher-student relations on peer bullying and to develop suggestions for creating a healthy social environment in schools.

2. METHOD

2. 1. Model of the Research

In this study, which examines the relationship between the quality of teacher-student relationship and bullying behaviors in schools from the perspective of high school students, the relational screening model was adopted. In the study, the descriptive survey model was also used as it was aimed to determine the quality level of the teacher-student relationship and the frequency of bullying behaviors in schools.

2.2. Universe and Sample

The universe of the research is students working in high schools in Turkey; The sample consists of high school students participating in the PISA 2022 research from Turkey. 196 schools and 7250 students (3561 female students (49.1%); 3689 male students (50.9%)) from Turkey participated in the PISA 2022 survey. The dataset used in the analysis to be carried out within the scope of the research was downloaded from the web platform of the Organization for Economic Cooperation and Development (OECD), which carried out the PISA 2022 research (OECD, 2022). After extracting the missing data, analyzes were made on the data set containing the data obtained from a total of 6947 high school students.

2.3. Measurement Tools

The data collection tool of this study is the relevant parts of the student questionnaire used in the PISA 2022 research. In the study, 2 scales in the questionnaire applied within the scope of the PISA 2022 research were used. Information about these scales is given below.

1. *Quality of Student-Teacher Relations Scale:* In this study, the "Quality of Student-Teacher Relations" scale in the PISA 2022 student questionnaire was used to measure students' perceptions of the quality of the student-teacher relationship in the schools they study. This scale consists of 8 items (ST267Q01JA, ST267Q02JA, ST267Q03JA, ST267Q04JA, ST267Q05JA, ST267Q06JA, ST267Q07JA, ST267Q08JA). The items on the scale have a Likert-type rating of 4, ranging from "Strongly disagree (1)" to "Strongly agree (4)". ST267Q04JA (*I feel intimidated by the teachers at my school)* and ST267Q08JA (The teachers at my school are mean towards me.*)* are reverse-coded because they contain negative propositions about the quality of student-

teacher relationships. Two example items on the scale are: "If I walked into my classes upset, my teachers would be concerned about me", "The teachers at my school are interested in students' well-being." (OECD, 2023). With items with similar content, the quality of student-teacher relations in schools is measured from the student's point of view. The Cronbach Alpha internal consistency coefficient of the scale was calculated as 0.695. Since this value is very close to the generally accepted value of 0.70, the internal consistency of the scale is considered sufficient.

2. *Bullying Scale:* In the PISA 2022 study, the data of the "Bullying Experiences" scale in the student questionnaire were used to measure the bullying behaviors that students encountered and/or were exposed to at school. This scale consists of 9 items (ST038Q03NA, ST038Q04NA, ST038Q05NA, ST038Q06NA, ST038Q07NA, ST038Q08NA, ST038Q09NA, ST038Q10NA, ST038Q11NA). The items on the scale have a Likert-type rating of 4, ranging from "None or almost never (1)" to "Once a week or more (4)". The items containing propositions about the bullying behaviors to which the student is exposed are in the same direction, and there are no items that are reverse-coded. A high score on the scale indicates that the student concerned has been exposed to more bullying behaviors in the last 12 months. Two sample items in the scale are: "Other students left me out of things on purpose", " I got hit or pushed around by other students" (OECD, 2023). The Cronbach Alpha internal consistency coefficient of the scale was calculated as 0.784. Since this value is greater than the generally accepted value of 0.70, the internal consistency of the scale is considered sufficient.

2.4. Analysis of Data

In this study, parametric techniques were used because the distribution of data was normal. The analyzes were carried out on the data collected from 6947 students. The analysis of PISA 2022 data was made using percentage, frequency, mean, Pearson correlation analysis and simple linear regression analysis techniques.

Likert type quadruple rating scale was used in the scales used in the research. The options were analyzed by giving values of 4, 3, 2, 1 from positive to negative. In the interpretations to be made in terms of averages, the value ranges given in Table 1 were used.

Table 1. Value Ranges of the Scales Used in the Research

Strongly Agree / Once a week or more	**3.26 – 4.00**
Agree / Several times a month	2.51 – 3.25
Disagree / A few times a year	1.76 – 2.50
Not at all / Not at all or hardly at all	1.00- 1.75

3. FINDINGS

3.1. Findings on the Quality of Student-Teacher Relations in Schools

In Table 2, the findings obtained from the analyzes made for the items related to the quality of the relationship between the teacher and the student are given.

Table 2. Students' Views on the Quality of Student-Teacher Relations

Items	$\bar{x}$	SS
The teachers at my school are respectful towards me.	2,93	,802
If I walked into my classes upset, my teachers would be concerned about me.	2,39	,900
If I came back to visit my school 3 years from now, my teachers would be excited to see me.	2,66	,868
I feel intimidated by the teachers at my school.	1,97	,851
When my teachers ask how I am doing, they are really interested in my answer.	2,75	,856
The teachers at my school are friendly towards me.	2,79	,825
The teachers at my school are interested in students' well-being.	2,66	,842
The teachers at my school are mean towards me.	1,78	,790
QUALITY OF STUDENT-TEACHER COMMUNICATION	**2,80**	**,609**

When Table 2 is examined, it is understood that the students included in the study generally expressed a positive opinion about the student-teacher relationship in their schools ($\bar{x}$=2.80; SD=0.609). However, it was found that the students "If I walked into my classes upset, my teachers would be concerned about me" at the level of "I disagree" ($\bar{x}$=2.39; SD=0.90). On the other hand, the item in which the students participated at the highest level was "The teachers at my school are respectful towards me" ($\bar{x}$=2.93; SD=0.802).

3.2. Findings on Bullying Behaviors in Schools

The mean and standard deviation values of the answers given by the students participating in the study to the items related to the quality of the student-teacher relationship are given in Table 3.

Table 3. Bullying Behaviors at School

Items ***During the last 12 months;***	**x̄**	**SS**
Other students left me out of things on purpose.	1,46	,853
Other students made fun of me.	1,56	,920
I was threatened by other students.	1,19	,570
Other students took away or destroyed things that belonged to me.	1,18	,568
I got hit or pushed around by other students.	1,15	,523
Other students spread nasty rumours about me.	1,40	,792
I was in a physical fight on school property.	1,24	,617
I stayed home from school because I felt unsafe.	1,17	,590
I gave money to someone at school because they threatened me.	1,05	,319
BULLYING	**1,26**	**,405**

When Table 3 is examined, it is found that there is a very low level of bullying behaviors in schools. Students who participated in the PISA 2022 survey reported "none or almost never" to questions about bullying behaviors in their schools. On the other hand, "The other students left me out of things on purpose," "The other students made fun of me," and "The other students spread nasty rumours about me." It is noticeable that the arithmetic means and standard deviations of its items are higher than those of other items.

3.3. The Relationship Between the Quality of the Teacher-Student Relationship and Bullying Behaviors

Table 4 presents the results of the Pearson correlation analysis to determine the relationship between the quality of the teacher-student relationship and bullying behaviors.

Table 4. The Relationship Between Quality of Teacher-Student Relationship and Bullying Behaviors

Variables	Quality of the teacher-student relationship	Bullying behaviors
Quality of the teacher-student relationship	1	
Bullying behaviors	-,189**	1
****. Correlation is significant at the 0.01 level (2-tailed).**		

When Table 4 is examined, it is seen that there is an inverse significant relationship between the quality of the teacher-student relationship and bullying behaviors at the school level at the level of .01 (r=-0.189; p<.01). Based on this finding, it can be said that as the quality of the teacher-student relationship increases in schools, bullying behaviors decrease.

3.4. Quality of Teacher-Student Relationship as a Predictor of Bullying Behaviors in Schools

The results of simple linear regression analysis to determine the level of teacher-student relationship quality predictive bullying behaviors are presented in Table 5.

Table 5. The Predictive Level of Teacher-Student Relationship Quality on Bullying Behaviors

Predictor	R	R^2	F Variance p	B	S.E.	β	t	p
Constant				14,468	,194		74,617	,000*
Teacher-Student Relationship Quality	,189	,036	.00*	-,222	,014	-,189	-16,390	,000*

Dependent variable: Bullying behaviors

When Table 5 is examined, it is understood that the quality of the teacher-student relationship is a significant predictor of bullying behaviors in school (R=0.189; β= -0.189; t=-16.39; p<.01). According to the findings in the table; the quality of the student-teacher relationship explains 3.6% of the variance in bullying behaviors in schools.

4. CONCLUSION, DISCUSSION AND RECOMMENDATIONS

As a result of the research, it was revealed that the students generally had a positive view of the student-teacher relationship in their schools. The students stated that the teachers communicated with them in a respectful manner. In the study conducted by Yurtal and Yaşar (2018), it was emphasized that a teacher-student relationship based on respect is one of the main elements in preventing peer bullying. The fact that teacher-student relationships are based on trust and support contributes to the reduction of such behaviors by making it easier for students to share bullying situations with their teachers (Olweus, 1993; Rigby, 2003). Teachers' empathy with students and creating a positive social climate is considered an effective tool in combating bullying (Wang, Berry, & Swearer, 2013). Bradshaw (2015), on the other hand, stated that the quality of teacher-student relationships is a factor that prevents the emergence of peer bullying, and that elements such as respect, trust and communication play a critical role in this context. In addition, teachers' effectiveness in classroom management and sensitivity to students are also seen as important in preventing bullying behaviors (Hymel and Swearer, 2015).

According to the findings of the research, students stated that there was a low level of peer bullying behaviors in schools. One of the main reasons for this situation is the decrease in the frequency of peer bullying in high schools (Marengo, 2019). Aslan's (2024) study showed that the level of experiencing peer bullying decreases with the increase in the age of students; these results are also consistent with the research of Solberg and Olweus (2003). Solberg and Olweus state that bullying behaviors are more common at the elementary and middle school level and that these behaviors decrease as they move to high school. Students stated that being left alone, ridiculed and gossiping were among the most common bullying behaviors they encountered in schools. Brank et al. (2012) also supported these findings and revealed that the most common types of peer bullying are ridicule for students' appearance, exclusion from the group, and negative discourses about them. Such bullying behaviors can negatively affect students' adaptation to the school climate by weakening their social bonds (Smith et al., 2003). It has been stated that creating a healthy communication environment in the school environment is an important factor in reducing such behaviors, so the role of the student-teacher relationship in preventing bullying should be emphasized (Wang et al., 2013).

In the study, it has been proven that there is an inverse significant relationship between the quality of the teacher-student relationship and bullying behaviors in schools. In this context, in schools where teacher-student relations are strong, the

probability of peer bullying decreases significantly. This finding shows that teacher-student relations have a direct effect on bullying and that a positive school climate is important as a preventive factor against peer bullying. Research conducted by Arslan et al. (2011) reached similar results and revealed that the frequency of peer bullying behaviors decreased in schools with healthy relationships and a positive school climate. There is a wide acceptance in the literature that healthy teacher-student relationships contribute to the reduction of bullying behaviors by increasing students' commitment to school, and that positive social interactions limit the tendency to violence among peers (Rigby, 2000; Hong & Espelage, 2012).

In the regression analysis conducted within the scope of the research, it was determined that the quality of the teacher-student relationship was a significant predictor of bullying behaviors in schools. This finding shows that bullying behaviors can decrease if teacher-student relations are strengthened, and it states that teachers' healthy relationships with students play an important role in preventing bullying in schools. Similar results were reached in the research conducted by Longobardi et al. (2018), and it was seen that positive teacher-student interactions had a significantly reducing effect on bullying behaviors. In the literature, it is emphasized that teacher-student relationships increase students' commitment to school and are effective in reducing conflicts in peer relationships (Espelage et al., 2013; Ttofi & Farrington, 2011). These findings suggest that teachers' interest in students and the level of support they provide may reduce the likelihood that students will be bullied or exposed.

The suggestions developed within the scope of the research are listed below.

Recommendations for Researchers

- Qualitative research can be conducted in order to examine the relationship between teacher-student relationship and peer bullying in more detail. Including studies that include students' experiences on bullying behaviors as well as teachers' observations on this subject can provide different perspectives.

- The effects of these variables on the teacher-student relationship and bullying can be examined by conducting research in schools with different socioeconomic and sociocultural characteristics in different cities.

- Longitudinal studies can be conducted to see the impact of the teacher-student relationship on peer bullying in the long term.

- In order to understand the connection between different types of bullying and the teacher-student relationship, research can be done by considering the subtypes of bullying such as physical, emotional and cyber separately.

Recommendations for Practitioners

- In-service training programs can be organized to improve the quality of teacher-student relations. In these programs, effective communication, empathy and reassuring skills should be emphasized.

- It is necessary to create a positive school climate to prevent bullying in schools. The establishment of healthy relationships between teachers and students should be supported and school administrators should actively contribute to this process.

- Guidance services for students play an important role in preventing bullying. Regular monitoring of bullying incidents by guidance units and informing teachers about these issues can reduce bullying.

- Monitoring the status of teacher-student relations by conducting periodic evaluations in schools struggling with bullying and sharing the findings with teachers will provide a continuous improvement process.

- Students should be actively involved in the bullying prevention process. Student committees can be formed to organize activities to raise awareness about bullying and encourage them to contribute to the fight against bullying.

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CHAPTER 13

Compost Fertilizer Preparation

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INTRODUCTION

Compost fertilizers, derived from the recycling of organic waste, represent an ideal method to reduce environmental pollution and utilize natural resources more efficiently. This process also reduces the reliance on chemical fertilizers, thereby alleviating environmental burdens. Consequently, the use of compost in sustainable agricultural practices is of great importance for minimizing environmental impacts. Compost is a soil conditioner that enhances soil structure, boosts biological diversity, and is environmentally friendly. By improving soil porosity and preventing compaction, compost increases water retention capacity and mitigates erosion. These characteristics make compost an effective tool for enhancing productivity and quality in agricultural production (Kara and Gül, 2013; Efe, 2014).

Composting is the process of decomposing organic waste into a humus-like substance through microbial activity. The balance of elements such as carbon (C) and nitrogen (N) is crucial for successful composting. In modern agriculture, sustainability is a critical approach that aims to balance environmental protection with agricultural productivity (Mücevher, 2022). Within this framework, compost fertilizers emerge as a natural solution that not only contributes to environmental sustainability by recycling organic waste but also improves soil health. As a natural fertilizer, compost is produced through the aerobic decomposition of organic materials, enhancing the physical, chemical, and biological properties of the soil. With its ability to increase soil fertility, compost provides advantages in both quality and yield in agricultural production. By promoting biological diversity, organic contents in compost boost soil microorganism activity and preserve the soil's natural ecosystem. Additionally, compost increases water retention capacity, enhancing plant resilience under challenging conditions like drought, thus offering long-term benefits to agricultural lands.

In addition to agricultural waste, animal waste also serves as a significant source of organic matter. Turkey annually produces approximately 10 million tons of fresh poultry manure from meat and egg production (TÜİK, 2020). Particularly in the TR 52 Region, which houses approximately 10% of Turkey's total egg-laying poultry population, an estimated 210,000 tons of fresh poultry manure is produced annually. With a nitrogen content of 5–6%, poultry manure is a rich resource for plant nutrition (Aydeniz and Brohi, 1991). However, direct use of this manure can lead to nitrogen losses; therefore, composting it with plant residues is an ideal method to ensure effective nitrogen utilization. This review

aims to explain the steps involved in preparing compost fertilizers and highlight the importance of these natural fertilizers in sustainable agriculture.

SELECTION OF COMPOST MATERIALS

The selection of compost materials should consider factors such as the carbon-to-nitrogen (C/N) ratio, moisture content, biodegradability, and the effects of additives. Carbon serves as an energy source for microorganisms, while nitrogen is essential for cell synthesis. Therefore, combining plant and animal waste is important for achieving an ideal C/N ratio. Balancing nitrogen-rich materials like fresh poultry manure with carbon-rich plant residues enhances compost efficiency and minimizes environmental losses (Mücevher, 2022).

Compost fertilizers, produced through the aerobic decomposition of plant and animal waste, are noted for being pathogen-free and for their soil-conditioning properties, which make them a preferred solution in agriculture. For instance, natural soil conditioners like leonardite, formed from ancient organic materials under anaerobic conditions, are known to balance soil tension and support plant growth due to their humic and fulvic acid content (Erdal et al., 1999; Savaştürk, 2005). Leonardite has been reported to promote seed germination and strengthen root development (Kolay et al., 2016).

Alternative materials, such as fertilizers derived from sewage sludge, also demonstrate productivity-enhancing effects in agriculture. Studies have shown that sewage sludge enriched with mineral fertilizers can address nitrogen and potassium deficiencies and provide yields comparable to traditional fertilizers (Deeks et al., 2013).

Composting waste from olive oil production, such as pomace and wastewater, represents another viable alternative. These by-products, when composted, produce phosphorus- and potassium-rich, pathogen-free products (Alburquerque et al., 2003). However, such applications require careful planning due to the effects of phenolic compounds (Oruç, 2012).

Using compost in vegetable cultivation enhances yield and reduces nitrate accumulation. Compost derived from animal waste has been found to increase productivity and decrease nitrate accumulation in spinach cultivation (Çıtak and Sönmez, 2010). Furthermore, using compost alongside phosphorus fertilizers has been shown to positively impact vegetable growth and quality (Wanga and Lia, 2004).

The appropriate selection of compost materials significantly influences the effectiveness of the composting process and the quality of the resulting product.

Considering factors such as the carbon-to-nitrogen balance, moisture content, and properties of the additives ensures efficient compost production while contributing to environmental sustainability. The use of diverse organic materials such as leonardite, sewage sludge, and olive processing residues enhances the nutrient value and soil improvement capacity of compost while providing alternative waste management solutions. Compost use in vegetable production not only improves yield but also minimizes nitrate accumulation, safeguarding both environmental and human health. These benefits demonstrate that compost fertilizers are indispensable for modern agricultural practices and environmental management.

MATURATION OF COMPOST

The maturation of compost is a biological process in which organic materials decompose and transform into a stable, nutrient-rich soil conditioner. This process occurs in distinct phases, each characterized by specific temperature ranges and microbial activities. The compost maturation process can generally be divided into three main stages:

1. Rapid Decomposition (Thermophilic) Stage

During this initial stage, organic compounds within the composting material decompose rapidly. The temperature rises to 50–70°C, effectively eliminating pathogens. Carbon and nitrogen serve as energy sources and are utilized for cell synthesis by microorganisms. A significant reduction in the volume and mass of the composting material is observed. At the end of this phase, the organic material is referred to as "fresh compost," which is not yet fully stabilized (Yıldız and Demir, 2010).

2. Stabilization Stage

In the stabilization stage, after the rapid decomposition, the temperature gradually decreases to 30–50°C. Microorganisms continue to break down more resistant organic compounds, and the material transitions into a more stable form. During this stage, microbial diversity increases, and the compost becomes more homogenous, referred to as "active compost" (Yıldız and Demir, 2010; Günal, 2018).

3. Maturation Stage

In the final stage, the temperature of the compost drops to match the ambient temperature. Organic materials are fully decomposed, and the compost reaches a stable state. This stage is characterized by decreased microbial activity and the occurrence of biological processes such as nitrification. When maturation is

complete, the compost is termed "final compost" and becomes suitable for agricultural use (Yıldız and Demir, 2010).

Throughout this process, the careful monitoring of parameters such as temperature, moisture, pH, and aeration directly influences the quality of the matured compost.

CONCLUSION

Compost fertilizers provide significant environmental and agricultural benefits by recycling organic waste. The composting process requires effective management of factors such as carbon-to-nitrogen balance, moisture content, and temperature. Proper material selection enhances compost efficiency while minimizing environmental impacts. The incorporation of materials such as leonardite, olive waste, and sewage sludge increases the nutrient value and soil enhancement capabilities of compost, supporting sustainable agricultural practices.

The compost maturation process encompasses stages of rapid decomposition, stabilization, and maturation, resulting in a final product that is stable and nutrient-rich. Controlling parameters such as temperature, pH, porosity, and aeration during these stages is essential for ensuring the quality of the final product.

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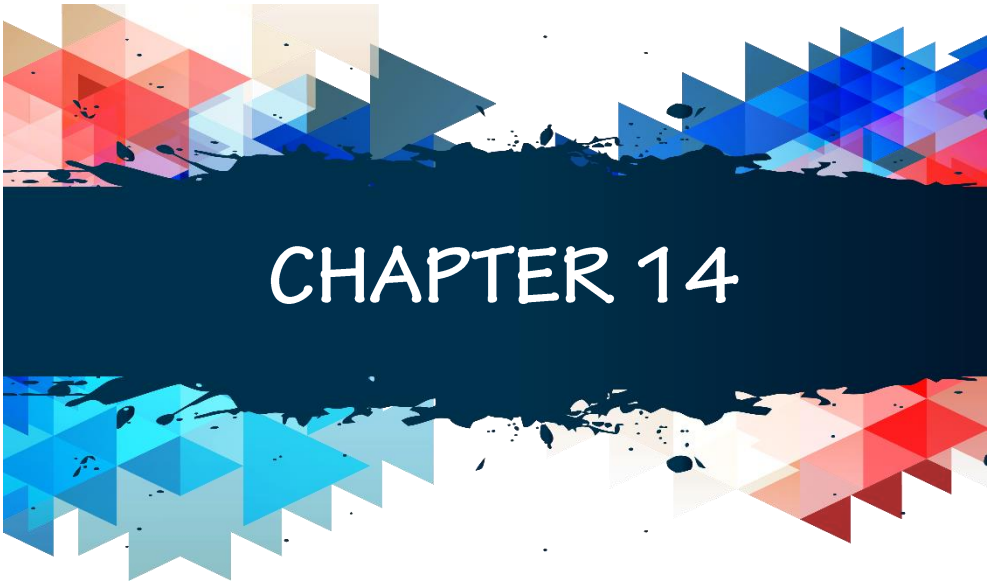

An Overview of Agricultural Production Issues in the World

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INTRODUCTION

The agricultural sector holds vital importance in the economic structures of countries worldwide. This sector, which plays an indispensable role in meeting people's basic food needs and raw material production, is irreplaceable. However, the development of the agricultural sector has faced many challenges throughout history. In the past, agricultural production was limited to animal manure, and the necessity of leaving the soil fallow and planting different crops each year restricted production potential. Particularly until the 18th century, due to the scarcity of resources used in agriculture, productivity could not be increased, and production remained at low levels. Over time, developments in global trade and rising income levels have led to an increase in per capita consumption of agricultural products. However, economic fluctuations worldwide have caused agricultural product prices to rise (Doğan et al., 2015).

The growing world population has further highlighted the importance of agricultural production for nutrition. This situation has increased the demand for energy-dense foods, making grains not only important for their caloric value but also for their protein, fat, and other essential nutrients (Aksu, 2011; Gültekin and Kaplan, 2021). However, while the consumption of common grains such as wheat, rice, and corn is increasing globally, a notable decline is observed in the use of other grains and root crops (Şaşmaz, 2023; Al, 2022). This trend underlines the central role of grains in the global food system and their critical importance for food security (Khoury, 2014).

Food security refers to the continuous access of individuals to sufficient, reliable, and nutritious food (Baran et al., 2021). The rapidly growing global population and the effects of climate change are making the issue of food security increasingly complex. Wheat, which has played a crucial role in human nutrition throughout history, is key to ensuring food security. Although the Green Revolution has brought significant increases in wheat production, problems such as climate change, diseases, and pests seriously threaten wheat production (Kılıç et al., 2021). Climate change negatively impacts not only agricultural yields but also the nutritional value of crops. For instance, extreme temperatures can alter the nutritional content of plants, leading to malnutrition (Neupane et al., 2013). This review aims to provide a general explanation of global agricultural production issues, the challenges in agricultural production, and the impact of food waste in agriculture.

INCREASE IN FOOD DEMAND AND PRICES

One of the primary reasons for the rise in grain demand is the rapidly growing global population and the increase in per capita income. Population growth leads to greater food demand, while rising incomes, particularly in developing countries, increase interest in more diverse and nutritious foods (Ercan, 2023; Yavuz and Berber, 2023).

The first impact of rising food prices is reflected in the increased food expenditures of consumers. In less developed countries, where consumers spend 50-80% of their income on food, these increases affect the most vulnerable groups. Price increases also reduce consumer demand for other goods and services (OECD, 2011, p.13). Their effects on inflation are also significant. Price increases in agricultural products included in inflation baskets lead to higher overall inflation rates. In developed countries, a 1% increase in food prices causes a 0.15% increase in overall prices, while in less developed countries, this rate can reach up to 0.3% (Walsh, 2011, p.20-21). Moreover, rising food inflation can prompt central banks to raise interest rates, slowing down economic growth (Bayramoğlu and Yurtkur, 2015).

Food supply and security are among the critical issues in countries' economic growth processes. Factors such as population growth and Gross Domestic Product (GDP) growth in developing countries are cited as the main reasons for increased food demand. Particularly, the promotion of financial liberalization and the expansion of international trade have accelerated the rise in food demand while enhancing the role of countries like Turkey in the global economy. According to the OECD-FAO Agricultural Outlook (2021) report, between 2011 and 2020, the global population grew by 1.1% annually. Most of this growth occurred in developing countries. The report also highlights that India is projected to surpass China as the world's most populous country, emphasizing the global impact of increased food demand in countries like India and China. During the same period, the global GDP growth rate was recorded at 2.5%, while India and China showed growth rates of 6% and 7%, respectively. This economic growth has led to a rapid increase in food consumption in these countries (Güngör and Erer, 2022).

Macroeconomic factors also play a significant role in the rise of food prices. A study by Baek and Koo (2010) linked the rapid increase in U.S. food prices during the 2007-2008 period to rising energy prices and agricultural commodity prices. Additionally, the impact of oil prices on food prices is observed both directly and indirectly. Rising oil prices increase the costs of inputs required for

agricultural production, leading to production declines and contributing to food inflation. Gohin and Chantret (2010) evaluated the impact of oil prices on the agricultural sector through production, processing, and transportation costs. The energy-intensive nature of agricultural activities makes the sector vulnerable to changes in oil prices. This situation increases the costs of agricultural production, causing price fluctuations in the markets.

WASTE IN AGRICULTURE

Waste in agricultural production causes significant problems due to the unnecessary consumption and inefficient use of resources. The excessive or incorrect use of inputs such as water, fertilizers, pesticides, and energy not only increases production costs but also results in environmental damage. For instance, the overuse of fertilizers leads to nutrients that cannot be absorbed by plants polluting the soil and seeping into water resources. This situation poses significant threats not only economically but also in terms of environmental sustainability (Beres et al., 2020).

Research conducted in China has demonstrated that methods such as more intensive planting techniques in agriculture can both increase yields and reduce waste. For instance, increasing planting density in corn production has reduced the need for fertilizers, minimizing environmental impacts. This approach offers a sustainable solution by reducing reactive nitrogen losses and greenhouse gas emissions by up to 10% (Hou et al., 2020). Moreover, genetic improvements can serve as a powerful tool to reduce waste in agriculture. Developing plant varieties resistant to abiotic stresses like cold and drought prevents crop losses and enhances production efficiency. Modern agricultural practices also ensure more efficient use of resources by limiting unnecessary pesticide and fertilizer use.

Studies show that approximately half of agricultural product losses are due to errors in the supply chain. Products that do not meet conventional standards and are not preferred by retailers are sold at prices far below their value, leaving producers unable to cover their costs. Additionally, products that cannot find a place in the market due to sudden economic contractions are wasted without being utilized. According to the United Nations Food and Agriculture Organization (FAO), there is a global food loss and waste rate of 14% in food production processes. The total monetary value of this loss is estimated at approximately 936 billion USD (FAO, 2009). One-third of all food produced each year is lost or wasted due to inefficiencies in the supply chain (Gustavsson et al., 2011). This wasted amount is sufficient to alleviate malnutrition for one-

eighth of the global population and represents a significant opportunity to meet the 150-170% increase in food demand projected for 2050 (FAO, 2014).

In less developed countries, the rate of losses during post-harvest and processing stages is particularly high. Food loss and waste in these countries account for 44% of global losses and waste (Lipinski et al., 2013). The primary causes of this situation include technical and technological inadequacies, poor farming practices, labor and financial constraints, and deficiencies in transportation and storage infrastructure (Gustavsson et al., 2011; Yıldırım et al., 2022). In industrialized countries, 40% of food loss and waste occurs at the consumption stage. These losses are linked to consumer behaviors, over-purchasing, and poor planning (Bond et al., 2013). Main sources of food waste in these countries include unnecessary over-purchasing of food products, waste during cooking or serving, and failure to consume products before their expiration dates (Priefer et al., 2016; Yıldırım et al., 2022).

The environmental impacts of food loss and waste are also significant. Food waste dumped in landfills releases greenhouse gases (GHG), accelerating global warming. Methane gas released in this process has 25 times more warming potential than carbon dioxide (Parry et al., 2007; Yıldırım et al., 2022).

CONCLUSION

Agricultural production is critically important for global economic growth, food security, and environmental sustainability. However, challenges such as a growing population, climate change, rising food demand and prices, and agricultural waste exacerbate the difficulties faced by the agricultural sector. Increases in food demand and prices negatively affect the living conditions of consumers, especially in less developed countries, while threatening macroeconomic stability. On the other hand, the environmental and economic costs of agricultural waste underscore the urgent need for more efficient resource use and sustainable agricultural policies.

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