European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available online at: www.oapub.org/edu

DOI: 10.46827/ejes.v12i3.5854 Volume 12 | Issue 3 | 2025

EXAMINATION OF VIEWS OF TEACHERS OF GIFTED STUDENTS ON UNIVERSAL DESIGN FOR LEARNING

Hüseyin Kocasaraç[1i],
Şahika Ünlü[2],
Metin Aydın[3]
[1]Dr.,
Ministry of National Education,
General Directorate of Innovation and Educational Technologies,
Ankara, Türkiye
[2]Dr.,
Ministry of National Education,
Yenimahalle Science and Art Center,
Ankara, Türkiye
[3]Principal,
Ministry of National Education,
Kıymet Necip Tesal Primary School,
Ankara, Türkiye

Abstract:
Universal Design for Learning (UDL), a contemporary educational approach, is recognized as a multidimensional and comprehensive framework for learning. Grounded in research across neuroscience, education, and technology, UDL has gained increasing scholarly attention in various countries. The primary objective of this study is to explore the perspectives of teachers working in Science and Art Centers in Ankara, Türkiye, regarding UDL. The study employs a phenomenological research design, a qualitative methodology, to capture participants' experiences and insights. Participants were selected using a combination of purposive sampling methods, specifically criterion sampling and snowball sampling. The study sample comprised teachers holding master's and doctoral degrees. Semi-structured interviews were conducted with 21 postgraduate-educated teachers who voluntarily participated in the research. Qualitative data were analyzed using content analysis techniques to identify emerging themes. Findings indicate that teachers associate the contributions of the UDL approach to teaching and learning processes with the concepts of "flexibility and diversity," "equity and accessibility," and "motivation." Furthermore, teachers recommended the UDL approach to their colleagues as a means to enhance student achievement. Additionally, they expressed consensus on the potential benefits of UDL for the education of gifted students.

[i] Correspondence: email huseyinkocasarac@gmail.com

Keywords: universal design for learning (UDL); science and art centre; teachers

1. Introduction

Contemporary social and technological advancements have led to evolving student needs in the learning process. Universal Design for Learning (UDL) addresses these shifting requirements by promoting inclusive educational environments. The concept of universal design originates from architecture, where it aims to create physical spaces accessible to all individuals, irrespective of physical, cognitive, or developmental disabilities (Courey, Tappe, Siker, & LePage, 2013). Universal design, as first conceptualized in architecture, facilitates access for all individuals without necessitating adaptations (Nelson, 2014). Mace (1997) defines universal design as the development of products and environments that are usable by the broadest possible audience without requiring specialized modifications.

Universal Design for Learning (UDL) extends this principle to education, drawing on cognitive neuroscience research to explore how the human brain processes learning. It is a multifaceted and comprehensive pedagogical framework that integrates insights from neuroscience, education, and technology. UDL was developed to address the diverse learning needs of 21st-century students and enhance educational inclusivity (Rose & Meyer, 2006). By fostering authentic and meaningful learning experiences, UDL facilitates lifelong learning. This approach emphasizes learning objectives, instructional methods, educational materials, and assessment strategies (Rao, 2015). Moreover, UDL challenges educators to reconceptualize their perspectives on student learning differences, advocating for lesson plans that adapt to students rather than requiring students to conform to rigid instructional structures (Meo, 2008). It enables teachers to design and implement lessons that accommodate a wide range of abilities and learning styles.

Traditional educational systems often design curricula, materials, and services based on standard student characteristics, overlooking the vast diversity in learning styles, abilities, and demographic factors such as gender, race, and age. UDL aims to address these disparities by ensuring that educational experiences are accessible to all students (Burgstahler, 2009). The implementation of UDL across various educational systems worldwide underscores its significance in promoting equitable learning opportunities (Alquraini & Rao, 2020; Capp, 2017; Chita-Tegmark *et al.*, 2012; Rao, 2015). Rather than making post hoc adaptations for individual learners, UDL advocates for proactively eliminating barriers through course design that considers diverse student needs (Novak, 2016). According to Burgstahler (2011), learner diversity encompasses not only physical, visual, auditory, and sensory impairments but also attention and communication disorders.

The integration of UDL principles is particularly relevant in Science and Art Centers, which provide specialized education for gifted students. These centers emphasize individualized learning experiences, making the flexible and inclusive nature of UDL a valuable asset. Contrary to the one-size-fits-all approach, UDL promotes

adaptability and alternative instructional strategies tailored to students' needs, learning styles, and preferences (Rose, 2001).

2. Literature Review

2.1 Implementation of UDL in Different Countries

The application of UDL varies across countries, reflecting distinct educational policies and priorities. In the United States, UDL has been incorporated into national educational policies, with the "Higher Education Opportunity Act" (2008) advocating for accessible instructional materials and teaching methods (Meyer *et al.*, 2014). In Canada, UDL is extensively implemented in special education, with the Ontario Ministry of Education providing resources and guidelines to support teachers in adapting instructional strategies for diverse learners (Rose & Gravel, 2019). Australia has embraced UDL as a means of fostering educational equity, with the Australian Association for Education and Educational Research advocating for its integration into teacher training programs to enhance inclusive pedagogy (Smith & Harvey, 2021).

In Ireland, UDL is actively promoted within higher education institutions. Trinity College Dublin, for instance, offers UDL training for faculty members, encouraging diverse instructional and assessment methods to accommodate varying student needs (CAST, 2020). Similarly, in Turkey, UDL is gaining traction within special education and teacher training programs. At Ankara University's Faculty of Education, research initiatives focus on UDL-based instructional strategies to foster inclusive education (Turan *et al.*, 2022). These examples illustrate how UDL is integrated into educational frameworks worldwide to promote accessibility and inclusivity.

2.2 Science and Art Centers and the Role of UDL

Science and Art Centers are specialized educational institutions designed to nurture the talents of gifted students at the primary, secondary, and high school levels across disciplines such as art, music, and general intellectual ability (Ministry of National Education, 2017 & 2019). Student admissions to these centers follow a structured process outlined by the Ministry of National Education (Special Education Services Regulation, 2018). Teachers working in these centers are also selected based on ministry-issued guidelines and regulations (Special Education Services Regulation, 2018).

A project-based, interdisciplinary curriculum underpins the educational framework of Science and Art Centers, with instructional activities aligned with principles of individualized learning (Special Education Services Regulation, 2018). These centers operate outside formal school hours, including weekdays and weekends, and may also offer training camps during holiday periods. Instruction may be delivered through one-on-one sessions or group-based learning, with additional support provided through designated education rooms in students' formal schools (Special Education Services Regulation, 2018). The implementation of UDL in Science and Art Centers is crucial for enhancing learning experiences, increasing educational accessibility, and maximizing student potential.

2.3 Research Objectives and Significance

This study aims to develop recommendations for the professional development of teachers in Science and Art Centers regarding UDL. Specifically, it seeks to explore teachers' perspectives on UDL in Ankara Province, Turkey, and to identify the underlying reasons for their views. Science and Art Centers represent a unique educational model designed to support highly talented students with diverse learning needs. UDL, as a pedagogical approach, employs flexible and individualized instructional strategies to ensure equitable access to learning for all students. However, a critical issue is that many teachers in Science and Art Centers lack sufficient knowledge and experience regarding UDL principles, posing a challenge to the effective implementation of this approach.

The central research question guiding this study is: What are the perspectives of teachers working in Science and Art Centers in Ankara, Turkey, regarding Universal Design for Learning?

Findings from this research are expected to contribute to raising awareness among teachers about UDL and its practical applications. By examining teachers' perceptions holistically, the study aims to identify effective strategies for addressing the specialized educational needs of gifted students. Furthermore, it will assess whether teachers possess adequate knowledge about inclusivity and accessibility in education, thereby informing policies aimed at fostering inclusive learning environments. If gaps in teachers' understanding of UDL are identified, the study will provide a foundation for developing professional development programs to address these deficiencies.

Additionally, investigating teachers' attitudes toward educational technology within the framework of UDL can inform the optimization of digital tools for enhancing learning experiences. In the context of policy development for special education initiatives like Science and Art Centers, it is crucial to consider the practical challenges teachers encounter and their recommendations for improvement. By analyzing teachers' perspectives on UDL, this research can contribute to the establishment of comprehensive support systems and the development of enriched educational environments that empower students to reach their full potential.

3. Material and Methods

3.1 Research Model

This study aims to investigate the perspectives of teachers working in Science and Art Centers in Ankara regarding universal design for learning. The study employs a phenomenological design, which is a qualitative research approach used to explore and describe the thoughts, judgments, and experiences of individuals who encounter a phenomenon in daily life but lack in-depth knowledge about it (Patton, 2002; Yıldırım & Şimşek, 2006).

Phenomenological studies provide valuable and rich insights into the literature by contributing to the definition and dimensions of the phenomenon under investigation. These studies also help elucidate the meanings that participants associate with the

phenomenon and facilitate theory generation based on these interpretations (Özmen & Karamustafaoğlu, 2019). Phenomenology is considered the most appropriate qualitative research design for exploring how individuals make sense of their experiences and lives, understanding the relationships between events and individuals' interpretations of them, uncovering how they perceive the essence of a particular phenomenon, and analyzing shared experiences among individuals (Tekindal, 2021; Swanborn, 2010).

3.2 Research Sampling

The criterion sampling method, which entails studying all cases that meet predetermined criteria set by the researcher, was adopted for participant selection (Yıldırım & Şimşek, 2006, p. 112). The primary criterion for inclusion in this study was that participants must have obtained a postgraduate degree.

Additionally, the snowball sampling method was utilized as an effective strategy for identifying individuals or cases that could provide rich information relevant to the research problem. This approach prioritizes reaching individuals with the highest level of knowledge and experience on the subject matter (Patton, 2002; Yıldırım & Şimşek, 2006).

The study sample consisted of all 21 teachers with postgraduate education working in Science and Art Centers in Ankara during the 2022–2023 academic year. In the selection of participants, factors such as voluntary participation, willingness, and postgraduate education in various disciplines were taken into consideration. The demographic characteristics of the participating teachers are presented in the table below.

Table 1: Demographic characteristics of the teachers

Demographic Characteristics	**Groups**	**Frequency**
Gender	Male	15
	Female	6
Foreign language	English	20
	French	1
Working years category	6-10 years	4
	11-15 years	2
	16-20 years	6
	21-25 years	9
Graduation	M.Ed.	4
	Ph.D.	17
Branch	Visual Arts	2
	Social Sciences	2
	English	2
	Mathematics	1
	Science	3
	Classroom Teacher	10
	Information Technologies	1
Total		**21**

3.3 Data Collection Tool

Qualitative research aims to explore how individuals construct their reality within social contexts. One of the primary methods employed in this approach is the interview method, which facilitates an in-depth exploration of participants' thoughts, emotions, attitudes, and behaviors. This method is particularly useful for uncovering unobservable aspects such as personal experiences and perceptions (Ekiz, 2003). In this study, qualitative data were analyzed using content analysis, wherein teacher responses were examined, and relevant codes, categories, and themes were identified to provide a meaningful interpretation of the data (Sönmez & Alacapınar, 2011).

To align with the research objectives, open-ended online interview questions were designed to allow participants to express their thoughts freely. As part of a pilot study, the interview questions were shared with teachers to assess their clarity and determine whether they effectively served the purpose of the research. Based on feedback obtained from the pilot interviews, necessary revisions were made, and the final version of the interview questions was established.

During the data collection process, teachers were informed that their participation in the study was entirely voluntary. The purpose of the study, its duration, data collection procedures, confidentiality principles, and the intended use of the collected data were explicitly outlined in the online interview form. These measures were implemented to enhance the reliability and validity of the research.

In accordance with the study's objectives, the researchers were actively involved in designing the online semi-structured interview questions, selecting the research method, collecting data, conducting data analysis, and reporting the findings.

3.4 Data Analysis

Content analysis is a widely used technique in qualitative research that systematically, objectively, and quantitatively describes variables within textual data (Gökçe, 1995; Wimmer & Dominick, 2000). Bengtsson (2021) defines this method as the process of extracting meaning from data, emphasizing that it not only presents data as it is but also interprets it through descriptive and analytical approaches to generate new meanings (Vaismoradi & Snelgrove, 2021). Similarly, Krippendorff (2020) describes content analysis as the logical and contextually meaningful examination of data, while Mayring (2021) highlights its extensive use in developing thematic categories through inductive and deductive approaches. Furthermore, Neuendorf (2022) notes the growing application of this method to emerging data sources, particularly social media and digital content.

A systematic approach was employed in the data analysis process, whereby codes such as "T1, T2, T3..." were assigned to teachers working in Science and Art Centers to ensure anonymity. The statements collected through the online interview form were processed while maintaining the confidentiality of the participants. Personal information was not collected, and textual inconsistencies, such as spelling errors, unnecessary expressions, and filler words (e.g., "thing," "new"), were removed as they were deemed irrelevant to the analysis. After a thorough examination of the data, similar expressions

were grouped, categorized, and synthesized into themes based on their interrelationships. These themes were then presented and interpreted in tables, with findings substantiated through direct quotations. Patton (2015) underscores the importance of presenting direct quotes from participants to ensure the transparency and validity of research findings.

Through this analytical process, the data were systematically transformed into a structured, meaningful, and analyzable format. Thematic categorization facilitated data summarization and the identification of key themes. According to Bengtsson (2021), trustworthiness in content analysis requires that the coding process be conducted in an open, systematic, and replicable manner. To minimize subjectivity, multiple researchers participated in the coding and theme development processes. To enhance the reliability of the data analysis, the coding process was meticulously conducted with a focus on transparency, consistency, and repeatability. Researchers actively contributed to coding, categorization, and theme generation while maintaining an objective analytical approach.

4. Findings

This section presents the findings derived from participants' responses to the questions posed in the semi-structured interview form. The analysis is based on teachers' perspectives and interpretations regarding the research topic.

4.1 Findings and Interpretations on Teachers' Training in the Universal Design for Learning Approach

The findings related to teachers' training on the Universal Design for Learning (UDL) approach are analyzed and interpreted in this section. The responses provided by participants offer insights into their knowledge, experiences, and perspectives on UDL, contributing to a comprehensive understanding of their training and professional development in this area.

Table 2: Teachers' views on the trainings they received about the universal design for the learning approach

Theme	Category	Codes
Trainings on the universal design for learning approach received during your profession	Trainings	T4: "*I participated in the Tübitak Designer Teacher Project*." T6: "*I received a training on this subject in TÜBİTAK 4005 Universal Design in Learning Integrating Technology into Teaching Strategies Project*"
	Other Trainings	T12: "*I studied computer programming at a distance. I'm studying face-to-face again*."

Secondly, teachers who had received training on the Universal Design for Learning (UDL) approach were asked to provide details about the training programs they attended. As shown in Table 3, two teachers participated in training sessions organized

by the Scientific and Technological Research Council of Turkey (TÜBİTAK), while one teacher received Universal Design Teaching training as part of a Computer Programming course at the university. Notably, all of these training programs were conducted in a face-to-face format.

4.2. Findings and Comments on Teachers' Definition of Universal Design for Learning Approach

Table 3: Teachers' views on the definition of universal design for learning (UDL) approach

Theme	Category	Codes
Definition of universal design for learning	Flexible Learning Environment and Motivation	T1: "*Creating changeable, flexible learning environments to provide equal learning opportunities for all students*." T5: "*Creating changeable, flexible learning environments to provide equal learning opportunities for all students*." T20: "*A model that accepts differences and opposes uniform learning*." T4: "*Providing appropriate learning opportunities for each individual with different learning methods and environments*." T13: "*It facilitates student learning and increases student motivation. It enables to reach the desired goals in the educational environment in a shorter time*."
	Inclusive and developmental	T6: "*It achieves studies by designing inclusive activities that are accessible to all students in the education and training process*." T8: "*Inclusive education.*" T10: "*Customized to meet the needs of each individual*." T15: "*In a classroom there are students with different levels of potential, educational needs and learning styles. It is the teacher's preparation of the learning environment and course content taking into account individual differences and learning styles.*" T20: "*A model that accepts differences and opposes uniform learning.*" T21: "*From the start, it's a model that allows all learners to move forward from where they are*."

Thirdly, the participating teachers were asked to define the Universal Design for Learning (UDL) approach based on their professional experiences. Five teachers highlighted the significance of a flexible learning environment and the role of motivation

in UDL. Overall, they stated that customizing the educational environment enhances learning skills, provides rich content, and addresses individual needs effectively.

The concept of universal design initially emerged in the field of architecture to accommodate the needs of individuals with disabilities. It is defined as "*the design of products and environments in a way that allows them to be used by all individuals without the need for adaptation or specialized design*" (Connell *et al.*, 1997). Other teachers in the study emphasized the inclusive and developmental aspects of UDL, highlighting its potential to create equitable learning experiences for diverse learners.

4.3 Findings and Interpretations on the Contribution of the Universal Design for Learning (UDL) Approach to Teaching and Learning Processes

The findings obtained from preliminary interviews with teachers regarding the contributions of the Universal Design for Learning (UDL) approach to teaching and learning processes are presented within three key categories: "Flexibility and Diversity," "Equity and Accessibility," and "Motivation."

Direct quotations from teachers' responses are provided to illustrate their perspectives, and interpretations have been made based on these statements. The findings were analyzed to highlight the impact of UDL on instructional practices and learning experiences. Teachers' views on the contributions of the UDL approach to teaching and learning processes are summarized in Table 4.

Table 4: Teachers' views on the contribution of universal design for learning (UDL) approach to teaching-learning processes

Theme	Category	Codes
The contribution of universal design for learning approach to teaching and learning processes	Flexibility and diversity	T2: "*I think it is an effective approach because it allows the use of various methods, techniques and materials in terms of mathematics branch*." T3: "*A supportive process that increases knowledge and skills in the developmental stages of an individual*." T4: "*I know that the learning journey is also different, taking into account that each of my students is special and different. After getting to know my student, when I provide him/her with the appropriate learning environment and path, I think that his/her journey is permanent and enjoyable*." T5: "*To realize learning at the highest level by providing an environment suitable for the individual differences of each child*." T11: "*There are similar challenges and requirements in teaching English all over the world, based on human nature. I think that's what this approach is all about*." T15: "*Putting the student at the center, trying to reach every student in the class, being flexible and taking into account the*

		needs of each student contribute to better student learning. Since the approach is not based on a single learning-teaching approach, effective learning can be achieved through practices such as question-answer, practice and repetition, discussion, reciprocal teaching, cooperative learning, mental modeling and problem solving, teaching through invention, research, investigation, case study, as well as direct teaching models that will help each student learn more easily." T18: "*I believe that a program that will be designed according to student interests and abilities in the field of informatics, which is renewed and developed every day, will be beneficial*." T1: "*It includes all students in the process as it starts by recognizing that each student's learning needs are different. No student is left outside the system*." T6: "*Reach different groups of students at different levels in the classroom*." T10: "*Each individual learns more permanently at his/her own pace and with personalized methods*."
	Equality and Accessibility	T15: "*Putting the student at the center, trying to reach every student in the class*." T8:" *With this philosophy, not a single child is left behind*."
	Motivation	T20: "*It adds excitement, enriches, and makes us love learning*." T14: "*It facilitates student learning and increases student motivation*." T13 "*Increased student motivation, increased quality of learning, enrichment, active participation, engaging students in the process. I use it in philosophy class to connect abstract theories with life*." T16: "*I think it will enrich*."

Three distinct themes emerged regarding the perspectives of the teachers who participated in the study on the contribution of the Universal Design for Learning (UDL) approach to teaching and learning processes. A summary of these themes is presented in Table 4.

4.4. Findings and Interpretations on Teachers' Views Regarding the Recommendation of the Universal Design for Learning (UDL) Approach to Other Teachers

Teachers' perspectives on recommending the Universal Design for Learning (UDL) approach to their colleagues were examined. Direct quotations from their responses were provided, and interpretations were made based on these statements. The findings related

to teachers' recommendations of the UDL approach to their fellow educators are summarized in Table 5.

Table 5: Teachers' opinions on whether they would recommend the universal design approach for learning to their fellow teachers

Theme	Category	Codes
Yes	Flexibility	T1: "*Because its flexible structure enables us to manage this process better and complete it without leaving any student out of the process*."
	Positive Learning	T3: "*When we realise this approach, a positive learning climate will be created*." T5: "*I do, to increase the efficiency of education*." T6: "*Being continuously learning orientated as development is psychologically satisfying*." T14: "*Since our aim is to be useful for the student, this approach should be used in the learning environment*." T18: "*I think that the application especially to the students receiving education in BİLSEM will improve the potential of the students*."
	Individualisation	T15: "*Because each student is potentially not the same. Their needs also differ. For such differences, it is obvious that we cannot achieve success when we try to explain the same thing to students at different levels with the same method. While some of them can learn, the rest cannot. When the right method and environment are provided, perhaps all of them will gain the desired knowledge and competences to a large extent*." T21: "*UDL aims to maximise students' potential by focusing on providing the appropriate level of support and challenge for each student. Reduces Teachers' Workload. By helping teachers to diversify the course content and materials, UDL can reduce teachers' workload and facilitate classroom management*."

An analysis of Table 5 reveals that teachers' opinions on whether they would recommend the Universal Design for Learning (UDL) approach to their colleagues are primarily categorized under "Flexibility," "Positive Learning," and "Individualization."

Upon examining their responses, teachers strongly emphasized their support for recommending the UDL approach to fellow educators. They highlighted that UDL has the potential to maximize the learning capabilities of all students. Additionally, they noted that the implementation of UDL would enhance the diversity of course materials and instructional content used in Science and Art Centers (BİLSEM). Furthermore, teachers stressed that diversifying learning and teaching methods within BİLSEMs would positively contribute to fostering the innate potential of each student.

4.5. Findings and Interpretations on Teachers' Views Regarding the Use of the Universal Design for Learning (UDL) Approach in the Education of Gifted Students

Teachers' perspectives on the application of the Universal Design for Learning (UDL) approach in the education of gifted students were examined. Direct quotations from their responses were provided, and interpretations were drawn from these statements to

analyze their viewpoints. The findings related to teachers' implementation of the UDL approach in gifted education are summarized in Table 6.

Table 6: Teachers' views on the use of universal design for learning (UDL) approach in the education of gifted students

Theme	Category	Codes
Special gifted students	Individualisation	T1: "*Especially in collaborative group work, gifted individuals can be important because they can bring their own talents to the forefront. They can be very successful with little help in line with their interests and abilities*." T4: "*Since it will improve their learning skills, they will continue to be excited about learning as they will discover individual learning paths*." T14: "*Since gifted students are different from other students, teaching methods need to be individualized. In this respect, the IST approach should be used in the learning of gifted students*." T15: "*Although gifted students seem homogeneous in BİLSEM, in fact they are not. Their interests and needs are very different. Their learning styles are also different. Therefore, I think the universal design approach is very suitable for these students*." T16: "*Although there are individual differences, I think they will like and benefit from it in general*." T21: "*It supports differentiated instruction. The learning speed and needs of gifted students may differ from other students. By providing students with differentiated teaching and learning opportunities, UDL can help them develop their special abilities and reach their full potential. Provides Enriched and Deepened Content. Gifted students often need more challenge beyond the standard curriculum. By providing richer, more complex and in-depth content, UDL can increase their level of interest and motivation. Provides a Motivating Environment: Gifted learners seek engaging and motivating learning experiences rather than boring and repetitive work. By providing such learning experiences, UDL can increase students' interest and engagement in learning*."

An analysis of teachers' opinions revealed that the Universal Design for Learning (UDL) approach is perceived as having a positive impact on the education of gifted students. Teachers emphasized that UDL supports individualized instruction and acknowledges the diverse needs of gifted learners.

In particular, they highlighted that the approach facilitates the identification of students' interests and abilities, thereby fostering their development by unlocking their full potential. Given that gifted students have varying learning paces, they require enriched and differentiated content. Teachers also noted that, much like stars, each student is unique; therefore, employing individualized learning and teaching methods for gifted students will enhance their academic success.

5. Results and Discussion

Teachers in this study recommended the UDL approach to their colleagues, emphasizing its ability to maximize students' learning potential. They also highlighted that UDL enhances the diversity of course materials and instructional content in Science and Art Centers (BİLSEM). Additionally, teachers predicted that UDL would have a positive impact on the education of gifted students. They stressed the importance of individualization and differentiation in gifted education, noting that UDL allows students' interests and abilities to be identified and nurtured. Since gifted students have varying learning paces, they require enriched and adaptable content. Teachers also compared students to stars, each unique in their abilities, and emphasized that employing individualized instructional methods would enhance their academic success. The teachers' responses indicated that they associated the contributions of the UDL approach to teaching and learning processes with the concepts of "*flexibility and diversity*." Kuuk (2023) explored the impact of project-based learning, supported by universal design-based learning principles, on students' motivation and 21st-century skills. The study revealed improvements in collaboration, creative and critical thinking, social and cultural awareness, self-regulation, flexibility, adaptability, time management, multiple perspectives, and technological integration. Universal design fosters flexibility in terms of materials, content, context, and instructional tools, allowing for multiple means of knowledge transfer, engagement, and expression (Rose & Meyer, 2005; Meyer *et al.*, 2014; Hodges *et al.*, 2020).

Similarly, Yavuzarslan and Arslan (2020) reported that UDL enhances attention, interest, collaboration, and self-regulation skills, as well as supports information retention, multiple representations of knowledge, and active classroom participation. Their study concluded that UDL is an effective teaching approach, particularly in mathematics education, and recommended its implementation. Thomas *et al.* (2015) further suggested that UDL serves as a tool for designing a more flexible and accessible curriculum, enabling teachers to tailor instruction to students' diverse learning styles and needs. Yüzlü (2017) found that UDL-based instruction improved students' mastery of grammar structures and self-regulation skills in English language learning compared to traditional methods. The use of UDL principles in educational settings offers students varied opportunities through collaborative learning, technology integration, and diverse instructional methods (Evans *et al.*, 2010). From this perspective, the ability to adapt lessons to learners' individual characteristics, skills, and learning paces is directly linked to UDL's contribution to flexibility and diversity in education. Therefore, the findings of this study regarding teachers' perspectives support previous research on the role of UDL in promoting flexibility and diversity in teaching and learning.

The findings also revealed that teachers associated the UDL approach with "*equity and accessibility*." UDL ensures that students with diverse characteristics have equal access to educational materials, content, and instructional methods, thereby promoting equity and fairness in learning. As students have varying learning styles—visual, auditory,

kinesthetic, or multimodal—UDL supports instruction by integrating materials and strategies that cater to these differences.

According to King-Sears (2009), UDL fosters student engagement by ensuring that instructional content is designed to meet the diverse needs of learners. Hitchcock and Stahl (2003) also highlight how UDL accommodates students with learning disabilities by offering equal access to information and active participation through the use of adaptive software, hardware, learning materials, and instructional activities. King-Sears *et al.* (2015) examined the impact of UDL in chemistry instruction for students with and without disabilities, reporting positive perceptions and learning outcomes among all participants. Similarly, Yurttabir (2019) found that incorporating UDL principles into foreign language instruction for students with disabilities facilitated the creation of individualized education programs. Franz *et al.* (2016) explored the use of UDL principles in problem-solving tasks in mathematics, concluding that UDL-enhanced learning environments support students' cognitive development and problem-solving abilities. Likewise, Kennedy *et al.* (2014) investigated the effect of UDL on students' vocabulary acquisition in social studies and found that the approach significantly improved student performance and reduced learning gaps between students with and without disabilities. Beyond its benefits for students with disabilities, UDL has been recognized as a universal tool for designing effective, meaningful, and engaging learning experiences for all learners (Howard, 2003). Burgstahler (2009) emphasized the need for inclusive instructional design that accommodates a wide range of individual characteristics and learning preferences. Altınpulluk (2015) further demonstrated how augmented reality technologies can be integrated into open and distance learning environments following UDL principles, ensuring equal access to learning resources. These findings align with the perspectives of teachers in this study, reinforcing the significance of UDL in ensuring equity and accessibility in educational settings.

The study also concluded that teachers associated UDL with "motivation." UDL promotes student engagement and active participation by providing equal learning opportunities for students with diverse interests and learning styles (King-Sears, 2009). When educational content, environments, and instructional materials are designed to align with students' cognitive, affective, and psychomotor skills, motivation and willingness to learn increase. By incorporating interactive and engaging materials and activities, UDL encourages students to take an active role in their learning process. This fosters a sense of self-efficacy and allows learners to direct and control their own learning progress. Katz (2013) found that UDL-based instruction enhanced student autonomy, social participation, and engagement in group activities. The study reported that students became more confident, collaborative, and self-aware of their learning progress when participating in UDL-based group work. Kumar and Wideman (2014) noted that UDL's flexible learning environments increased students' social presence and participation in classroom activities.

Similarly, Bektaş and Horzum (2014) found that students engaged in UDL-based project work demonstrated higher levels of creativity and productivity. Staulters (2006) examined how UDL reduced barriers in mathematical problem-solving, concluding that

it enhanced student performance, participation, and self-efficacy. Yavuzarslan and Arslan (2020) further emphasized that UDL fosters attention, interest, collaboration, and self-regulation skills, while supporting knowledge retention and active learning. Kitanosako (2012) found that balancing group dynamics with individualized instruction had a positive impact on student motivation and engagement. These findings reinforce the results of this study, supporting the role of UDL in fostering motivation in educational environments.

5. Recommendations

To promote awareness and effective implementation of Universal Design for Learning (UDL), it is recommended to organize in-service training, seminars, workshops, and conferences to enhance teachers' knowledge and expertise, revise curricula to include UDL-based activities at all educational levels, and establish mentorship programs where experienced teachers support their colleagues in applying UDL principles. Additionally, utilizing digital learning platforms and online resources can facilitate the sharing of best practices, activity repositories, and instructional strategies. Encouraging the integration of UDL into daily classroom practices will further emphasize its positive impact on teaching and learning outcomes. By implementing these strategies, UDL can be more effectively incorporated into educational settings, fostering inclusivity, accessibility, motivation, and student success.

6. Conclusion

Teachers in this study recommended the UDL approach to their colleagues, emphasizing its ability to maximize students' learning potential. They also highlighted that UDL enhances the diversity of course materials and instructional content in Science and Art Centers (BİLSEM). Additionally, teachers predicted that UDL would have a positive impact on the education of gifted students. They stressed the importance of individualization and differentiation in gifted education, noting that UDL allows students' interests and abilities to be identified and nurtured. Since gifted students have varying learning paces, they require enriched and adaptable content. Teachers also compared students to stars, each unique in their abilities, and emphasized that employing individualized instructional methods would enhance their academic success.

Conflict of Interest Statement
The authors declare no conflicts of interest.

About the Author(s)

Hüseyin Kocasaraç (PhD) works at the General Directorate of Innovation and Educational Technologies of the Ministry of National Education of the Republic of Turkey. I am a teacher educator and a lifelong learner. I conduct scientific studies on

Innovative Teacher, Innovative School, Innovative Education, Digital Tools in Education. Digital Education, Educational Technologies.
ORCID: https://orcid.org/0000-0002-5846-9958
E-mail: huseyinkocasarac@gmail.com
Şahika Ünlü (PhD)'s areas of work are program development, critical thinking, education of gifted individuals and teacher training. She has many academic studies in these areas, including national and international articles, books and projects. The author also has works in the field of children's literature. The author currently works as a classroom teacher at the Yenimahalle Science and Art Center affiliated with the Ministry of National Education.
ORCID: https://orcid.org/0000-0003-1155-4490
E-mail: sahikau@gmail.com
Metin Aydin, Principal at Kıymet Necip Tesal Primary School, an educator and researcher dedicated to innovative teaching and digital education. With a background in Educational Administration and Social Services, he has led and participated in numerous national and international projects, including TÜBİTAK 4006 Science Fairs, TÜBİTAK 4005 Data Visualization Techniques, and Erasmus+ KA101 and KA229 programs. As a project coordinator and trainer, he has contributed to various initiatives focused on technological skills, algorithmic thinking, disaster education, and the development of school culture.
ORCID: https://orcid.org/0000-0001-8306-4867
E-mail: metinaydinbilsem@gmail.com

References

Alquraini, T. A., & Rao, S. M. (2020). Assessing teachers' knowledge, readiness, and needs to implement Universal Design for Learning in classrooms in Saudi Arabia. *International Journal of Inclusive Education, 24*(1), 103–114. https://doi.org/10.1080/13603116.2018.1452298

Altınpulluk, A. G. H. (2015). Usability of augmented reality within the framework of universal design principles in open and distance learning. *Journal of Open Education Practices and Research, 1*(1), 4–6. Retrieved from http://dx.doi.org/10.5944/openpraxis.12.2.1017

Arslan, A. (2017). Learning based on universal design and universally designed educational programs. *Karaelmas Journal of Educational Sciences, 5*(2), 328–334.

Bektas, M., & Horzum, M. B. (2014). *Authentic learning*. Pegem Academy. Retrieved from https://files.eric.ed.gov/fulltext/EJ1294983.pdf

Bengtsson, M. (2021). How to plan and perform a qualitative study using content analysis. *Nursing Plus Open, 2*, 8–14. Retrieved from https://doi.org/10.1016/j.npls.2016.01.001

Burgstahler, S. (2009). *Universal design in education: Principles and applications.* Retrieved January 5, 2024, from http://files.eric.ed.gov/fulltext/ED506545.pdf

Burgstahler, S. (2011). Universal design: Implications for computing education. *ACM Transactions on Computing Education, 11*(3), 1–17. https://doi.org/10.1145/2037276.2037283

Capp, M. J. (2017). The effectiveness of universal design for learning: A meta-analysis of literature between 2013 and 2016. *International Journal of Inclusive Education, 21*(8), 791–807. https://doi.org/10.1080/13603116.2017.1325074

CAST. (2020). *Universal design for learning guidelines.* Retrieved from https://udlguidelines.cast.org

Chita-Tegmark, M., Gravel, J. W., Maria De Lourdes, B. S., Domings, Y., & Rose, D. H. (2012). Using the universal design for learning framework to support culturally diverse learners. *Journal of Education, 192*(1), 17–22. https://doi.org/10.1177/002205741219200104

Connell, B. R., Jones, M., Mace, R., Mueller, J., Mullick, A., Ostroff, E., & Vanderheiden, G. (1997). *The principles of universal design (Version 2.0).* Retrieved January 2, 2024, from https://www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm

Courey, S., Tappe, P., Siker, J., & LePage, P. (2013). Improved lesson planning with universal design for learning (UDL). *Teacher Education and Special Education, 36*, 7–27. https://doi.org/10.1177/0888406412446178

Ekiz, D. (2003). *Introduction to research methods in education.* Anı Publishing. Retrieved from https://atozpdfbooks.com/download/4922870-Introduction%20To%20Research%20Methods%20In%20Education

Evans, C., Williams, J. B., King, L., & Metcalf, D. (2010). Modeling, guided instruction, and application of UDL in a rural special education teacher preparation program. *Rural Special Education Quarterly, 29*(4), 41. https://doi.org/10.1177/875687051002900409

Franz, P. D., Ivy, J., & McKissick, B. R. (2016). Equity and access: All students are mathematical problem solvers. *Clearing House, 89*(2), 73–78. Retrieved from https://doi.org/10.1080/00098655.2016.1165167

Gökçe, O. (1995). *Content analysis.* Selçuk University Publications.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review, 27*. Retrieved from https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Howard, J. B. (2003). Universal design for learning: An essential concept for teacher education. *Journal of Computing in Teacher Education, 19*(4), 113–118. Retrieved from http://com.appolearning.files.s3.amazonaws.com/production/uploads/uploaded_file/ec1b9df9-e0fa-4e60-acd8-45d33f7da7d6/Howard-UDL.pdf

Kennedy, M. J., Thomas, C. N., Meyer, J. P., Alves, K. D., & Lloyd, J. W. (2014). Using evidence-based multimedia to improve vocabulary performance of adolescents with LD: A UDL approach. *Learning Disability Quarterly, 37*(2), 71–86. Retrieved from http://dx.doi.org/10.1177/0731948713507262

King-Sears, M. (2009). Universal design for learning: Technology and pedagogy. *Learning Disability Quarterly, 32*(4), 199–201. Retrieved from http://dx.doi.org/10.2307/27740372

Kitanosako, Y. S. (2012). *Applying principles of universal design for learning to early elementary math classes in Japan: A case study* (Doctoral dissertation). University of Kansas. Retrieved from https://kuscholarworks.ku.edu/entities/publication/1b13e1af-d469-47ef-b561-0f3e60655fea

Krippendorff, K. (2020). *Content analysis: An introduction to its methodology.* SAGE Publications. Retrieved from https://methods.sagepub.com/book/mono/content-analysis-4e/toc

Kumar, K. L., & Wideman, M. (2014). Accessible by design: Applying UDL principles in a first-year undergraduate course. *The Canadian Journal of Higher Education, 44*(1), 125. Retrieved from http://dx.doi.org/10.47678/cjhe.v44i1.183704

Kuuk, Ö. (2023). *The effects of project-based learning supported by principles of universal design on students' motivation and 21st-century skills.* (Unpublished doctoral dissertation). Bartın University, Bartın.

Mace, R. (1997). *What is universal design?* The Center for Universal Design. Retrieved November 19, 2024, from https://www.ncsu.edu/ncsu/design/cud

Mayring, P. (2021). *Qualitative content analysis: Theoretical foundation, basic procedures, and software solutions.* Beltz Verlag. Retrieved from https://www.researchgate.net/publication/266859800_Qualitative_content_analysis_-_theoretical_foundation_basic_procedures_and_software_solution

Meo, G. (2008). Curriculum planning for all learners: Applying universal design for learning (UDL) to a high school reading comprehension program. *Preventing School Failure, 52*(2), 21–30. https://doi.org/10.3200/PSFL.52.2.21-30

Meyer, A., Rose, D. H., & Gordon, D. T. (2014). *Universal design for learning: Theory and practice.* CAST Professional Publishing.

Ministry of National Education. (2017). *Understand me: I have a gifted child* (O. Kılıç & T. Bağrıaçık, Eds.). MEB Publications.

Ministry of National Education. (2019). *Guidelines for science and art centers.* Retrieved from https://orgm.meb.gov.tr

Ministry of National Education. (2023). *Teacher selection and placement guide for science and art centers.* Retrieved from https://orgm.meb.gov.tr

Nelson, L. L. (2014). *Design and deliver: Planning and teaching using universal design for learning.* Brookes Publishing Co. Retrieved from https://products.brookespublishing.com/Design-and-Deliver-P1237.aspx

Neuendorf, K. A. (2022). *The content analysis guidebook.* SAGE Publications. Retrieved from https://methods.sagepub.com/book/mono/the-content-analysis-guidebook-2e/toc

Novak, K. (2016). *UDL now: A teacher's guide to applying universal design for learning in today's classrooms.* CAST Professional Publishing. Retrieved from https://www.novakeducation.com/udl-now

Özmen, H., & Karamustafaoğlu, O. (Eds.). (2019). *Research methods in education.* Pegem Academy Publications.

Patton, M. Q. (2015). *Qualitative research & evaluation methods.* SAGE Publications. Retrieved from https://us.sagepub.com/en-us/nam/qualitative-research-evaluation-methods/book232962

Rao, K. (2015). Universal design for learning and multimedia technology: Supporting culturally and linguistically diverse students. *Journal of Educational Multimedia and Hypermedia, 24*, 121–137. Retrieved from https://www.researchgate.net/publication/283133330_Universal_design_for_learning_and_multimedia_technology_Supporting_culturally_and_linguistically_diverse_students

Rose, D. H., & Meyer, A. (2006). *A practical reader in universal design for learning.* Harvard Education Press. Retrieved from https://www.cast.org/resources/tips-articles/a-practical-reader-in-universal-design-for-learning/

Smith, T., & Harvey, L. (2021). Implementing UDL in Australian classrooms. *Journal of Inclusive Education, 14*(3), 45–60.

Swanborn, P. (2010). *Case study research: What, why and how?* SAGE Publications. Retrieved from https://methods.sagepub.com/book/mono/case-study-research-what-why-how/toc

Tekindal, S. (2021). *Quantitative, qualitative, and mixed methods research designs and statistics.* Nobel Publishing.

Turan, F., Yildiz, M., & Demir, S. (2022). Inclusive education with UDL principles. *Journal of Education and Science, 47*(2), 123–134.

Vaismoradi, M., & Snelgrove, S. (2021). Theme analysis in qualitative content analysis and thematic analysis. *Forum Qualitative Sozialforschung, 22*(3). Retrieved from https://doi.org/10.17169/fqs-20.3.3376