

DESIGNING AN ONLINE PROBLEM-BASED
PROFESSIONAL DEVELOPMENT PROGRAM
FOR DIFFERENTIATION OF EARLY LITERACY INSTRUCTION



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for Differentiation of Early Literacy Instruction

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- . this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
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ABSTRACT

Designing an Online Problem-Based Professional Development Program for Differentiation of Early Literacy Instruction

Effective professional development (PD) programs closely linked to classroom practice, and teacher collaboration stand as a crucial element in enhancing educational quality. In PD programs that incorporate problem-based learning (PBL), teachers work together to address real-world challenges. Elementary teachers often struggle with assessment and teaching early literacy to students with varied skill levels and diverse backgrounds. This study aimed to address this need by design and delivery of a PD program to develop in-service early literacy teachers' knowledge and implementation of differentiated instruction (DI). The program, designed with PBL principles, was conducted on an online platform. In this design-based research, a needs analysis was conducted, followed by two cycles, with design improvements implemented after the first cycle. Participant artifacts, video recordings of the sessions, interviews, questionnaires and field notes were used for data collection. The findings indicate that participation in the PD program led to improvements in the participants' understanding and application of DI. Through collaborative problem-solving and self-directed learning tasks, teachers demonstrated a deeper understanding of DI and made progress in developing differentiated lesson plans. The findings suggested that teacher PD programs structured around PBL design principles can foster effective learning experiences that support teachers in developing practical skills in DI.

ÖZET

Okuma-Yazma Öğretiminde Farklılaştırmaya Yönelik

Problem Tabanlı Çevrimiçi Öğretmen Eğitimi Programının Tasarlanması

Sınıf uygulamalarıyla yakından bağlantılı olan ve öğretmen iş birliğini içeren etkili mesleki gelişim programları, eğitim kalitesini artırmada önemli bir unsurdur.

Problem-tabanlı öğrenmeyi benimsemiş mesleki gelişim programlarında öğretmenler gerçek hayat problemlerine çözümler bulmak için birlikte çalışır. İlkokul

öğretmenleri farklı yeterlilik ve birikime sahip öğrencilerin bulunduğu sınıflarda okuma becerisini değerlendirmek ve öğretmek konusunda zorluklar yaşamaktadırlar.

Bu çalışmada, bu ihtiyacı karşılamak amacıyla öğretmenlerin farklılaştırılmış okuma-yazma öğretim bilgi ve uygulamalarını geliştirecek bir mesleki gelişim programı

amaçlanmıştır. Problem-tabanlı öğrenme prensipleri ile tasarlanan program çevrimiçi bir platformda gerçekleştirilmiştir. Bu tasarım temelli araştırmada, bir ihtiyaç analizi

yapılarak, ardından iki döngü gerçekleştirilmiş ve birinci döngünün sonunda tasarım iyileştirmeleri uygulanmıştır. Veri toplama araçları katılımcı ürünleri, oturumların

video kayıtları, görüşmeler, anketler ve alan notlarıdır. Bulgular, program sonunda katılımcıların farklılaştırılmış öğretimi anlama ve uygulamalarında gelişmeler

olduğunu göstermektedir. Öğretmenler, iş birliğine dayalı problem çözme ve öz denetimli öğrenme görevleriyle, farklılaştırılmış öğretim uygulamalarını daha

derinlemesine anlamış ve farklılaştırılmış ders planları geliştirmede ilerleme kaydetmişlerdir. Bulgular, problem-tabanlı öğrenme tasarım ilkeleriyle

yapılandırılmış öğretmen mesleki gelişim programlarının, öğretmenlerin

farklılaştırılmış öğretim uygulama becerilerinin gelişimini destekleyen etkili öğrenme deneyimleri sunulabileceğini göstermektedir.

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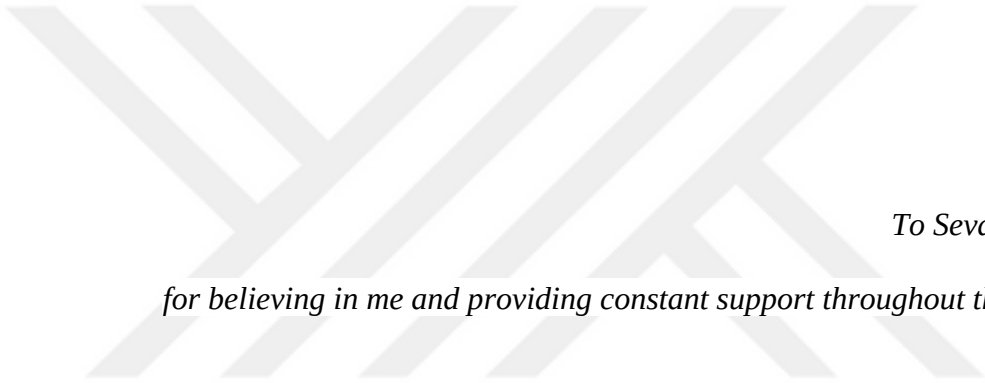
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ABBREVIATIONS

DBR	Design-Based Research
DI	Differentiated Instruction
DLP	Differentiated Lesson Plan
MEB	Ministry of National Education (<i>Milli Eğitim Bakanlığı</i>)
PBL	Problem-based learning
PD	Professional Development
SDL	Self-Directed Learning

CHAPTER 1

INTRODUCTION

As a special education teacher with approximately ten years of experience in rehabilitation centers, I have come to realize the urgency of including children with special needs in mainstream classrooms—not just physically, but also socially and academically. Transitioning to a school setting ten years ago, I realized that the challenge of inclusion extends beyond students with special needs to encompass the entire spectrum of learners in general education classrooms. This realization sparked my interest in differentiated instruction, as I recognized the importance of addressing each student's unique learning needs.

Furthermore, I noticed how limited were the teachers' skills in addressing the diverse needs within classrooms. This limitation was mostly accompanied by the teachers' perception of being responsible for fostering the development of the average student. These personal experiences led me to study teacher professional development for differentiated instruction in my PhD research. Within differentiated instruction, I chose to focus on early literacy instruction, recognizing the central role of literacy skills in students' success throughout their school years and into adulthood.

Teacher professional development is one of the key components of educational improvement (Fishman et al., 2014; Yates, 2007). The countries which are claimed to possess the best education systems are those which focus more on teacher PD (Yates, 2007). Furthermore, teachers who are supported with teacher PD express higher job satisfaction (García & Weiss, 2019; OECD, 2016). However,

many PD programs fail to equip teachers with the qualities necessary to support students (OECD, 2016).

The design of teacher PD programs, guided by the learning theories suggested to be effective in teacher knowledge and practice, is of vital importance to support teachers and contribute to student learning. The Turkish Ministry of Education (MEB) also stresses the need for a new understanding, system and model for teachers' professional development (MEB Strateji Geliştirme Başkanlığı, 2019) to make the transfer of teachers' competence to the classroom practice possible (Koyuncu & Düşkün, 2020).

The traditional teacher PD programs, which are fragmented in content and disconnected from the classroom context, are transformed nowadays into programs consistent with the sociocultural theory, constructivism and the situated theory of learning (Borko et al., 2010). These programs are closely connected to classroom practices and they involve the teacher communities of learners collaborating to develop professional knowledge (Borko et al., 2010; Chan & van Aalst, 2006). Online asynchronous, computer-supported learning environments, where teachers work with authentic problems, are also found to be effective with teachers' collaborative knowledge building (Chan & van Aalst, 2006). Asynchronous online learning environments do not require real time interactions. Therefore, learners can collaborate anytime they are available from different locations without having to conform to the predetermined schedules (Woo & Reeves, 2008).

Problem-based learning (PBL) will be used in the design of the PD program in this research. PBL is a learner-centered approach compatible with the effective PD features grounded in the constructivist and sociocultural theories (Hung et al., 2019; Wang, 2007). PBL was first evolved in medical education and later used in a variety

of disciplines including teacher education (Lu et al., 2014; McPhee, 2002; Newman, 2003; Savery, 2015). During PBL experiences knowledge is constructed in collaboration, while working as a community of learners in searching solutions to authentic, ill-structured problems (Lu et al., 2014; Savery & Duffy, 1995). In a small-scale qualitative study, the teachers participating in a PD program designed with PBL principles expressed that they found the program deeply engaging, and had positive influence on their teaching practice (Wheeler et al., 2005).

The professional development program designed in this study will focus on differentiated early literacy development, recognizing its central role in both school and adult life. The primary goal in the first two years of school is to learn to read. In the later years reading continues to maintain its importance being used as a primary means to learn other subjects including science and mathematics (Perfetti & Curtis, 1988). Consequently, early reading experiences are highly predictive of students' future academic success, as good readers tend to read more, learn more, and continue to outperform poor readers over time—a phenomenon Stanovich (2009) described as the Matthew Effect: 'The rich get richer, and the poor get poorer'.

Research reveals that teacher knowledge and instructional expertise is correlated with student reading achievement (Lyon & Weiser, 2009; Myrberg et al., 2019). However, teachers lack some of the essential knowledge to assess and teach reading to struggling readers (Baydik et al., 2012; Doğan, 2013; Washburn et al., 2011).

Differentiation is a student-centered approach to meet the unique needs of the students in a classroom (Tomlinson, 2017). Making differentiations in the content, process, products, and learning environment is found to be effective in literacy teaching (Connor et al., 2011; Valiandes, 2015). Research shows that teacher PD

programs can be effective in improving teacher knowledge of differentiation and reading instruction (Al Otaiba et al., 2016; Aydın & Kartal, 2017; Erdoğan, 2017; Kennedy & Shiel, 2010; Mather et al., 2001; Podhajski et al., 2009; Risko et al., 2008; Valiandes & Neophytou, 2018).

My personal experiences, combined with insights from the literature review, led me to study differentiated early literacy instruction in my PhD research. During this review, I also discovered a significant scarcity of professional development programs focused on differentiated instruction. Moreover, I found a notable absence of PD programs employing the PBL approach, which further underscored the need for comprehensive teacher training in this area.

After establishing the focus and significance of my study, I decided to utilize design-based research methodology because it allows for iterative development and refinement of educational interventions and prioritizes the application and testing of educational theories in real-world environments.

Based on the ideas and needs elaborated above, the purpose of this study is to design an online teacher PD program for differentiated early literacy instruction. PBL design principles were used in the design of the PD. The participants were kindergarten and elementary teachers. They were expected to develop knowledge of differentiated early literacy instruction while collaborating to solve a PBL problem.

In this design-based research the following research question was addressed: How does a teacher professional development program based on problem-based learning and delivered through video conferencing support teachers' knowledge of differentiated instruction in early literacy?

Sub-questions:

- In what ways does the participant teachers' knowledge of differentiated instruction change in the PD program?
- How does the PBL design of PD facilitate teacher learning in differentiated instruction of early literacy?
- What kind of design changes are needed after the first cycle of PD?



CHAPTER 2

LITERATURE REVIEW

In this chapter, I will introduce the theoretical and conceptual frameworks of the study. I will begin with the grand theory that underpins my research: sociocultural theory. Next, I will present the conceptual frameworks utilized in the study, which include teacher professional development, differentiated instruction, literacy development, and problem-based learning. The chapter will conclude with an overview of the design principles informed by problem-based learning, which guided my professional development program design.

2.1 Sociocultural theory

The theoretical basis of the teacher PD design, data collection and analysis comprise sociocultural learning theory from Vygotsky's perspective. The prevailing reason for this choice is its accordance with problem-based learning on which the PD design is based. Sociocultural approaches regard learning as a social activity inseparable from the authentic context where people interact using physical and psychological tools to build knowledge (Danish & Gresalfi, 2018). In the teacher PD program designed in this study teachers will interact in a community of learners to solve authentic teaching problems to build knowledge and skills of planning and implementing differentiated early literacy instruction.

In most studies, PBL is found compatible with the constructivist learning theory (Hung, 2009; Savery & Duffy, 1995). They in fact utilize social constructivism which mostly relies on Vygotsky's theory of social construction of knowledge through dialogues and its consequent internalization by the individual.

Conversations among individuals take place at the Zone of Proximal Development where sign production and reception take place. Individuals transform the collective signs used in the ZPD to personal ones and learning takes place (Ernest, 2010).

Social constructivism can be seen as a combination of constructivism and sociocultural theories of learning. For Lerman (2001, 2019) however, constructivist and sociocultural theories are contradictory in some ways. First, the two theories are different in their explanation of individual's knowledge formation. In the constructivist view deriving from Piaget's theory, knowledge formation results from the individual's experience with the world, as a reorganization of the pre-existing mental schemas. In the sociocultural theory of Vygotsky, on the other hand, knowledge is first developed through social interactions outside the individual and then it is internalized. Consequent to this basic difference, Lerman stated that the two theories differ in their explanations of mental development. In constructivism, individual mental development as biological maturation prompts learning, in sociocultural theory mental development is the result of learning occurring through social interactions. Furthermore, for Piaget learning proceeds from the concrete to the abstract, for Vygotsky is the other way around. Lerman asserts that these differences are an obstacle to using the two theories simultaneously in research, and social constructivism, known as an emergent perspective, which uses these two theories in a complementary way can be misleading.

Taking into consideration Lerman's critique of social constructivism I will ground my study on sociocultural learning theory from the lenses of Vygotsky's perspective and explain PBL and my research choices through this lens.

Sociocultural theories are focused on learners' participation in social practices instead of individuals' mental processes. According to this perspective, human

learning must take place in consideration of the context where learning takes place.

PBL aligns with the sociocultural theory in the following aspects.

First, in PBL, learning occurs via discussions to find solutions to ill-structured, real-life problems (Marra et al, 2014). This is in accordance with Vygotsky's sociocultural theory where learning occurs through interactions with the outside world—people and other environmental elements—and later is internalized by the individuals (Fosnot & Perry, 1996). In PBL, knowledge is constructed within the learning community through problem solving interactions with the other group members. Ill-structured authentic PBL problems also fulfill the relevance and authenticity of the problems required by a sociocultural approach. According to Vygotsky (1978) what individuals learn has to be authentic and relevant for them.

In sociocultural theory, enculturation to the community occurs via the usage of language and other psychological tools (Vygotsky, 1978; Lave & Wenger, 1991). In PBL processes, this is achieved by collaborative group work facilitated by distributed scaffolds. Group members gradually become independent, acquiring and using the norms and cultural practices necessary to be fully active and productive members of the community. PBL whiteboard, among other technological devices, is also a tool which supports social knowledge construction as an area for the negotiation of ideas and visualization of the knowledge construction process.

In sociocultural theory, learning environment must be designed to support the learning process through appropriate scaffolding (Vygotsky, 1978; Wood et al., 1976). Scaffolding can be distributed across different agents such as the teacher, peers, and material or physical and software tools to address different learning needs (Puntambekar & Kolodner, 1998; Tabak, 2004). In PBL, the complexity level of the problems is designed and calibrated taking into consideration the learners' domain

knowledge and problem solving skills (Hung, 2009). In doing this learners' zone of proximal development is taken into consideration. The scaffolds are provided to support the learner during the problem-solving process and are decreased as the learner becomes independent and no longer needs any scaffolding. The teacher's role in PBL as a facilitator resembles the more knowledgeable other who supports the learner acting in the zone of proximal development.

Reflections are also used in PBL as means of articulation to reinforce learning occurring through the internalization of knowledge constructed by group interaction. Reflections as verbal articulations are among the psychological tools of sociocultural theory which contribute to learning. Vygotsky (1978) interprets child's self-talk as a form of reflection and a language-based tool of learning.

In this study, reflection will be encouraged to support teachers' learning, which will be observed from a sociocultural perspective. The sociocultural perspective is interested in the changes in participation within the social activities rather than in the changes due to individual learning. Thus, the unit of analysis will be the social processes the individuals are participating in during the teacher PD program along with the individual learning data (Rogoff, et al., 1995).

Studies of sociocultural approach mostly use qualitative data sources like interviews and video recorded discussions during instructional sessions. In this study, in accordance with the sociocultural learning approach, interviews, group discussions and artifacts will be analyzed to observe the group learning of differentiation. The collaboratively developed reading development checklist, differentiated lesson plan template, and differentiated lesson plan for fictional PBL problem classroom will constitute the group artifacts (Weizman et al., 2008).

2.2 Teacher professional development

Teacher professional development as a life-long learning opportunity for teachers is proven to be an effective way of improving teacher qualities and student achievement (Desimone et al., 2002, Vescio et al. 2008). In some of the high-performing countries of the international PISA test, participation in professional development programs is mandatory for teachers for salary increase, in some others it is a requirement for being able to continue to teach (OECD, 2018).

Teachers mostly work apart from each other with few occasions for collaboration. Teaching quality can be improved by promoting peer networks and collaboration instead of considering it a solitary activity. The OECD Teaching and Learning International Survey Report conducted in 2013 suggests that collaborative practices have a positive relationship with the job satisfaction of teachers (OECD, 2016).

Fishman et al. (2014) compile the most effective PD features as follows: Extended duration, content knowledge with a focus on student understanding, consistent with standards and expectations which teachers are experiencing, teacher reflection on their own practices, collaboration, and grounded on teachers' real classroom experiences. They also state that teacher PD does not only aim for change in knowledge, but also beliefs.

In this study a teacher PD program is designed taking in consideration the effective teacher PD features (Darling-Hammond et al., 2017; Fishman et al., 2014). The design is guided by the problem-based learning approach which is compatible with these features and is focused on collaborative self-directed problem solving.

2.3 Differentiated instruction

In most of the classrooms the teaching environment and activities are organized targeting an average student, without taking in consideration their individual differences. In reality, every student is unique with diverse learning characteristics. Differentiated instruction (DI) is a student-centered approach considering the learner diversity in planning and practicing teaching. Differentiation is done in the three elements of the curriculum—the content, the process, and the product—based on student readiness, interest, and learning profile.

Tomlinson (2017) defines differentiation as follows:

At its most basic level, differentiating instruction means "shaking up" what goes on in the classroom so that students have multiple options for taking in information, making sense of ideas, and expressing what they learn. In other words, a differentiated classroom provides different avenues to acquiring content, to processing or making sense of ideas, and to developing products so that each student can learn effectively. (p.1)

Differentiated instruction is not just for the students at the margin—with significantly low or high academic levels. So, it is not a big investment for just a few students. Every student needs and makes use of the teachers' personal attention. This personal attention doesn't mean that the teacher has to provide a different teaching strategy or assignment for each student. Differentiation is rather a process of organizing the teaching as a whole class, small group, or individual teaching sessions taking in consideration the students' learning needs (Tomlinson, 2017).

As seen in Figure 1 instruction can be differentiated in response to the students' readiness, interest, and learning profiles. In differentiating instruction based on student readiness, Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) is crucial. ZPD represents the range where a student can perform a task with guidance but not independently. With the differentiation for readiness teachers provide students content and tasks in their ZPD and facilitate

learning by offering scaffolds. By tailoring content and tasks to students' ZPDs, teachers enable learning through targeted support, helping students bridge the gap between current abilities and potential mastery (Tomlinson et al., 2003). Student interests are the second trait to consider in DI. Learners vary in their overall motivation and how they respond to specific tasks and research shows that students with strong emotional interest are drawn to a subject because it excites and engages them (Frymier, 1993; Mazer, 2013). At the heart of interest-based differentiation is the process of identifying and creating tasks that align with the unique interests of each student. This approach fosters a more individualized and engaging learning experience (Tomlinson et al., 2003). A student's learning profile, the third trait, refers to their preferred mode of learning, which can be influenced by various factors such as learning style, intelligence preference, gender, and cultural background (Tomlinson et al., 2003). Tailoring instruction to better match students' unique ways of processing and engaging with information allows teachers to create a more inclusive and effective learning environment.

Differentiation in the classroom involves adapting the three key elements of the curriculum—content, process, and product—based on the three critical aspects of student variation: readiness, interest, and learning profile.

Content refers to the material that is taught or the knowledge that students are expected to learn. When differentiating content, it can be approached in two ways: firstly, by altering what is taught, and secondly, by adjusting how content is delivered, ensuring that students have different pathways to access and engage with the material. Process refers to the part of the lesson where students have to process the content, ideas and skills to which they have been introduced and where the new knowledge becomes their own (Vygotsky, 1978). Product assignments refer to the

final student artifacts produced engaging with the new content, which is also a way to assess student learning (Tomlinson, 2001).

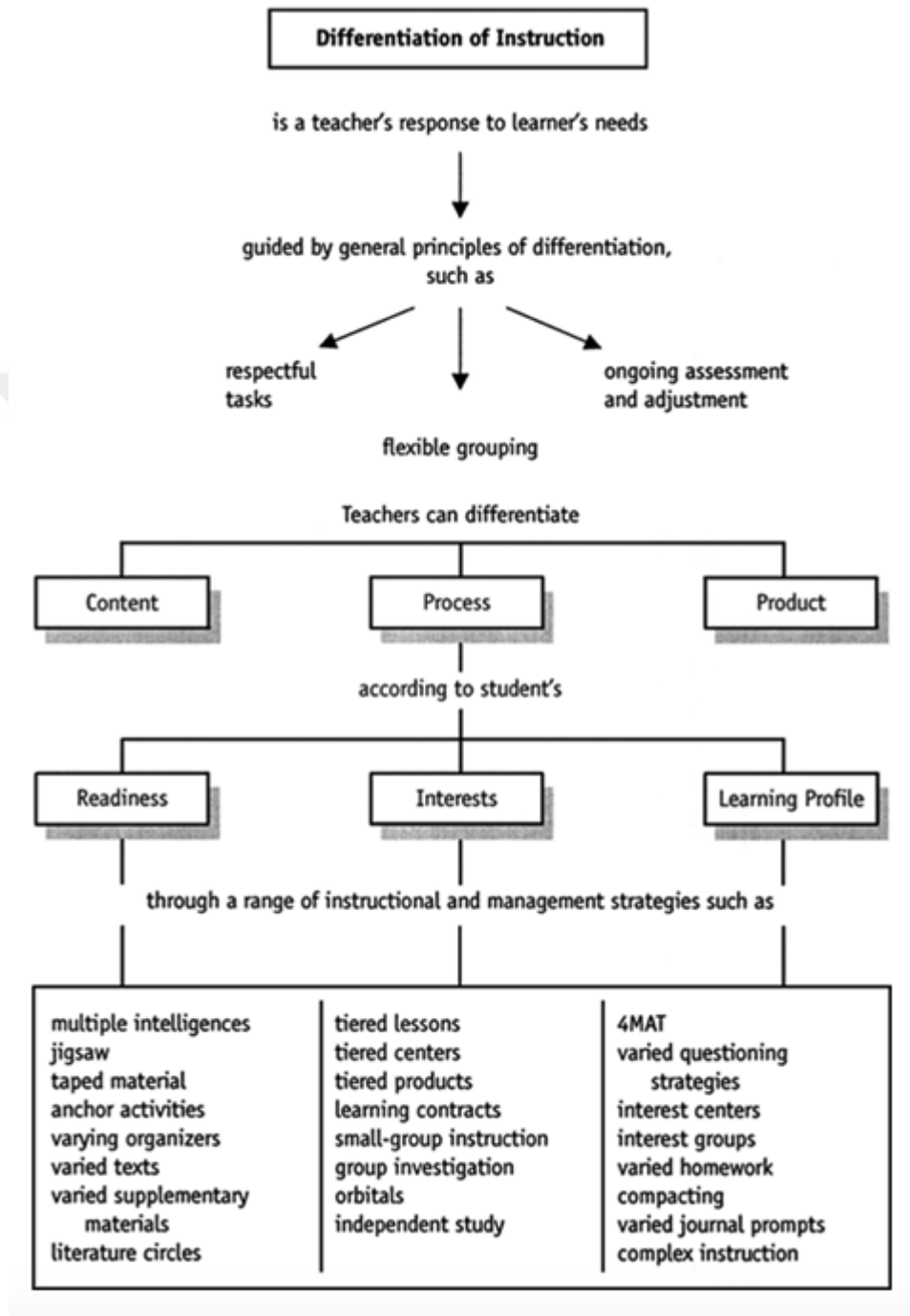


Figure 1. A concept map for differentiating instruction
Source: Tomlinson & Allan, 2000

Learning environment, the way the classroom works and feels, is the fourth area to be differentiated (Tomlinson, 2017). Differentiation here refers to creating a safe learning community where individual differences are respected, supporting one another's learning, and ensuring everyone feels welcomed. It fosters an environment where there are growth expectations for all learners (Tomlinson, 2001).

Assessment is a crucial component of differentiated instruction, with formative assessment playing a significant role in monitoring student readiness along a learning continuum, allowing for tailored instruction. Additionally, assessments are vital for understanding students' interests and learning profiles, ensuring a holistic approach to each student's needs. This comprehensive use of assessments helps inform and refine differentiated instructional strategies (Tomlinson & Moon, 2013).

Instructional strategies enrich the teachers in designing and managing DI. Among many others, flexible grouping is a key strategy. These groups can be whole class, homogeneous or heterogeneous small groups, or individual, depending on the task or objective. By using flexible grouping, teachers can provide more targeted support, encourage peer learning, and promote collaborative problem-solving.

Research reveals that there is need for teacher DP programs in Turkey. Culhaoglu and Letzel-Alt (2023) conducted qualitative interviews with 15 primary school teachers in Turkey, revealing a significant gap in the implementation of differentiated instruction DI in their daily teaching practices. While some teachers were able to articulate the concept, most exhibited a limited understanding of its practical application. Additionally, the research indicated that Turkish teachers recognize both the positive impacts and constraints of DI but primarily utilize a narrow range of differentiation strategies. The authors emphasize the urgent need for

improved DI training within Turkish teacher education and professional development programs.

The meta-synthesis study conducted by Uçarkuş (2024) reveals that teachers find differentiated instruction effective for both themselves and their students, but they face challenges that hinder its implementation. It highlights a lack of knowledge about differentiated instruction stemming from educational policies and stakeholders, suggesting that all education stakeholders should be informed about this approach based on the research findings.

2.4 Literacy development

Literacy is an indispensable skill in today's society. For most of us, reading acquisition feels natural and effortless, making it difficult to recall how we became fluent readers. However, unlike talking, reading acquisition is not a natural process and requires proper instruction (Gough & Hillinger, 1980). Moreover, for a considerable number of children, learning to read is quite an effortful process, such that they cannot become fluent readers throughout their lives (Rayner et al., 2001).

Reading can be defined in a broader way including the decoding, fluency, comprehension, writing, literature and other literacy activities. A narrower definition is also possible depending on the practical purpose of defining reading which can be limited to just decoding and fluency (Perfetti & Marron, 1998). In 80s, reading theorists tried to explain reading acquisition in successive developmental stages beginning from pre reading skills and proceeding gradually to fluent reading (Chall, 1983, as cited in Tracey & Morrow, 2017; Ehri, 1991; Frith, 1985, as cited in Tracey & Morrow, 2017; Gough et al., 1992).

In Chall's (2013) model, during the zero stage children understand and use the spoken language, read a few words, develop some phonological awareness and get familiar with books. At the first stage, children start to decode and read simple texts. The second stage is where readers get fluent, and after this stage reading becomes a tool to learn. At the third stage children, use reading to learn new knowledge, at the fourth and fifth stages readers gradually read more complex materials for their own purposes. At these last stages, reading becomes more effective than listening to learn new knowledge. These stages differ qualitatively from each other just like Piaget's levels of cognitive development, and generally progress hierarchically.

Reading highly depends on the writing systems of languages. Writing systems can be alphabetic, syllabary, and morpho-syllabic. In alphabetic systems like English and Turkish graphic units are associated with phonemes. In syllabary writing systems like the Japanese one, the graphic units are associated with syllables, and in morpho-syllabic systems, the association is mostly between the graphic units and the syllables which are mostly also morphemes (Rayner et al., 2001). As Turkish writing system is, an alphabetic system phonemes and consequently phonological awareness play a central role in reading, which is also true for English.

Most of the reading acquisition research is done in the English language. However, different morphological, phonological, and orthographical structures of languages are effective in literacy development. In our case, the properties of the Turkish language have to be taken into consideration to detect the probable causes and solutions for reading problems.

One of the most outstanding properties of the Turkish language is its transparent writing system. Transparency is the one-to-one correspondence of the

phonemes and graphemes which makes decoding much easier than opaque writing systems (Patel et al., 2004). The words in Turkish language are also easier to break into syllables and 98% of the syllables are of four types (V, VC, CV, and CVC). As a result of this simple syllable structure, the phonemes are easier to identify. Vowel harmony in Turkish words also supports the early phoneme awareness (Durgunoğlu, 2006). Consequently, Turkish speaking children acquire syllable and phoneme awareness more easily and earlier than English speaking children (Durgunoğlu & Öney, 1999). Ergül et al. (2020) conducted a three years longitudinal study with kindergarten and first grade students and found that phonological awareness, rapid naming and phonological memory were predictors of later reading achievement.

The complex morphological structure of Turkish can cause difficulties in reading and writing. Turkish is an Altaic morphologically rich, agglutinative language. Turkish word roots can take numerous successive suffixes, and produce words of technically infinite length (Ergin et al., 2020). The suffixes can be added with a certain order, and the suffixes change form in accordance with the vowel harmony. As for the syntactic characteristics of Turkish, we can mention its flexible word order and the subject-drop property, which are effective on listening comprehension and consequently reading comprehension (Durgunoğlu, 2006).

Öney and Durgunoğlu (1997) state that in Turkish-speaking children, reading comprehension problems are more frequent than decoding problems. Reading comprehension problems arise from listening comprehension problems, which are related to the morphological and syntactic characteristics of Turkish.

In Turkey, the teaching method of reading is determined by the programs developed by the Ministry of Education. Since 2004, reading has been taught with the sentence method (Bulut, 2019; Göğüş, 1970). The sentence method, which

resembles the whole language method, proceeds from the whole to the pieces. The instruction starts from whole meaningful sentences. These sentences are divided into their constituent words in time, and new sentences are constructed with these words. Later the words are divided into their syllables, and new words are constructed with these syllables. At the last stage the syllables are also divided to their constituent letters, and with these letters new syllables, words and sentences are formed (Yangin, 2005). In the 2004–2005 education year, the Ministry of Education changed the method of teaching reading and introduced a phonological approach, which continues today with a few changes in the order of the letters introduced. In this method, groups of letters are introduced first, and words and sentences are constructed with these letters as soon as possible (Yangin, 2005).

Chall's (2013) reading model consisting of six stages and Spear-Swerling's (2015) reading difficulties model provided the content of the PD program about reading development and intervention. Determining student readiness and differentiating content relatively is one of the basic steps of differentiation. Chall's stages were introduced to the participant teachers to support them in determining the students place in the reading development process and create awareness of the developmental and hierarchical nature of reading.

Spear-Swerling's (2015) reading phases and difficulty profiles were also provided to the participants to help them determine the reading profiles of their students who may have reading difficulties. Reading interventions related to specific reading profiles were shared with the participant teachers to support them to do adaptations to differentiate reading instruction.

2.4.1 Differentiated reading instruction

Research supports the effectiveness of teacher PD programs of differentiation and their positive consequences on student reading development (Bastopcu, 2024). In a quasi-experimental study conducted by Al Otaiba et al. (2016) 10 kindergarten teachers from four schools participated in a PD program for differentiated instruction of reading. Results revealed that teachers improved their differentiation of reading instruction compared to the controls. Likewise, students of the teachers who participated in the PD outperformed the controls in word reading. There was no difference between groups regarding vocabulary growth. In another quasi-experimental study conducted in Cyprus with 10 teachers and 479 fourth grade students of mixed ability classrooms, differentiated instruction resulted in higher achievement level in experimental group students compared to the control group students. The participant teachers were all experienced teachers and they attended a training program designed by the researchers to provide them with the theoretical background of differentiation (Valiandes, 2015). In a study conducted in Turkey with 5th grade students the attitudes of the students towards the Turkish course were influenced positively after the differentiated instruction (Karadag & Yasar, 2010). Similarly, the study conducted by Erden and Koçyiğit (2023) revealed that differentiated teaching practices are more effective than traditional program applications in improving fifth-grade students' reading comprehension and motivation.

Watts-Taffe et al. (2012) delineate the common characteristics of effective differentiation of reading instruction as follows:

- Ongoing formative assessments in detecting students' unique reading needs, their response to instruction, and tailoring the differentiation strategies accordingly.
- Methods monitoring student progress to modify the groups and instruction in accordance with student development.
- Comprehensive knowledge of reading acquisition and research-based teaching and assessment practices.
- Ability to use the literacy curriculum and materials flexibly and creatively.
- Emphasis on strategic reading while differentiating instruction to support all readers to achieve their highest levels of literacy.
- Skills to support differentiation: to develop classroom routines where students study independently in small groups when the teacher is supporting one of the groups.

2.5 Problem-based learning

Problem-based learning is identified as a promising instructional method to address the theoretical needs of teacher learning. It aligns with design principles for socioculturally oriented, constructivist, and situated teacher PD programs, which have been suggested as effective in fostering teacher development (Helleve, 2010; Putnam & Borko, 2000).

Hmelo-Silver (2004) defines PBL as an instructional method where students learn while solving ill-structured facilitated problems which don't have one single correct solution. The role of the facilitators is very determinative in achieving the learning goals. Zhang et al. (2011) lists experienced PBL facilitators' strategies as

questioning, revoicing, making connections, clarifying, reframing, summarizing, meta-talk, and modeling.

The PBL curriculum has to be designed around the problem scenarios. This means that the starting point must be the problem scenarios and the other components of the modules like the lectures, reading materials, or videos have to be organized around these problems to support their solution. Just inserting problems in a traditional curriculum based on disciplinary knowledge will not lead to PBL (Savin-Baden, 2003).

The problems in PBL are often moderately ill-structured, considering the age, expertise and the learning goals of the learners (Lu et al.,2014). Students collaborate in small groups to find what they need to learn to solve these complex problems. This is a self-directed learning process where they reflect on what they learn and the strategies they use to solve the problems.

Schmidt (1983) lists seven steps of the PBL:

- The clarification of unknown terms and concepts making use of both prior knowledge and dictionaries.
- Making a definition of the problem, and agreeing on the phenomena which needs explanation.
- Analysis of the problem either based on prior knowledge or rational thought.
- Developing various explanations of the problem.
- Formulation of learning objectives and determination of learning resources.
- Individual study to collect the required information.
- The final step of synthesizing and testing the new information.

The outcomes of PBL are:

- To think critically, and be able to analyze and solve real-world problems
- To find, evaluate and use appropriate resources
- To be able to collaborate in small groups
- Using effective written and oral communication skills
- To become life-long learners (Duch et al., 2001).

2.6 Design of the PD program

This study involves the design of an online teacher PD program for early literacy instruction, based on the PBL principles, which is a model compatible with the effective teacher PD features.

The PBL principles leading the design of the PD program are:

- (1) Promote self-directed learning
- (2) Use ill structured real-world problems
- (3) Promote collaboration
- (4) Tutors act as facilitators to support the PBL process
- (5) Use distributed scaffolding
- (6) Make use of reflection

In this part the six PBL design principles will be discussed. In the tables under each principle, you will also find how these design principles are reflected in the PD program as design embodiments.

2.6.1 PBL design principles

Design Principle 1: Promote self-directed learning

Hmelo and Cot (1996) state that students mostly leave schools without acquiring the skill of being lifelong self-directed learners and suggest PBL as a learning approach to promote self-directed learning to be used in schools. PBL aims to support learners to be lifelong independent learners and problem solvers making use of authentic real-life problems (Hung & Loyens, 2012).

In the PBL process, learners collaborate in small groups to identify what they need to learn in order to find solutions to the given problems. They access resources containing the required information and study them independently. Reflection of the participants on their personal learning strengths and difficulties, on what they learned, and how they collaborated in finding solutions to problems also exemplifies self-directed learning focus of PBL (Blumberg & Michael, 1992; De Graaf & Kolmos, 2003; Lu et al., 2014; Savery, 2015).

Self-directed learning also coincides with the effective PD feature of active learning (Darling-Hammond et al., 2017). Teachers are the actors of their own learning experiences as opposed to passive recipients of lectures (Desimone & Garet, 2015). The embodiments of this design principle in the PD design can be seen in Table 1.

Table 1. Embodiments of the 1st Design Principle

1. Design Principle	Design Embodiments
Promote self-directed learning	Tools and Materials Privision of learning resources (articles, videos, checklists, model lesson plans, a repository website) for self-directed learning SDL tasks and collaborative activities
	Task & Participant Structures Voluntary participation in the PD Participants' determination of learning issues Participants' search for the additional resources needed to find solutions to the PBL problem Weekly SDL tasks considering participant choices Application of the new knowledge to the problem Facilitator's support for SDL when needed
	Discursive Practices Group discussions leading to the acknowledgement of the knowledge gaps Group discussions leading to the knowledge building

Design Principle 2: Use ill structured real-world problems

The PBL approach requires a shift from instruction to learning. If we want to understand learning, we have to focus on the learner side. Sawyer and Greeno (2009) define learning as a continuous process of active participation in authentic social practices. Similarly, one of the central aims of the learning sciences is to identify the principles of designing learning activities and environments in such a way that students can participate in and develop deep conceptual understanding without losing the properties of authentic practices.

In real life, problems are always complex. In PBL the problems must also be ill-structured, complex tasks with no single correct solution. Learners will not memorize facts but will engage in free inquiry to find solutions to these problems

(Savery, 2015). When problems are well designed, learners will develop ownership of the problem and get motivated to find authentic solutions to them (Savery, 2015; Savery & Duffy, 1995).

Learning in PBL depends on the quality of the problems provided to the students. This quality depends on the compatibility with the learners' prior knowledge, relevance to the professional area of interest, stimulation of self-learning, incorporation of multiple learning objectives, supply of cues to stimulate elaboration via discussions and explanations, and integration of theory with practice (Dolmans et al., 1997)

Content focus is one of the effective features of teacher PD defined by Darling-Hammond et al. (2017). This feature emphasizes the importance of being focused on the content that teachers are supposed to teach in the classroom context they actively teach. PBL problems meet this feature as they are extracted from real-life contexts. Teachers will also be encouraged to bring their own cases as problems to discuss and find solutions. The embodiments of this design principle in the PD design can be seen in Table 2.

Table 2. Embodiments of the 2nd Design Principle

2. Design Principle	Design Embodiments
Use ill structured real-world problems	Tools and Materials A PBL problem designed to reflect and address the realities of actual classroom environments
	Task & Participant Structures Tasks designed to facilitate the solution of the ill structured, complex, real world PBL problem
	Discursive Practices Group discussions to solve the PBL problem. Tutor facilitation to guide the discussions and enhance problem-solving

Principle 3: Promote collaboration

The idea of communities of learners evolved from Lave and Wenger's (1991) notion of communities of practice (Collins & Kapur, 2014). Bielaczyc and Collins (1999) define learning communities as groups of people involved in a collective endeavor of understanding in a culture of learning. Communities of learners involve a knowledge building approach which was first put forward in learning sciences in the early 1990s by Scardamalia and Bereiter. In this approach knowledge is not a mental content, but it is a community property. The focus is not on the content of individual students' minds but the improvement of the knowledge itself (Scardamalia & Bereiter, 1994). Learning is a collaborative group process where contribution to community is the primary goal whereas individual students' knowledge is secondary. All students are collaborators of knowledge creation. Knowledge is distributed and no one single student can possess the whole of it (Scardamalia & Bereiter, 2014).

Scardamalia and Bereiter (1994) state that working collaboratively to improve ideas is not a natural human attribute. It has to be evolved through teacher effort and purposefully designed learning environments. The design of online learning environments are suggested and used to develop a knowledge building culture which becomes a virtual space for idea improvement (Scardamalia & Bereiter, 2014).

Hmelo-Silver and Barrows (2008) define the main goal of PBL as knowledge building. Students learn in collaboration while solving problems and reflecting on their own experiences (Hmelo-Silver et al., 2007). Collaboration is also identified as an important feature of teacher PD (Darling-Hammond et al., 2017; Desimone & Garet, 2015). The embodiments of this design principle in this study can be seen in Table 3.

Table 3. Embodiments of the 3rd Design Principle

3. Design Principle	Design Embodiments
Promote collaboration	Tools and Materials Use of an online video conferencing platform to support participant collaboration. Icebreaker activities to support group formation
	Task & Participant Structures Ill structured, complex problems to promote collaboration Tasks designed to promote collaboration among participants
	Discursive Practices Collaborative discussions Modeling and facilitation of collaborative discourses during the online synchronous meetings

Design Principle 4: Tutors act as facilitators to support the PBL process

Hmelo-Silver (2004) defines PBL as a collaborative learning process through facilitated problem-solving experiences. The teacher in PBL is not the owner of the already existing knowledge whose role is to transfer it to the students. Instead, the teacher in PBL acts as the facilitator of a collaborative learning process. The facilitation aims to develop problem-solving skills, collaboration skills, intrinsic motivation, self-directed learning skills for lifelong learning, and construction of flexible knowledge from multiple domains applicable in a variety of problem situations.

Collaboration in online learning environments does not happen naturally. Participants may find the collaborative problem-solving process difficult and time consuming, thus it has to be supported by the facilitator (Rummel & Spada, 2005). Hmelo-Silver and Barrows (2008) mention three discourse moves to promote

knowledge building discourse, namely, posing appropriate questions; making statements which suggest new points of view, and which facilitate collaboration; reformulating, or advancing an idea. With such strategies facilitators support students to make their thinking visible and participate in the group processes (Hmelo-Silver, 2004). The embodiments of this design principle in the PD design can be seen in Table 4.

Table 4. Embodiments of the 4th Design Principle

4. Design Principle	Design Embodiments
Tutors act as facilitators to support the PBL process	Tools and Materials Facilitating tools and materials will be provided when needed or requested by participants
	Task & Participant Structures Tutor will act as the facilitator of collaboration
	Discursive Practices The tutor will facilitate the discussions

Design Principle 5: Use distributed scaffolding

In designing a learning environment, scaffolding—the support provided by a more knowledgeable other within the learner’s zone of proximal development (Vygotsky, 1978)—needs to be distributed across different agents, such as the teacher, peers, and material or physical and software tools to address different learning needs (Puntambekar & Kolodner, 1998; Reiser & Tabak, 2014; Tabak, 2004). Scaffolding must result in learning as it has to be faded gradually as students learn the skill and become independent (Guzdial, 1994).

Hmelo-Silver et al. (2007) state that PBL is a learning approach where the cognitive load due to ill-structured problems is decreased by planned scaffolding to

facilitate learning. The use of scaffolding strategies in PBL will depend on the participants' characteristics so that self-directed learning is facilitated (Hung & Loyens, 2012). In case students are not able to access the sources of knowledge themselves, or when a learning need arises, direct instruction of mini-lectures can also be employed during the problem-solving process, (Hmelo-Silver et al., 2007). In this study, an expert lecture and presentations are planned because of the scarcity of resources in the Turkish language. The embodiments of this design principle in the PD design can be seen in Table 5.

Table 5. Embodiments of the 5th Design Principle

5. Design Principle	Design Embodiments
Use distributed scaffolding	Tools and Materials Online resource repository for the use of the participants Learning needs /goals checklists for each module Expert lecture and presentations to support participants' knowledge gaps
	Task & Participant Structures Models and modeling of effective practices Scaffolded tasks and the adjustment of the scaffolds depending on the participants individual and group needs
	Discursive Practices The facilitator's promotion of collaborative discursive practices

Design Principle 6: Make use of reflection

In the Vygotskian perspective, learning occurs through articulations during social interaction and gradually transforms to internal thought. Articulation also encourages learners to reflect about what they have articulated. Collins and Kapur

(2014) state that reflection makes it possible for the students to compare their own problem-solving processes with that of the other students and experts.

The PBL process begins with exposure to an authentic ill-structured problem, and ends with the learners' reflection on their learning. Learners also use reflection periodically during the process in relating the new knowledge to their already existing prior knowledge, abstraction and transfer of problem-solving strategies and knowledge to other circumstances. Learners mostly need facilitation of tutors and scaffolds to be able to reflect on their learning (Hmelo-Silver, 2004). The embodiments of this design principle in the PD design can be seen in Table 6.

Table 6. Embodiments of the 6th Design Principle

6. Design Principle	Design Embodiments
Make use of reflection	Tools and Materials Structured journals to support participants' reflection on their learning Online questionnaires to promote self-monitoring and self-regulation experiences of the participants
	Task & Participant Structures Tasks designed to promote reflection
	Discursive Practices Group discussions to promote reflections Facilitator's probing questions Peer and facilitator feedback

2.6.2 Conjecture map of the design

Conjecture maps are concrete representations of design research which depict planned design relationships. Sandoval (2014) proposes to use conjecture maps to provide an argumentative grammar to design studies. Conjecture maps consist of (1) high level conjectures about how learning will be supported through the design

principles extracted from theories, (2) the embodiments of those principles in the designed learning environment, (3) the mediating processes generated by the embodiments, and (4) the targeted outcomes of designed learning environment. There are two more elements in the map: Design conjectures and theoretical conjectures. Design conjectures represent the researchers' views about how the mediating processes emerge from design embodiments. Likewise, theoretical conjectures represent the researchers' views about how the research outcomes get realized as the result of the mediating processes. This map functions as a chart of empirical predictions which will be tested after the implementation of the design and the required refinements will be done accordingly (Sandoval, 2004).

As shown in the Table 7, the high-level conjecture of this teacher PD program design consists of the six PBL principles. In the embodiment section of the conjecture map you can see the embodiments of each design principle. The observable interactions and the participant artifacts are the mediating processes which are generated by the embodiments. The observable interactions in this design are the participants' collaborative interactions while analyzing and finding solutions to the authentic PBL problem. Self-directed learning practices of the participants are also observable interactions. Problem solutions, the reading development evaluation checklist, the DLP template, and the DLPs developed by the teachers comprise the participant artifacts. The desired outcomes were for the participants to develop knowledge of differentiated literacy instruction, and use this knowledge to plan and implement differentiated lesson plans in their classrooms.

Table 7. Conjecture Map of the Design of Learning Environment

High Level Conjecture	Embodiment	Mediating Processes	Desired Outcomes
A teacher PD program designed with PBL principles can promote teachers' knowledge of differentiated early literacy instruction. The design principles are: (1) Promote self-directed learning (2) Use ill structured real-world problems (3) Promote collaboration (4) Tutor acts as facilitators to support the PBL process (5) Use distributed scaffolding (6) Make use of reflection	Tools and Materials PBL-based PD program delivered through video conferencing Ice breaking activities Problem cases to solve Learning resources for self-directed learning (written documents, checklists and videos) Expert Lecture Presentations Online tools Instant messaging groups Rubrics and checklists Task & Participant Structures Voluntary participation Collaborative problem-solving activities Ill-structured, complex, real-life problems Distributed scaffolds Participants as self-directed learners Tutor as facilitator Self-directed learning tasks Discursive Practices Collaborative problem-solving discussions Tutor facilitation of discussions	Observable Interactions Collaborative interactions while analyzing problem cases and developing differentiated reading programs Self-directed learning practices Participant Artifacts Problem solutions Reading development evaluation checklist The DLP template DLP for the fictional PBL problem classroom. Individual DLPs for the participants' own classrooms	Knowledge of differentiated literacy instruction

In this study, the online teacher PD program for early literacy is designed with the PBL principles. The PD is constructed around an ill-structured authentic problem to promote teacher collaborative problem-solving experiences. The participant teachers are expected to learn how to differentiate the reading instruction and to apply this knowledge to handle comparable difficulties in their classrooms.

In this design-based research the following research question was addressed:

How does a teacher professional development program based on problem-based learning and delivered through video conferencing support teachers' knowledge of differentiated instruction in early literacy?

Sub-questions:

- In what ways does the participant teachers' knowledge of differentiated instruction change in the PD program?
- How does the PBL design of PD facilitate teacher learning in differentiated instruction of early literacy?
- What kind of design changes are needed after the first cycle of PD?

CHAPTER 3

METHDOLOGY

In this chapter, the methodology of the study will be introduced. It will start with an explanation of the design-based research approach used in this study, the rationale for its selection, and the researcher's role. This will be followed by a presentation of the research context and participants. Finally, the chapter will cover data collection, data analysis, and considerations of trustworthiness.

3.1 Research design

This research is conducted using design-based research (DBR) which is frequently used in the field of learning sciences to study the design of learning environments. DBR involves the study of learning in naturalistic contexts including innovations designed and improved through multiple cycles by the researchers, with the dual goal of developing theories and practices generalizable to other learning environments (Barab, 2014; Chen & Reeves, 2020; McKenney & Reeves, 2012; Puntambekar, 2018). Edelson (2002) states that the goal of DBR is not just to test a theory as in the traditional research methods where design and theory are distinct processes done sequentially. With DBR a researcher can develop and refine theories through the iterations of design and implementation in complex real-world settings.

In DBR studies qualitative and quantitative data are both used. The goal is not simply reporting outcomes, but is to make convincing arguments through detailed narratives and depict rich models of learning interactions (Van den Akker, 1999). In DBR studies the goal is not a generalization from sample to population. The objective is the theoretical generalization of the design mechanisms from a specific context to others (Bakker, 2018). This generalization is possible with the

detailed analysis of one learning environment so that it can be regenerated in other contexts with different characteristics (Barab, 2014).

In this study an online teacher PD program for differentiation of literacy instruction was designed within the PBL framework. Two successive cycles were implemented through which the design was refined according to the data received from qualitative and quantitative measures. The in-depth analysis of the process enhanced the theory, so that it will hopefully inspire other researchers and be an example for the development of similar online teacher PD programs for early literacy instruction.

DBR was employed to conduct this research because the purpose was to design and assess the efficiency of the online teacher PD program in a naturalistic context and refine it through iterations so that it will meet the needs of the teachers. Dolmans et al. (2005) states that there is need for research that connects theory and practice, with an emphasis on the real-world application of PBL principles and DBR is particularly suited for this. Through iterative cycles of design, enactment, analysis, and redesign, DBR can help understand how PBL interventions function in practice, and how they can be optimized.

Both practical and theoretical outcomes were targeted in this study. The practical outcome was teacher learning of differentiation in early literacy contexts. The theoretical outcome was the development of new design principles which will contribute to the theory of PBL for teacher PD on DI. A variety of both qualitative and quantitative means of collecting data were used to deeply analyze the process and give detailed information of the context of this study for future scale up studies.

3.1.1 Design-based research phases

The research was conducted in three phases identified by McKenney & Reeves (2012) which are quite flexible, and do not proceed in a completely linear way (See Figure 2).

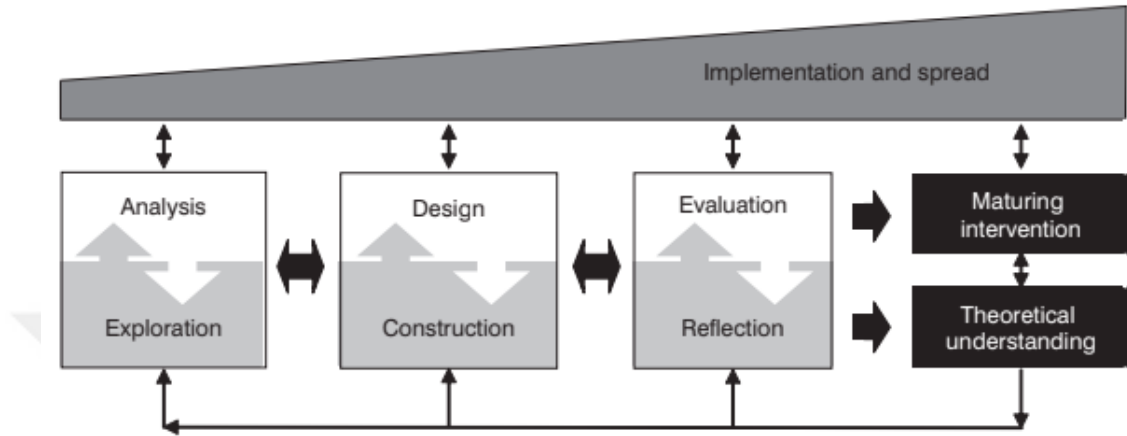


Figure 2. Generic model for conducting design research in education
Source: McKenney & Reeves, 2012, p. 77

PHASE 1: Analysis and exploration (June 2021- June 2022)

- A literature review for needs analysis was conducted.
- A questionnaire was developed to collect data on teachers' learning needs, regarding reading instruction and differentiation.
- The Turkish version of the DI-Quest Differentiated Instruction Questionnaire was selected to collect data on teachers' perceptions and practice of differentiation.
- Open-ended questions for the first phase of the needs analysis were formulated.
- Ethics committee approval for the needs analysis phase was secured.
- The successive two phases of needs analysis were conducted.

PHASE 2: Design and construction (June 2021 - November 2022)

- A literature review for teacher PD design was conducted.
- Data collected to identify teachers' learning needs were analyzed and used as a basis for the design of the PD program.
- The teacher PD program for DI was designed.
- Data collection tools were prepared.
- Ethics committee approval for implementation was secured.
- The content was checked by a subject expert.
- Connections were made with PD program participants and they were invited to an informative meeting.

PHASE 3: Evaluation and reflection

(December 2022 - November 2024)

- The first cycle was implemented.
- Preliminary analysis of the first cycle data was conducted.
- Design improvements were planned and implemented.
- The revised first cycle was executed.
- Data analysis was conducted.

3.2 Researcher's role

Objectivity is a concern in interpretative research especially when researchers play many roles. I will outline my roles and position as a researcher in this study, as it is important to acknowledge the researcher's influence on the research process (Putnam & Borko, 2000). I have always been sensitive to the inclusion of 'others' in society. This sensitivity inspired me to pursue a second degree in special education, which helped me find my path in life. After working as a special education teacher in

rehabilitation centers, I began teaching at a school where I realized that the concept of being 'other' in classrooms was not limited to those with inclusion reports. I observed that every student in the classroom had unique needs and experiences that set them apart, making each one an 'other' in their own right. This observation led me to focus on differentiated instruction in my PhD dissertation.

Since my ultimate goal was to transform classroom practices to meet the unique needs of students, I chose to utilize the design-based research method and problem-based learning, to equip the teachers with DI practices. Both approaches emphasize real-life classroom applications, making them effective tools for enhancing teaching and learning. The DBR method allows for iterative cycles of design, implementation, and evaluation, enabling the adaptation and refinement of the learning environments based on real-time feedback from participants and their learning experiences. Similarly, problem-based learning emphasizes real-life applications and fosters collaboration among teachers as they create personalized learning experiences tailored to their individual professional development needs. By facilitating the practical implementation of educational theories in the classroom and transforming theoretical concepts into effective teaching practices, PBL ultimately empowers educators to better meet the diverse learning needs of their students.

Sociocultural theory guided my dissertation as the overarching framework. Differentiated instruction, problem-based learning, and design-based research are all compatible with this theory, as they emphasize the importance of social interactions, cultural contexts, and collaborative learning in educational settings. These approaches facilitate personalized learning experiences that respect and build upon cultural identities, ensuring that each learner's unique background is acknowledged and valued.

I had a double role as a researcher and facilitator of the PD program. This position was quite arduous in two aspects. Initially, it was challenging to maintain a neutral standpoint while evaluating the design and implementation choices and practices especially as I was also involved as a facilitator. Furthermore, it was emotionally demanding to shoulder both of those responsibilities as a novice researcher. Navigating the complexities of facilitating professional development while simultaneously collecting and analyzing data was quite challenging. Ultimately, I believe this experience enriched my research and enhanced my ability to contribute meaningfully to the professional development of educators.

3.3 Research context and participants

3.3.1 Research context

The context of this study was an online teacher PD program for differentiated early literacy instruction for preschool and elementary teachers. The goal of the PD program was to support teachers' knowledge and implementation of differentiated reading instruction. The remotely delivered PD program was developed during and implemented following the pandemic Covid 19 pandemic lockdown period. The potential for future shutdowns due to ongoing pandemic conditions, along with the theoretically proven benefits of online PD programs (Collins & Liang, 2015), supported the decision to deliver the PD program online. The participant teachers of the study were relatively familiar with online and hybrid learning experiences and were generally satisfied with its advantages. Within the program's participants, there were teachers from various cities, as well as one from another country.

3.3.2 Participants

In this research a mixed group of preschool and elementary teachers were targeted, because learning communities with participants of diverse expertise are stated to be more effective for collaboration (Bielaczyc & Collins, 1999). Preschool teachers were specifically targeted for two reasons. First, pre-reading and phonological awareness skills are developed at this stage, and early intervention can prevent or reduce the effects of reading difficulties. Second, preschool teachers' experiences of early reading skills instruction would contribute to the collaboration and knowledge construction in the PD.

The needs analysis phase of this study consisted of two subsequent phases. The 91 participants of the first phase were reached out with the convenience sampling method. These 91 preschool and elementary teachers were sent a quantitative survey to detect their learning needs, perspectives and knowledge of differentiated reading instruction. Forty-eight teachers out of these 91 declared to be voluntary participants of a future PD program for differentiated literacy instruction and shared their communication information. For the second needs analysis phase, these 48 teachers were sent a second survey consisting of open-ended questions to deepen the data collected at the first phase. Twenty of these 48 teachers replied to the survey. Of these 20 teachers, 8 took part in and completed the two cycles of the PD program. There were 5 and 4 participants in the first and second cycles, respectively (See Figure 3). One of the second cycle participant teachers was contacted just before the PD implementation, hence was not one of the needs analysis participants.

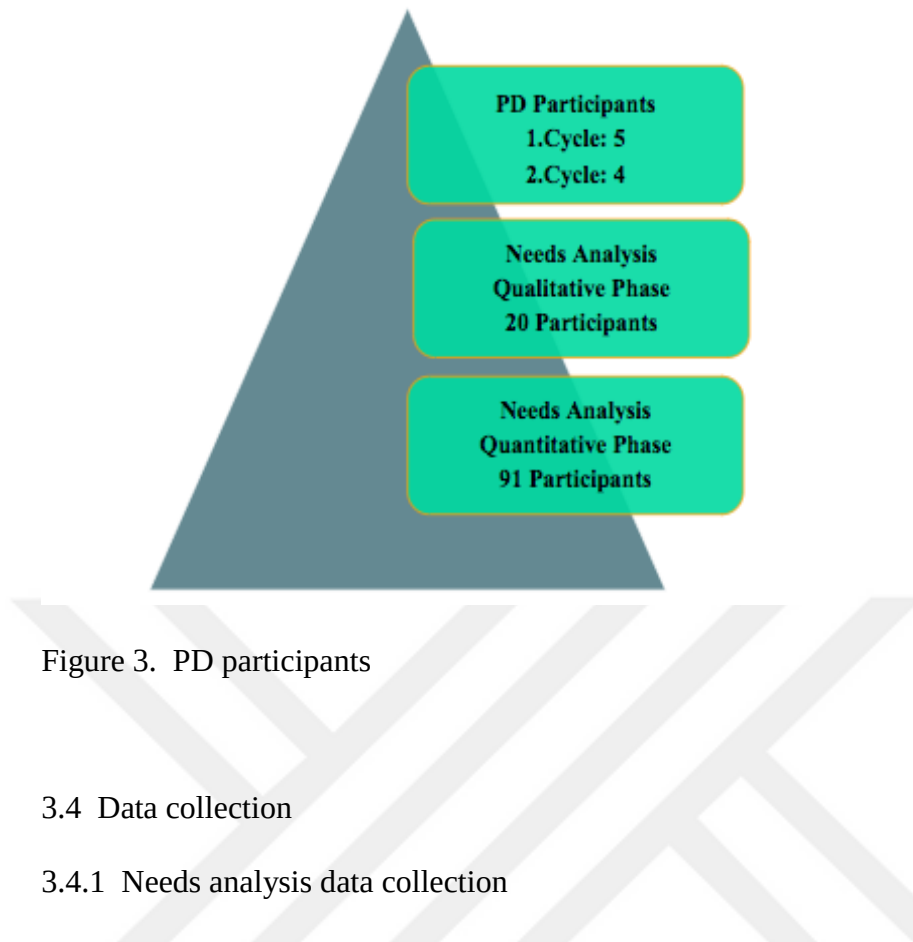


Figure 3. PD participants

3.4 Data collection

3.4.1 Needs analysis data collection

The needs analysis consisted of two phases. At the first phase, a teacher needs survey (See Appendix E) consisting of three parts was used to collect data. The first part included questions related to demographic information, the second was a questionnaire developed by the researcher for the teacher learning needs of differentiated literacy instruction, and the third was the DI-Quest questionnaire (Cengiz et al., 2021; Coubergs et al., 2017). At the second phase a teacher needs survey consisting of open-ended questions (See Appendix F) was used.

3.4.2 First and second cycle data collection

In DBR studies data is mostly collected through a combination of quantitative and qualitative data collection methods (McKenney & Reeves, 2012). In this study the qualitative data collection tools are prevalent. Table 8 displays the qualitative and

quantitative data collection instruments used to collect data for the two cycles. The table also displays the temporal sequence of data gathering, which occurs prior to, during, and subsequent to the two cycles. Multiple data sources were used for each outcome for the purpose of triangulation, to help establish validity.



Table 8. Research Questions and Corresponding Data Collection Tools

Research Questions	Qualitative and Quantitative Measures	1 st Cycle			2 nd Cycle		
		Before	During	After	Before	During	After
RQ1: In what ways does the participant teachers' knowledge of differentiated instruction change in the PD program?	DI-Quest Questionnaire	X		X	X		X
	Interview	X		X	X		X
	Artifact /document analysis (Reading evaluation checklist, DLP template, DLPs)		X			X	
	Session video records		X			X	
	Reflective Journal		X			X	
RQ2: How does the PBL design of PD facilitate teacher learning in differentiated instruction of early literacy?	Interview			X			X
	PD program evaluation questionnaire		X			X	X
	Session video records		X			X	
RQ3: What kind of design changes are needed after the first cycle of PD?	Interview			X			
	Session video records		X				
	PD program evaluation questionnaire / Field notes/ DI-Quest		X				

3.4.2.1 Quantitative data collection tools

DI-Quest Questionnaire: DI-Quest questionnaire (Cengiz et al., 2021; Coubergs et al., 2017) was used before and after the first and second cycles to collect data about the teachers' perceptions and practices of differentiated instruction.

The PD program evaluation questionnaire (See Appendix K) was developed by the researcher and implemented in two cycles to collect participants' feedback regarding the PD design.

3.4.2.2 Qualitative data collection tools

Interviews: Semi-structured interviews were conducted with the participants before and after each cycle of the implementation. The interviews were conducted in Turkish. English translations of the interview questions are provided in Appendix J. As seen in Table 9 the interview questions before the implementation are aimed to learn about teachers' knowledge of differentiated instruction, reading difficulties encountered by the teachers and their solutions, experience of collaborative/group work, and teacher PD expectations. The final interview questions were focused on the knowledge of differentiated instruction and the impact of design principle embodiments on the participant teachers.

Table 9. Scope of Initial and Final Interview Questions

Interviews	Scope
Initial	Knowledge of differentiated instruction Reading difficulties encountered in the classroom and participants' solutions Teacher PD expectations Experience of collaborative group work
Final	Knowledge of differentiated instruction Impact of design principle embodiments on the participant teachers

Video records: All sessions were conducted via a video conferencing tool and were recorded. The relevant parts of the sessions were transcribed to be analyzed using thematic analysis and utilized to triangulate the data collected with DI-Quest questionnaire and interview.

Reflective journal: Reflective journal questions were sent to the teachers after certain sessions to collect their reflections on the topics covered during that week.

3.5 Data analysis

3.5.1 Needs analysis data analysis

DI-Quest and the teacher learning needs questionnaire were analyzed using descriptive statistics. A repeated measures ANOVA was conducted in the Jamovi statistical software (Navarro & Foxcroft, 2019) to compare the five factors of the DI-Quest. In the second phase, the responses to the open-ended questions were tallied and organized into categories.

3.5.2 First and second cycle data analysis

The interviews and session transcriptions were analyzed using thematic analysis

(Braun & Clarke, 2021a). Braun and Clarke (2021a) provide the following definition of thematic analysis.

At a very basic level, TA is a method for developing, analysing and interpreting patterns across a qualitative dataset, which involves systematic processes of data coding to develop themes – themes are your ultimate analytic purpose. TA is ... a method for data analysis, rather than a methodology.

This type of analysis has been recently renamed as reflective thematic analysis by Braun and Clarke (2019). Braun and Clarke (2021b) highlight the significance of the researcher's subjectivity as an analytical resource, as well as their reflexive interaction with theory, data, and interpretation.

Reflexive thematic analysis consists of six phases:

1. Familiarization with the dataset
2. Coding
3. Generating initial themes
4. Developing and reviewing themes
5. Refining, defining and naming themes
6. Writing up

In my coding process, I first became familiar with the data through transcription and a few readings of the transcribed texts. Later, I generated codes mostly using the participant teachers' utterances, without any references to theory. As a result, I had an abundance of codes, which I reduced by associating those with very similar meanings. In the third phase of generating initial themes, I referred to the theory and built my themes around it. In the fourth phase of developing and reviewing themes, I organized my codes under the identified themes, reviewed them,

and finalized themes derived from both the theoretical frameworks of PBL and DI, as well as those that emerged from the data.

Although very similar data were collected during the first and second cycles, data analysis showed variations between the two cycles. The data from the first cycle were particularly analyzed to identify design improvements needed for the PD program. Therefore, design-related data (post-interview design principle questions, researcher/facilitator field notes, and the PD program evaluation questionnaire) were primarily analyzed to explore the PBL design principles' influence on and contribution to participant learning. Additionally, pre- and post-interview questions related to PD content, along with participant responses to DI-Quest, were analyzed to examine teacher learning as an indicator of the impact and relevance of the PD program.

However, the data from the second cycle underwent a more in-depth thematic analysis to explore the learning outcomes among participants, with a stronger focus on the impact and relevance of the PD program. Additionally, design-related data was analyzed to generate insights for refining and informing potential future implementations of the program.

3.6 Trustworthiness

In this study the strategies proposed for design-based research were used (McKenney & Reeves, 2012) to ensure the trustworthiness and rigor. The primary warrant of trustworthiness in qualitative studies is to conduct the study in an ethical manner. The ultimate guarantor of a trustworthy research will be the trustworthiness and competence of the researcher (Merriam & Tisdell, 2016; Patton, 2015). In this

research, I took on multiple roles: I was both the researcher and the facilitator of the program. I took the following steps to ensure trustworthiness in my both roles.

As a researcher, I committed myself to a thorough and thoughtful design process. This involved an extensive review of the existing literature to identify best practices and effective strategies for professional development. I also sought the insights and perspectives of experienced researchers in the field. By integrating these diverse sources of knowledge and expertise, I aimed to create a PD program that adheres to the standards of research integrity and ethical practice while effectively meeting the needs of participants. I achieved this by closely adhering to established analysis methods and sharing my experiences with seasoned researchers to gather their suggestions.

As the facilitator of the PD program, I aimed to strike a balance between remaining committed to my research and meeting the needs of the participants. Additionally, I implemented feedback mechanisms to gauge participant satisfaction and adapt the program accordingly. By adhering to ethical research guidelines, I ensured that participants felt safe and respected throughout the process, further contributing to the trustworthiness of the research.

I also employed the qualitative trustworthiness strategies suggested by McKenney and Reeves (2012), which are confirmability, credibility, transferability, and dependability, to assure the trustworthiness of a DBR study.

The credibility of this study is assured by long term implementation of the PD program, triangulation of data collection and analysis strategies, peer review, and the declaration of the investigator's position.

Dependability in qualitative studies is related with the consistency of the research findings with the data collected. Triangulation, peer review, and declaration

of investigators position are used to ensure dependability. In this study, I triangulated the findings by utilizing multiple data sources, including interview responses, session recordings, participant artifacts, and questionnaire data. I presented my analysis and findings to more experienced researchers and sought thorough feedback. Additionally, I clearly stated my position and role as a researcher. An audit trail is also recommended by Merriam and Tisdell (2016). Deep descriptions, along with researcher journals and memos, contribute to the audit trail. In my study, I provided a detailed description of the participants, and the PD sessions were reported comprehensively, including participant quotes. I provided the participant artifacts in the report of analysis and findings. I maintained a researcher journal to document my PD experiences, which informed design improvements.

Transferability to other contexts is enhanced through thick descriptions of the processes and maximum variation among participants. This variation was achieved by including individuals from different elementary grade levels and preschool teachers, as well as teachers from both public and private schools. Additionally, the study included teachers from Istanbul and other cities, with a majority from Istanbul.

Confirmability is achieved through triangulation of data collection methods and member checking (McKenney & Reeves, 2012; Merriam & Tisdell, 2016). I implemented both strategies by using interviews, session recordings, artifacts, and questionnaires to triangulate the data. Additionally, I sought peer review from researchers experienced in qualitative analysis during the thematic analysis process.

CHAPTER 4

NEEDS ANALYSIS

4.1 Introduction

In the needs analysis stage of this DBR study the purpose was to see the preschool and elementary teachers' learning needs, perceptions, and use of differentiated instruction to use in the development of a professional development (PD) program for differentiated early literacy instruction. The needs analysis of the study consisted of two sequential phases. At the first phase, data was collected through an online survey composed of three parts and analyzed using Jamovi statistical software. At the second phase, a survey composed of open-ended questions was sent to a subgroup of the first phase participants who shared their communication information as volunteers to participate in the PD program. The data collected with the open-ended questions were analyzed by tallying and organizing into categories.

A convenience sampling method was used to reach out to the participant teachers of the needs analysis phase. 115 teachers participated in the first phase, of which 91 were preschool and elementary teachers, who were included in the study. Teachers of other subjects, such as music and physical education, were excluded. Of these 91 participants 48 volunteered to participate in the online teacher PD program and shared their communication information. The second online survey consisting of open-ended questions was sent to these 48 teachers who shared their communication information and 20 of them replied to the survey.

4.2 First phase needs analysis

Survey data from 91 preschool and elementary teachers were analyzed during the first phase of needs analysis. Data was collected to explore preschool and elementary teachers' learning needs, perceptions and practices of differentiated reading instruction.

4.2.1 Data collection tools

The teacher needs survey of this first phase consisted of three parts. The first part included questions related to the teachers' demographic information such as their gender, age, total years of teaching experience, years of teaching experience at preschool, first and second grades, the school they graduated from (preschool or primary education), and the type of school they most recently taught (public or private).

The second part consisted of the teacher learning needs questionnaire developed by the researcher. The questionnaire included 22 Likert-type questions to determine which areas related to differentiated reading instruction were needed to learn by the participant teachers. The items were prepared by the researcher in accordance with Tomlinson's differentiation theory (Tomlinson, 2017) and the first-grade curriculum of teaching reading and writing. The questionnaire was validated by three experts.

The third part consisted of the Turkish adaptation (Cengiz et al., 2021) of DI-Quest differentiated instruction questionnaire (Coubergs et al., 2017). DI-Quest was developed by Couborgs et al. (2017) to meet the need of a validated instrument to measure teachers' perceptions and classroom practices of differentiation. The instrument items were developed based on prevailing differentiation theories, mainly

that of Tomlinson (2014), and consisted of 31 Likert scale items with five factors, after exploratory and confirmatory factor analyses. The five factors are (1) growth mindset, (2) ethical compass, (3) flexible grouping, (4) output=input, and (5) adaptive teaching are grouped in three categories: (1) philosophy, (2) classroom practices, and (3) adaptive teaching. Adaptive teaching is the main factor. Growth mindset and ethical compass are under the category of philosophy, flexible grouping and output=input are under the category of classroom practices (See Figure 4).

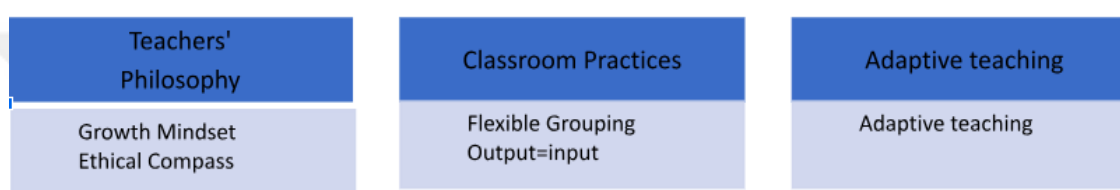


Figure 4. DI Quest categories and factors

Teachers' Philosophy: The factors growth mindset and ethical compass constitute the philosophy of differentiation. Growth mindset is a teacher's belief in the students' growth capacity. This is the opposite of the fixed mindset which assumes intelligence to be static. Teachers with a strong ethical compass rely on the student needs when planning their instruction rather than the standards or curriculum.

Classroom practices: Flexible grouping is the use of whole group, small group and individual instruction in a flexible way depending on the student needs. Output=input is the use of student outputs – evaluations, artifacts, expressions, behaviors – as an input of teaching to make adaptations.

Adaptive teaching: Adaptive teaching is the adaptation of teaching considering student needs—readiness, interests and learning profile.

The Cronbach alpha coefficient of the Turkish adaptation of the DI-Quest differentiated instruction questionnaire was .84 (Cengiz et al., 2021), and .87 for this study. Table 10 presents the Cronbach alpha coefficients for the five factors of the instrument, as computed for the Turkish adaptation and the current study.

Table 10. Cronbach Alpha Scores (α)

Factors	Cronbach Alpha Turkish Adaptation	Cronbach Alpha This Study
Growth Mindset	.80	.80
Ethical Compass	.75	.75
Flexible Grouping	.73	.85
Output-Input	.83	.85
Adaptations	.86	.87
Total	.84	.87

4.2.2 Assumption checks

Before conducting statistical analyses, normal distribution, sphericity and linear relationship assumptions were checked for the DI-Quest questionnaire. As seen in Table 11 Shapiro-Wilk test was conducted for normality and DI-Quest total scores were found to be normally distributed. DI-Quest total score skewness and kurtosis coefficients were found to be between -1.96 and +1.96, which are within normality limits. The factor scores of growth mindset, ethical compass, flexible grouping, output=input, and adaptive teaching however, were all found to be significant in

Shapiro-Wilk test which is stated to have more power to detect non-normal distribution (Field, 2009). However, Field (2009) also states that these tests are not always reliable because they give significant results very easily for big samples. In this study the sample is fairly big (N=91), so the normality is also checked through histograms, Q-Q Plots, and skewness and kurtosis z-scores. Skewness coefficients of all factors were found to be between -1.96 and +1.96, which is within the normal distribution limit. Apart from the growth mindset (2.94), the kurtosis coefficients of the other factors were also found to be within the normal distribution range of -1.96 and +1.96. Taking into account these values, and the central limit theorem which tells that the sampling distribution of big samples (30 and more) tend to be normal the assumption of normality is assumed to be met.

Table 11. Summary of Assumption Check Results

	total	Growth mindset	ethical compass	Output-Input	Flexible Grouping	Adaptive teaching
Skewness	-0.150	-1.34	0.485	-0.983	-0.398	-0.444
Std. error skewness	0.253	0.253	0.253	0.253	0.253	0.253
Kurtosis	-0.344	2.94	-0.716	0.895	-0.612	-0.148
Std. error kurtosis	0.500	0.500	0.500	0.500	0.500	0.500
Shapiro-Wilk W	0.989	0.837	0.947	0.888	0.952	0.957
Shapiro-Wilk p	0.641	< .001	0.001	< .001	0.002	0.005

4.2.3. Findings

4.2.3.1 Demographic Information

A total of 115 teachers completed the needs analysis survey. The teachers who did not graduate from preschool or primary education departments were not included in

the study; hence, the answers of 91 teachers were analyzed using Jamovi statistical software. Table 12 summarizes the results of the analysis of the demographic data of participant teachers. Of the 91 participant teachers, 80 (87.9%) were female and 11 (12.1%) were male. Primary school teachers were 73 (80.2%), preschool teachers were 18 (19.8%). Sixty-three teachers (69.2%) were currently teaching in public schools and 28 (30.8%) in private schools. The number of teachers aged between 36 and 40 was 35 (38.5%); this was followed by 30 teachers older than 40 (33%), 19 between 30 and 35 (20.9%), 6 between 26 and 29 (6.6%), and 1 between 20 and 25 (1.1%). In terms of total years of teaching experience; 30 (33%) teachers had 11 to 15 years, 26 (28.6%) 16 to 20 years, 18 (19.8%) >20 years, 14 (15.4%) 6 to 10 years, and 3 (3.3%) 3 to 5 years of experience. The majority of preschool teachers taught for more than 6 years, and the majority of the elementary teachers taught first and second grades for 3 to 5 five years each.

Table 12. Demographic Information of Participant Teachers for the First Phase

Demographic characteristics	Participants (N=91)	Frequency	%
Gender	Female Male	80 11	87.9 12.1
Graduation	Preschool Elementary	18 73	19.8 80.2
School Type	Public Private	63 28	69.2 30.8
Age	20 - 25 26 - 29 30 - 35 36 - 40 >40 years	1 6 19 35 30	1.1 6.6 20.9 38.5 33.0
Total Teaching Experience	3 - 5 6 - 10 11 - 15 16 - 20 >20 years	3 14 30 26 18	3.3 15.4 33.0 28.6 19.8
Preschool Teaching Experience	0 1 - 2 3 - 5 >6 years	69 3 2 17	75.8 3.3 2.2 18.7
Teaching Experience 1st grade	0 1 - 2 3 - 5 >6 years	19 14 38 20	20.9 15.4 41.8 22.0
Teaching Experience 2nd grade	0 1 - 2 3 - 5 >6 years	19 10 42 20	20.9 11.0 46.2 22.0

4.2.3.2 Teacher learning needs questionnaire findings

Descriptive analysis was used to obtain the means and standard deviations for the items on the teacher learning needs questionnaire to identify which differentiated reading instruction knowledge and skills were particularly needed by preschool and

primary teachers. The combined means and standard deviations for elementary and preschool teachers are presented in Table 13. The means ranged from 4.36 to 4.60 over 5. These high means suggest that teachers perceive a need to learn about all of these reading instruction content areas. These learning needs were considered by the researcher in the development of the teacher PD program.



Table 13. Teacher Learning Needs Questionnaire: Mean Scores and Standard Deviations

Items	Mean	SD
I would like to learn how to actively utilize interest and learning corners in lessons.	4.60	0.82
I would like to learn teaching methods and strategies for students experiencing reading difficulties.	4.59	0.92
I would like to learn how to differentiate activities that support language skills according to student needs.	4.59	0.83
I would like to learn how to identify student learning profiles.	4.58	0.90
I would like to learn how to benefit from peer teaching.	4.57	0.87
I would like to learn how to identify student interests.	4.57	0.83
I would like to learn different strategies to support students with advanced literacy levels.	4.56	0.97
I would like to learn how to use different teaching strategies.	4.55	0.96
I would like to learn how to differentiate activities for feeling, recognizing, and distinguishing sounds based on student needs.	4.54	0.87
I would like to learn methods to facilitate transitions between activities during lessons.	4.53	0.97
I would like to learn how to flexibly design homogeneous and heterogeneous groups and pair work according to needs.	4.53	0.87
I would like to learn how to differentiate literacy instruction based on individual student characteristics.	4.52	0.98
I would like to learn how to differentiate assessment	4.51	0.92
I would like to learn how to differentiate fluent text reading activities according to student needs.	4.48	1.00
I would like to learn how to differentiate reading comprehension activities according to student needs.	4.47	1.00
I would like to learn how to assess student readiness levels to differentiate literacy instruction.	4.46	1.10
I would like to learn how to differentiate syllable reading activities by combining sounds according to student needs.	4.44	1.07
I would like to learn how to create a positive classroom environment that makes students feel safe.	4.42	1.13
I would like to learn how to conduct word reading activities by combining syllables.	4.40	1.08
I would like to learn about the relationship between the structural features of the Turkish language and literacy education.	4.38	0.95
I would like to learn children's developmental stages of reading skills	4.38	1.05
I would like to learn how to prepare differentiated literacy instruction plans in content, process, and product areas.	4.36	1.08

4.2.3.3 DI-Quest findings

First category: Teachers' Philosophy (Growth Mindset and Ethical Compass)

The means for growth mindset items which are shown in Table 14 are high and range between 6.08 and 6.19. These high means indicate that participant teachers think that if pupils are taught with dedication and engagement, they can learn more than first assumed (Dweck, 2006). The five ethical compass item means and standard deviations are also shown in Table 10. These are all reverse items with recoded means. The means range between 2.41 and 3.71, suggesting that teachers have a low ethical compass. Hence, they prioritize compliance to the curriculum rather than taking into account the needs and progress of the students when planning their instruction. The item "Following the criteria of governmental inspection makes me a less qualitative teacher" is the only item having a relatively high mean compared to other items of ethical compass.

Table 14. DI-Quest Items: Mean Scores and Standard Deviations

DI-Quest Items	Mean	SD
2- The way a teacher teaches is of influence on the intellectual capabilities of students (GM)	6.15	1.154
3- Classroom experiences of success can influence the intellectual capacities of students (GM)	6.08	1.147
4- A teacher's belief in the competences of a student can influence their intellectual capacities (GM)	6.19	1.010
6 (TR)- The curriculum does not provide any flexibility to cope with an individual student (EC)	2.44	1.688
7 (TR)- The curriculum is overloaded on content and goals (EC)	2.41	1.605
8 (TR)- The curriculum does not provide any room to foresee in differentiated instruction (EC)	2.43	1.492
9 (TR)- Governmental inspection on the implementation of the curriculum is limiting my professional freedom as a teacher (EC)	2.43	1.492
11 (TR)- Following the criteria of governmental inspection makes me a less qualitative teacher (EC)	3.71	1.858
12- I regularly change between working with homogeneous and heterogeneous groups (FG)	5.35	1.242
13- I teach my students to help each other (FG)	6.55	0.749
14- I explicitly make sure I have a good relationship with all of my students (FG)	6.34	0.778
15- During my lessons, students need to work together in order to progress in their learning process (FG)	5.97	1.059
16- I make sure that every student has a specific function in my classroom (FG)	5.95	1.129
17- Working in heterogeneous groups gives my students the opportunity to learn from each other (FG)	6.21	0.972
18- I make sure that every student who needs extra guidance will get this (FG)	6.07	1.031
19- I differentiate by switching between working with heterogeneous and homogeneous groups (FG)	5.79	1.179
20- I use assessment to gain insight into the learning processes of my students (O-I)	6.11	1.130
21- I use assessment to assess in what way I can adjust my lessons to the learning processes of my students. (O-I)	6.13	0.921
22- I teach my students how to cope with feedback (O-I)	5.85	1.125
24- I choose the learning content and teaching methods based on my students (AT)	5.87	1.195
25- I adjust my assessment based on my students (or groups of students) (AT)	5.77	1.221
28- During my lessons, my students can decide with me on which assignment they need to work (AT)	5.46	1.276
29- Knowing my students, I select the learning content, materials and teaching methods (AT)	6.05	0.911
30- Based on their learning profile, I let my students choose between learning content and teaching methods (AT)	5.40	1.316
31- During my lessons, I choose the learning content and teaching methods for my students based on the learning profile of my students (AT)	5.87	1.035

Growth Mindset (GM)

Ethical Compass (EC)

Flexible Grouping (FG)

Output-Input (O-I)

Adaptive Teaching (AT)

Second category: Classroom Practices (Flexible Grouping and Output-Input)

The means of the two factors constituting the classroom practices—flexible grouping and output input—are both high indicating that teachers claim to use these two differentiation practices in their classes. The means of the eight flexible grouping items range between 5.35 and 6.55. These high means suggest that teachers stated that they employed flexible grouping strategies and encouraged cooperative learning in their classrooms. The means of the three output-input factor items are also high ranging between 5.85 and 6.1. This implies that teachers stated that they used student outputs gathered from observations, tasks, evaluations, etc. to adjust the input by providing feedback to students and planning the subsequent instruction accordingly.

Third category: Adaptive Teaching (Adaptive Teaching)

Adaptive teaching, the main factor of the instrument, measures how frequently teachers adapt their teaching considering student readiness, interests and learning profiles. The means for the six items range between 5.40 and 6.05. These high frequencies imply that teachers think they adapt their teaching to accommodate the diverse needs and characteristics of their students.

4.2.3.3.1 Factor means and the participant teachers' DI profile

The four factors, namely growth mindset, flexible grouping, output-input, and adaptations, have high means, with the exception of the ethical compass as seen in Table 15. Thus, the teachers state that they believe in the students' learning capacity when appropriate instruction is provided (M:6.14). They implement the DI practices of flexible grouping (M:6.03) and utilize student outcomes in their instruction as input (M:6.03). Additionally, they make adaptations (M: 5.74) in accordance with students' readiness, interests and learning profile. However, when coming to the

ethical compass factor, teachers state that they prioritize the curriculum over student learning (M:2.77).

Table 15. DI-Quest Factors: Means and Standard Deviations

Factors	Mean	SD
Growth Mindset	6.14	.93
Ethical Compass	2.77	1.19
Flexible Grouping	6.03	.72
Output-Input	6.03	.93
Adaptations	5.74	.90

The mean scores on the five factors of the DI-Quest test differ significantly [$F(2.62, 235.43) = 287, p < .001$]. This finding shows that there is a significant difference between at least two of these five factor scores. Bonferroni post hoc test was performed to see which factors showed significant differences. Bonferroni results show that all differences are significant except for Growth Mindset and Flexible Grouping, Growth Mindset and Output-Input, and Flexible Grouping and Input-Output pairs.

Figure 7. shows the line graph of the five DI-Quest questionnaire factor means. In a study Gheyssens et al. (2020) collected data from 1.302 primary and secondary school teachers using DI-Quest questionnaire. A cluster analysis was conducted, resulting in the identification of three distinct profiles of DI teachers. The first profile, referred to as "DI-teachers," exhibited high levels across all five factors.

The second profile, labeled "Formal Teachers," displayed a high growth mindset, but had a low ethical compass and average implementation of adaptations. Lastly, the third profile, named "Fixed Mindset Teachers," demonstrated an ethical compass, but had a low growth mindset and average implementation of adaptations. These profiles revealed that the implementation of adaptations was high when the two philosophy factors were both high. However, when one of these philosophical elements had a low value, the adaptations of DI were also seen to occur at reduced rates.

The mean scores of the participant teachers in this study (See Figure 5) do not align with the findings of Gheysens et al. (2020). The teachers in this research claim to possess a growth mindset, but exhibit a low ethical compass. The same teachers concurrently claim to frequently do adaptations in their instruction. This finding highlights a paradox that will be discussed later.

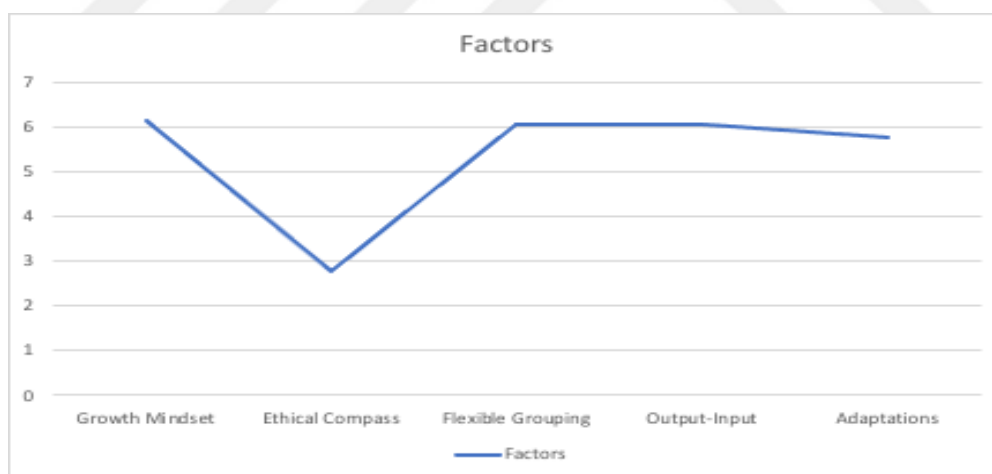


Figure 5. Participant factor mean scores

4.3 Second phase needs analysis

At this second phase of the needs analysis, a teacher needs survey consisting of open-ended questions was sent to 48 of the 91 participant teachers of the first quantitative needs analysis phase. The questions were revised based on feedback secured from two experts and a teacher who examined the needs analysis survey. These 48 teachers were those who volunteered to participate in the teacher PD program and shared their communication information. Only 20 of these 48 teachers replied to the survey. As seen in Table 16, of those 20 teachers 19 were female and 1 was male. Sixteen were elementary school teachers and 4 preschool teachers. 11 taught in public schools and 9 in private schools. The majority had 11 to 15, and 16 to 20 years of teaching experience. A total of 13 teachers had participated in more than 3 online PD programs, while 6 teachers had participated in 1 to 3 programs. There was one teacher who did not take part in any online PD programs.

Table 16. Demographic Information of Participant Teachers for the Second Phase

Demographic characteristics	Participants (N:20)	Frequency
Gender	Female Male	19 1
Graduation	Preschool Elementary	4 16
School Type	Public Private	11 9
Total Teaching Experience	3 - 5 6 - 10 11 - 15 16 - 20 >20 years	3 2 8 5 2
Previous participation to online PD programs	0 1-3 >3	1 6 13
Use of technology in teaching	never sometimes usually always	5 10 4 1
Heard about PBL before	Yes No	13 7

In this phase more comprehensive data were collected regarding teachers' conception of differentiated education, difficulties they experienced while teaching in academically diverse classrooms, and the most prevalent reading difficulties they faced. This information was taken into account when formulating the content for professional development. Furthermore, information on teachers' utilization of technology, familiarity with problem-based learning, previous professional development and collaboration experiences, as well as their expectations of the professional development program, were gathered to inform the design of the PD program.

4.3.1 Findings

4.3.1.1 Teacher learning needs findings

In the second phase of needs analysis, participants were asked to define differentiated instruction. As indicated in in Table 17, 5 of the 20 participants related it to a type of instruction that addressed the individual needs of all students.

“An instruction reaching all students.” ID: 5

“Different clothes for different sizes.” ID: 10

These definitions emphasize the main rationale of differentiation without providing any further information. Nine participants acknowledged individual differences in general terms. However, the three students’ characteristics driving differentiation—readiness, interest, and learning profile—were identified by only one participant each. Regarding the three lesson components—content, process, and product—only one participant made reference to content and process both, while no teacher referred to the learning profile. Three teachers described differentiation as an instruction that is out of the norm/non-traditional. One teacher defined differentiation by only mentioning one of the fundamental strategies of differentiated instruction: working in small groups. Finally, two teachers claimed to know nothing about differentiated instruction.

Table 17. Participants' Definitions of DI

Participants' definitions of DI	Frequency
Reaching each student	5
Individual differences	4
Individual differences + Readiness	1
Individual differences + Interest	1
Individual differences + Readiness + Interest	1
Individual differences + Learning Profile	2
Content + Process	1
Product	-
Differentiation strategies	1
Non-traditional	3
Don't know	2

Teachers were also asked about the challenges they experienced when teaching in a classroom of students at varied skill levels. As indicated in Table 18, the most stated difficulty by the teachers was about planning (n = 19). Developing materials for different content and assessment were stated as areas of difficulty in planning the instruction.

Preparing different materials takes time, supporting different groups in the classroom simultaneously can be challenging for a single teacher, good planning is required. ID: 4

Precisely assessing the level and characteristics of students. ID: 13

The second area of difficulty mentioned by teachers was the inclusion of all students (n = 15).

If I repeat, the curriculum may be delayed, or students who are ahead may become bored. Progressing based on the pace of advanced students could cause slower learners to disengage from the lesson, which may affect their future learning processes and self-esteem. ID: 1

The third most often mentioned challenge was related to time constraints to meet the requirement of covering the curriculum.

If I repeat, the curriculum may be delayed. ID: 1
To accomplish the objectives within the limited class time was challenging for me.ID: 17

Classroom management in a differentiated classroom was also perceived as a challenge by the participant teachers.

It can become difficult to control students during the lesson process, they may become bored. ID: 5
To gather attention in the classroom. ID 9

Resistance to differentiation by the parents and school administration was mentioned twice. Peer bullying, large class sizes, being the sole teacher in the classroom, requirement of a lot of effort and lack of parental support were each mentioned once.

Table 18. Challenges Experienced when Teaching in a Mixed Ability Classroom

Challenges experienced when teaching in a mixed ability classroom	Frequency
Making plans	19
Including all students	15
Not being able to cover the curriculum	6
Classroom management	4
Resistance to differentiation by parents and school administration	2
Peer bullying/large class size/being the sole teacher/requiring a lot of effort/lack of parental support	1

To get a better understanding of the student reading issues that teachers face in their classrooms, they were asked to describe a specific student they struggled to teach literacy skills. As presented in Table 19 the teachers highlighted three sources of difficulties: Cognitive (n = 12), self-regulative (n = 8), and family-related (n = 5). The difficulties confronted by the teachers were mostly about letter knowledge (n = 12), fine motor skills (n = 5), knowledge of syllables (n = 4), phonological awareness (n = 1), and spelling (n = 1).

Table 19. Reading Issues Faced by Teachers

Reading issues confronted by teachers	Frequency
Cognitive factors	12
Self-regulation related factors	8
Family-related factors	5
Phonological awareness	1
Letter level	12
Syllable level	4
Fine motor skills	5
Spelling	1
All levels	1

4.3.1.2 Teacher PD program design related findings

In order to gather data for the design and development of the online professional development program, the participants were asked to name three characteristics of an effective teacher PD program.

As indicated in Table 20 the most often cited characteristic of a PD program that emerged from the teachers' responses was that it should be tailored to the

specific needs of teachers in their actual classroom settings (n = 16). The next most stated features were being practice-based (n = 6), provision of resources and examples (n = 6), including recent innovations (n = 5), captivating attention (5), and delivery by proficient trainers (n = 4). Getting feedback (n = 2) and being flexible (n = 2) were also stated as characteristics of effective PD programs. Small groups of participants, being technologically facilitated, existence of different points of views, time management, being simple and comprehensible, well planned, targeting particular areas of teaching, including examination were also cited as necessary.

Table 20. Effective Teacher Professional Development Program Characteristics

Effective Teacher Professional Development Program Characteristics	Frequency
Functionality	16
Practice-based	6
Supply of resources and examples	6
Captivating attention	5
Including recent innovations	5
Proficient - qualified trainers	4
Feedback	2
Flexible	2
Limited number of participants, provision of information, technologically facilitated, existence of different points of views, time management, simplicity and comprehensibility, well-planned, targeting specific subject teachers, including examinations	1 (each)

Teachers' familiarity with problem-based learning was also addressed, since the PD program would be designed considering the PBL principles. The thirteen

teachers who claimed to have heard about PBL were asked to define it. As seen in Table 21 five teachers stated that PBL was based on solving problems.

While not certain, I can say it's a teaching method built upon a problem situation. The lack of active participation in a class with insufficient educational materials (the problem) can lead to generating solutions, which could serve as an example of this teaching approach. ID: 1

Three teachers emphasized PBL's relation to real life.

I believe it could be more understandable as it contains examples from real life. ID: 4

Learning in a simulated environment is an appropriate learning method as it allows for generalization in real-life experiences. ID: 9

And two teachers defined PBL as a student-centered learning style.

A learning style where students are at the center and they reach the knowledge themselves. ID:12

Other attributions to PBL were: leading to thinking, fruitful, more comprehensible, up-to-date, flexible, realistic, based on practice. A teacher emphasized the guidance provided to the problem-solving process, and another teacher stated that PBL needs to have more space in our lives.

Table 21. Teacher knowledge of Problem-based Learning

Problem-based learning	Frequency
Based on solving problem	5
Related to real life	3
Student centered	2
Thought-provoking, fruitful, more comprehensible, up-to-date, flexible, realistic, experience-based, guidance to solve problems, needs to have more space in our lives	1 (each)

Because collaboration in small groups is one of the PBL learning principles, Teachers were also asked to share their previous favorable experiences of teamwork. As indicated in Table 22 the most reported positive experience by the teachers was the exchange of ideas, knowledge and experiences (n = 17).

In our team collaborations, by exchanging ideas with each other, we are achieving more creative experiences. ID: 14

I gained different perspectives from different experiences. ID: 18

Advantages of collaboration in teamwork were also stated by the teachers. Some of the advantages cited were: relying on teammates, supporting each other, contribution of all teammates in the area they are proficient in, finding shared solutions to problems, completing tasks in less time, and division of labor for common goals. Other stated teamwork advantages were formation of networks, enjoyable and motivating experiences, and enhanced product quality.

Table 22. Favorable Teamwork Experiences

Favorable teamwork experiences	Frequency
Exchange of ideas, knowledge, and experiences	19
Advantages of collaboration within a team	11
Formation of networks	2
Enjoyable and motivating experiences	2
Enhanced product quality	1

Teachers also shared their unfavorable teamwork experiences. As demonstrated in Table 23 among those experiences disruptive team member characteristics were the most frequently cited (n = 12). These features were: Not being open to innovations, being dissatisfied, being income oriented, thinking to

know everything, being disrespectful of other participants, wanting to stand out, not acting in line with common decisions, being prejudiced, being careless, being biased, and lack of motivation and restricted use of technology of older team members. Time management issues (n = 6) and unbalanced contribution of team members (n = 6) were the second most stated ones. Unfavorable team composition—reluctant or homogeneous groups— (n = 2), conflicts causing tension (n = 2), and ignorance of individual differences (n = 1) were also among the participants’ negative experiences of teamwork.

Table 23. Unfavorable Teamwork Experiences

Unfavorable Teamwork Experiences	Frequency
Team member traits challenging teamwork	12
Poor time management	6
Unbalanced contribution from team members	6
Unfavorable team features (reluctance, homogeneity)	2
Tension leading to conflicts	2
Disregard for individual differences	1

Teachers were asked to state their expectations from this teacher PD program. As seen in Table 24, 8 teachers mentioned their expectation to gain new knowledge about teaching. Some expressed specific learning areas like being able to create different lesson plans, accelerating instruction time, increasing student participation in the learning process, and helping students form more desirable behaviors. Four teachers pointed out that they wanted to learn new teaching methods and strategies,

and four wanted to gain practice-based functional teaching skills. Three teachers stated specifically differentiated instruction related learning needs. Two teachers found this PD as an opportunity to reflect on their teaching. Other expectations included: Benefitting from experiences, acquiring new experiences, increased sharing within the field, making learning enjoyable and this PD to contribute to the teaching profession with a program development.

Table 24. Expectations from this Teacher PD Program

Expectations from this Teacher PD Program	Frequency
Learning new teaching skills	8
Learning new teaching methods and strategies	4
Acquiring functional, practice-based knowledge	4
Learning about differentiation	3
Engaging in self-reflection as a teacher	2
Benefitting from experiences	1
Acquiring new experiences, increased sharing within the field, making learning enjoyable, contribution to the teaching profession	1(each)

4.4 Discussion of the findings from the needs analysis

The needs analysis conducted prior to the development of the PD program revealed the learning needs of the preschool and elementary teachers regarding differentiated literacy instruction. Yet, there were inconsistencies in the results. Teachers expressed high learning needs for all the differentiated literacy instruction areas in the teacher learning needs questionnaire. However, the same teachers expressed high use of differentiation practices and adaptation of lesson plans for a variety of learning needs

in response to the DI-Quest questionnaire. Another inconsistency existed in the teachers' low level of ethical compass and high level of differentiation related classroom practices and adaptations. These inconsistencies in the first phase needs analysis emphasized the importance of the second phase, in which the teachers' learning needs data is supplemented with additional data.

Teachers' statements about differentiation demonstrated that they were aware of the purpose of differentiation as reaching all students in the classroom, but very few of them cited unique areas of student needs, such as readiness, interest, and learning profile. The lesson components—content, process and product—were also missing in the teachers' statements. This data supported the necessity of a PD program for differentiated literacy instruction.

Teachers' statements about the characteristics of an effective teacher PD program obtained during the second phase were in accordance with current teacher PD literature and PBL approach. These features were considered in the design of the PD. The participants' past experiences of collaboration and group work were also considered by the PD facilitator in the guidance of group work.

The primary goal of the PD program was the acquisition of differentiated instruction skills by the teachers and literacy instruction was its application area. Hence, differentiated instruction goals were prioritized in the program over the literacy development content.

CHAPTER 5

FIRST CYCLE

5.1 Participants

Small groups of three to ten participants are suggested for PBL for favorable group interactions (Holen, 2000). Lou et al. (2001) reported that group size with three to five members resulted in superior performance compared to individual performance in their meta-analysis of studies on learning with technology. In PBL classrooms there are usually more than one group collaborating during the process. However, in this study, I was only capable of finding a small number of voluntary participants, and the existence of only one group made it possible to conduct the study with just one facilitator. A third cycle can be planned in the future with two or more collaborating subgroups.

The first cycle started with six participants. However, one of the participants, who seemed to be the most knowledgeable about differentiated instruction among all, dropped out without stating any particular reason. As seen in Table 25 all the participants were female. P1, aged between 36 and 40 years, was an elementary teacher with 11 to 15 years of experience who had resigned after the birth of her second child. She had previously taught in Armenian schools and was currently working on the development of a textbook for teaching reading in Armenian. P2 was an elementary school teacher between the ages of 20 and 25 with 3 to 5 years of experience. She was recently teaching 2nd grade in a private school in Istanbul. P3, a preschool teacher with 11 to 15 years of experience, was aged between 36 and 40 years and was teaching in a public school in Mersin. P4 was a special education teacher teaching in a public school to three special education students with autism.

She was between 30 and 35 years old and had a teaching experience of 11 to 15 years. P5, the most experienced participant teacher, was over 41 years old and had been an elementary school teacher for over 20 years. She was recently teaching the 1st grade in a public school.

Table 25. Participant Demographic Information for the First Cycle

Name	Gender	Age	Graduation	Teaching Experience	Grade Level	School Type
P1	F	36-40	Elementary	11-15	-	-
P2	F	20-25	Elementary	3-5	2	Private
P3	F	36-40	Preschool	11-15	Kindergarten	Public
P4	F	30-35	Special Education	11-15	Special Education	Public
P5	F	>41	Elementary	>20	1	Public

5.2 The first cycle process

The participants who volunteered to participate in the online PD program and take part in the second phase of the needs analysis were sent an invitation for a preliminary online meeting to inform possible participants about the PD program calendar, its purpose, content and delivery method. Thirteen of the twenty teachers replied to the invitation and attended the meeting. The meeting time was established using an online meeting scheduling application. At the meeting, I presented myself as both the researcher and PD program facilitator, and explained my personal motivation for being interested in differentiated instruction. Afterwards, the teachers introduced themselves and I delivered a presentation including a brief summary and purpose of this doctoral research, as well as the professional development program in which they will participate. I shared the number and the duration of the PD meetings, the video conferencing tool via which the meetings will be held, and the PD delivery

method, namely, problem-based learning. I introduced the problem-based learning process and related design principles, as well as the method's compatibility with the PD characteristics they stated to be effective in the needs analysis survey. The presentation ended with the expected learning outcomes, responsibilities, and their right to withdraw from the PD program at any time wished.

Thirteen teachers who attended the meeting and volunteered to participate were divided into two groups, one to participate in the first cycle, which took place in December 2022 - January 2023, and the other in the second cycle, which took place in April - June 2023. However, only eight of the teachers actually participated in and completed one of the two cycles. Five in the first cycle and three in the second. A fourth teacher, who was not present during the needs analysis phase, also joined the second cycle. A few criteria were considered in grouping the teachers: their available times to participate in the program, whether they were a preschool or elementary teacher, and the grade level they were teaching.

The first cycle started with six participants, but one of the teachers dropped out after the third week. Prior to the implementation of the PD program, interviews were conducted with the participant teachers. The interview data was used to inform the PD sessions and to collect data about initial teacher knowledge of DI, reading difficulties encountered by the teachers, PD expectations and collaborative group work experiences.

At the end of the interview, the teachers were informed about the electronic form they will get and complete prior to the first session. The form asked them to provide a detailed profile of their current three students: One at the grade literacy level (average), one who already accomplished the grade literacy goals (advanced), and one who needed support to achieve the goals (struggling). These student profiles

are utilized as the students of the fictional classroom which took place in the PBL problem scenario (See Appendix G) developed for this PD program (See Appendix H).

The first cycle consisted of eight weekly sessions each three hours long. The sessions took place on Thursdays from 20.00 to 23.00. Before the first session, the participants were also asked to complete the DI-Quest questionnaire and an empty Google drive folder was shared with them as a storage space for PD materials. A detailed description of the eight sessions conducted during the PD program is provided as follows.

Session 1: The first session began with an icebreaker activity on an online collaboration tool. Participants responded to prompts such as, 'What would you do if you won the lottery?' They also shared their personal stories and motivations for choosing a career in teaching. After this introductory activity the effective collaboration features were discussed with the participants given that participants would be collaborating throughout the professional development process. Additionally, a short movie outlining the main characteristics of effective collaboration was presented during the session. Afterward, participants were provided with an overview of the 8-week PD program. Subsequently, the first collaboration activity of the program commenced "A letter to Teacher Sedat". Which consisted of offering ideas to a teacher who sent a letter to the group requesting assistance with challenges stemming from having a heterogeneous classroom. The teachers read the letter and wrote back a letter where they shared their suggestions.

The first week's session ended with the presentation of the PBL problem. The PBL problem consisted of a highly heterogeneous classroom, where providing literacy instruction to students with different individual needs was a problem to

solve. The students in this fictional classroom were the actual students from the participant teachers' classes. Three from each individual participant teacher (one average, one advanced, and one struggling) whose detailed descriptions were provided prior to the first session. In this first session they read the problem scenario that would serve as the basis for the PD program and composed the problem definition, first independently and then collaboratively.

Session 2: This second session started with a discussion activity to reflect on inclusive education. Two visuals were used to initiate the discussion among the participants. The first visual included four images representing reality, equality, equity, and justice in learning environments. The second visual included four images representing exclusion, segregation, integration and inclusion in the education system. After this warm up activity, the session proceeded with the PBL problem analysis phases. First the problem situation and the problem definition developed at the first session were recalled. Following this, the problem was analyzed by making a list of the advantages and disadvantages of a classroom presented in the problem situation, the solution steps were formulated, and the learning issues needed to solve this problem were identified. At the end of the session, the first learning issue identified for the next week was reading development, including its components and evaluation. The participants accepted my suggestion to invite an expert to the next session to deliver a lecture on this subject. Furthermore, it was decided that the self-directed learning activity for that week would consist of researching a reading component and developing questions to evaluate it. At the end of the session, I realized the need of sharing a summary of the session and the self-directed learning task. This constituted the first design improvement: A weekly letter provided after

each session, including a summary of the work done that week, a detailed description of that week's self-directed learning task, and the links to the resources.

Session 3: Dr. Nalan Babür, visited the online meeting and delivered a lecture on Chall's (2013) stages of reading development, the five components of language, kindergarten pre-reading skills, and Spear-Swerling's six phases of reading development in typically developing children. The participants had also the opportunity to ask questions and share their experiences. With the previous readings done by the participants and information acquired through this intense lecture the session concluded with the decision to develop a reading evaluation checklist. The task of developing the checklist was that week's self-directed learning task. They had to develop their part of the checklist asynchronously on a shared document. They were also expected to use that checklist to evaluate their actual students who take place in the PBL problem fictional classroom and don't follow typical reading development. One participant was absent at this session due to a health problem. Because of data privacy concerns, the audio record of the lecture was delivered to this participant after being edited to remove parts where the participant teachers shared their experiences.

Session 4: The session started with the introduction of the prototype website created by me, which was intended to serve as a repository for PD documents and resources. The participants were asked to contribute to the website by submitting content and suggesting organization. However, this instrument of the PD program could not be used effectively in the PD process. Following this I delivered a presentation about:

- The types reading assessment: Scanning, diagnosis, formative, and summative (Walpole & McKenna, 2017).

- Reading components and reading profiles/Response to intervention (Spear-Swerling, 2015).

Following the presentation, the group collaborated to refine the reading evaluation checklist which they developed earlier during the week. The first self-directed task of the week was the evaluation of the students using this checklist and determining the students' reading profile accordingly.

At the end of the session, the participants were asked questions about differentiation to make an introduction to differentiated instruction, identify its basic components, and assign them to the participants as the week's second self-directed learning task.

The data collection tool, online PD program evaluation questionnaire, was sent to the participants.

Session 5: At the beginning of the fifth session, participants shared student reading evaluation results, conducted using the reading evaluation checklist developed by the group. Following this, I informed them that she uploaded some resources to the PD website and they can access the PD resources from there. Afterwards, the differentiated instruction presentations began. I started the presentation by mentioning the philosophy and principles of differentiation. In continuation of the presentation, the participants took over and presented the parts they researched during the week: (1) The individual differences: readiness, interest, and learning profile; (2) the elements of a lesson plan that can be differentiated: content, process, and product; and (3) the differentiated instruction strategies. At the end of the session the weekly self-directed task was delivered: Each participant had to choose three differentiation strategies and present it at the next session with examples. Later, the participants were assigned a second task with the weekly letter:

They had to read the lesson plan delivered to them and highlight the parts which were related to the differentiation elements they studied and presented at this fifth session. They were also asked to bring a sample lesson plan with them to the next session to use as a foundation for creating a DLP template.

Session 6: At the beginning of the sixth session the participants were asked to reflect and share their self-directed learning experiences since the participants couldn't complete last week's task. The participants shared that they found it difficult to complete tasks effectively due to their heavy school and family responsibilities, along with feelings of guilt. In response to these preoccupations, I emphasized the priority of attending the sessions regularly and doing their best regarding the self-directed learning tasks. I also stressed that this is a fact of life and compared it to the differentiation practices. We will be doing our best in differentiating our instruction without getting discouraged and giving up: Perfect is the enemy of good. I stressed the importance of the task they couldn't complete for that session and asked them to complete it for the next week. Additionally, I asked them to provide their reflections on the task in a document that would be sent to them.

Following this introduction two participants and I shared a few differentiation strategies. The session continued with that week's main activity: Developing a DLP template that incorporated the essential components to differentiate a lesson. The purpose of this activity was to encourage participants to reflect on what they learned about DI elements and apply it in the creation of a product—DLP template—to support deep learning. The session ended with the recall of the next week's tasks.

The reflective journal was sent to the participants.

Session 7: The seventh session started with the teachers' reflections about the DLP they have read and highlighted. Following this the main collaborative task of

the week started: Developing a DLP for the fictional classroom taking place in the PBL problem situation. The goal of the lesson was chosen to be reading comprehension. After completing the DLP, I shared a checklist of the essential parts of a DLP and the participants evaluated the DLP they developed accordingly.

The session ended with the sharing of the following week's self-directed task: Each participant had to create DLPs for their own classrooms, share them with the group, have feedback, and after revisions implement them.

Session 8: At the beginning of the session, the teachers engaged in a conversation over the school homework system. This discussion stemmed from one participant's personal challenges in managing her son's school assignments. Following this, one participant shared her classroom implementation of the DLP, which she prepared and revised according to the feedback she got. After the presentation feedback was given to the DLP. I made clarifications about the content and process differentiation because of a misconception that arose during the presentation. I also highlighted the importance of not oversimplifying the tasks while differentiating for readiness. This followed the DLP presentation of the second participant teacher. She was unable to put it into practice since she was not teaching at the time. The third teacher, who was not able to prepare a DLP for this session, prepared and implemented it later and shared her experiences during the post-interview. The other two teachers (The special education and first grade teachers) didn't complete this task. The session ended with the exchange of good wishes and the sharing of the last task of writing one paragraph to Teacher Sedat individually, to whom they had written a letter collaboratively in the first session.

Data collection tool: DI-Quest questionnaire

After the sessions ended post-interviews were conducted with the participants. One teacher was interviewed one month after the PD programme completed, since she was living in close proximity to the area affected by the earthquake that occurred in February 2023.

5.3 Findings

The analysis of the first-cycle data focused on identifying necessary design improvements for the PD program. Post-interviews, researcher field notes, and PD program evaluation questionnaire data were examined to explore the contribution of PBL design principles to participant learning. Additionally, DI-Quest results were analyzed to assess participants' overall learning about DI, serving as an indicator of the program's impact and relevance.

5.3.1 DI-Quest data findings for participant learning of DI

Table 26 presents the participants' factor scores before and after participating in the PD program. One of the participants, P5, did not complete the DI-Quest after the PD, so only the scores of the four participants will be reported here. The scores for the DI-Quest philosophy category, which include growth mindset and ethical compass factors, showed no consistent pattern among participants. While one participant exhibited an increase in both scores, others showed an increase in one score and a decrease in the other. The remaining two categories, practice (which includes flexible grouping and output-input factors) and adaptations, are only assessed for three participant teachers, as one participant (P1) was not actively teaching at the time. The three participants' scores on both categories are increased after participating in the

PD. Overall, the trend indicates a positive impact of the PD program on participants' differentiation practices.

Table 26. Participant pre and post PD DI-Quest Scores

Participants	Growth Mindset		Ethical Compass		Flexible Grouping		Output Input		Adaptations	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
P1	5.7	6.0	2.0	3.0	6.1	-	3.3	-	4.7	-
P2	5.7	7.0	3.4	3.0	4.6	5.5	3.0	5.3	2.3	3.7
P3	6.0	5.0	3.0	3.4	4.4	5.0	3.3	3.7	2.3	3.8
P4	5.0	5.3	3.2	2.8	5.3	6.0	5.7	6.0	4.8	6.0
P5	7.0	-	2.0	-	6.3	-	5.7	-	4.8	-

The results indicate some encouraging trends in participants' differentiation practices following the PD program. The increase in scores within the practice and adaptations categories for three participants suggests some positive influence of the PD on their ability to implement differentiated strategies in their teaching. The inconsistent patterns observed in the philosophy category highlight an area for potential growth in future PD programs. The findings suggest that further support or additional resources might be needed to facilitate deeper reflection and integration of these philosophical elements.

5.3.3 Design findings and related design improvements

Design related feedback was sought throughout the implementation (including a program evaluation questionnaire), and immediate provisions and improvements were implemented. For instance, in response to the participants' concern about not

having enough time to complete the weekly tasks, a group discussion was conducted on this issue and the participants were encouraged to reflect on their learning process, and ways in which the facilitator and the group might support them to meet the challenges of insufficient time. The data obtained in the first cycle from the final interviews conducted with the four participants, field notes, and all of the session recordings were viewed to determine the design improvements needed before the second cycle of the implementation.

During the post-interview, the four participants were asked how they would describe this PD program to their friends in a few sentences. The four participants focused on four different aspects of the program in their response. One emphasized the problem-solving process in finding solutions to their own problems. Another stressed her enhanced awareness and understanding of literacy development and instruction as a result of this PD. The third one highlighted how she learned from the other participants' experiences and ideas. And the last participant emphasized her learning of how to develop DLPs. Each of these four aspects, learning through problem solving, literacy development and instruction, collaboration with colleagues, and developing DLPs were central in the design of the PD program. Each participant highlighting one central aspect of the design came as a pleasant surprise and offered valuable evidence supporting the program's design.

5.3.3.1 PD content refinements

The data from the interviews and the sessions showed that the distinction between content and process in differentiated instruction was not clear for some participants. Another confusion occurred between interest and learning profiles as defined in Tomlinson (2017). Some teachers regarded the student's learning preferences as their

interest. Besides, the participants tended to forget mentioning “learning profile” when referring to student personal differences considered in differentiated instruction. Finally, there was an inclination to oversimplify the content in differentiating the reading instruction. These misconceptions and tendencies were considered in the second cycle PD delivery.

During the first cycle, it was observed that the PD content couldn't be completed within the allocated eight weeks. Upon reevaluation of the PD content for the second cycle, it was decided that the collaborative letter-writing activity to Teacher Sedat in the first week could be omitted. This decision stemmed from the realization that the topics discussed during the letter-writing activity closely mirrored those addressed when analyzing the problem situation presented as part of the PBL design. Additionally, time needed to be allocated for presentations on the implementation of the DLP at the end of the PD.

5.3.3.2 Design refinements based on PBL principles

Design principle 1: Promote self-directed learning

The participants generally found the amount of the self-directed tasks reasonable. However, they also expressed concerns about lacking sufficient time to complete the weekly self-directed learning tasks adequately. They also expressed feelings of guilt about this and emphasized their desire to complete the readings following the program. Considering these participant experiences certain weekly tasks were reduced for the second cycle. One participant voiced her struggle with understanding the task instructions. In response to this, the weekly review was implemented as a design refinement during the first cycle. Weekly reviews were sent to the participants

after each session which contained a summary of the week's activities, and recommendations for resources.

The participants had also expressed a need for readily available bite-size summaries of resources to address their time constraints; however, this need was not addressed to maintain the self-directed learning focus of PBL.

Design principle 2: Use ill structured real-world problems

The participants largely agreed that the problem situation offered as part of the PBL design generally mirrored the challenges they encountered in their actual classrooms. They expressed that the problem-solving experience gained during this program would assist them in addressing similar issues in their classrooms in the future. Thus, no further design refinement seemed necessary regarding this design principle embodiment.

Design principle 3: Promote collaboration

The participants generally found the program well-balanced between lecture-presentations and collaborative tasks that actively engaged them. They stated benefiting from the diverse experiences and viewpoints of other group members, and one referred to the good group synergy. However, two participants expressed concerns about the time spent addressing deadlocks encountered during collaborative activities, and one participant expressed her expectation for me to intervene. Additionally, the participants noted varying levels of contribution to collaboration among group members.

Based on these participant responses, I reevaluated my role in addressing deadlocks for the next cycle. I planned to ensure that the group would be given sufficient time to resolve these issues independently, but if discussions became prolonged on the same issue for too long, I would ask targeted questions to accelerate

the problem-solving process. Regarding the unequal participation in collaboration, explicit assignments aimed at encouraging participants to engage more actively were planned for the next implementation cycle.

It was also observed that the participants tended to directly contact me during the week, rather than utilizing the group communication channels, such as the instant messaging or email group that had been established on the first day of the program. Therefore, it was decided to guide the participants towards using the group texting platform more actively in the second cycle.

Design principle 4: Tutors act as facilitators to support the PBL process

The participants mostly stated that they were satisfied with the support and guidance they received from the facilitator. They highlighted several forms of support, including the facilitator's guiding questions, timely provision of answers and resources upon request, and assistance during collaborative activities. Moreover, they emphasized the facilitator's accessibility throughout the program. As an expectation of further support, two participants mentioned the need for more guidance to resolve deadlocks, as mentioned earlier.

Design principle 5: Use distributed scaffolding

Overall, participants expressed satisfaction with the provided scaffolds, including discussion activities, an expert lecture, presentations, checklists, weekly reviews, resource lists, and guidance from the facilitator. However, when asked about further support needed, they mentioned the desire for ready-to-use bite-size summaries, concrete examples, sample lesson plans, and videos demonstrating differentiation practices.

The weekly reviews, found to be very helpful to follow the PD program, were formulated after the first session because I realized such a need. These reviews were intended to help the participants to stay attuned to the program during the week.

Despite the short time between the two cycles, a few videos of differentiation practices were translated into Turkish and added to the second cycle resources.

Additionally, some of these videos were utilized as discussion starters, prompting participants to reflect on and share their opinions.

Design principle 6: Make use of reflection

The participants stated that the expert lecture, presentations and collaborative tasks prompted them to reflect on their previous knowledge and teaching practices, as well as on the new knowledge they acquired. They also noted their ability to collaboratively find solutions to problems. The reflective journal was meant to be used in the program to prompt the participants to reflect on each session. However, this tool was only used once after the sixth session. As a design refinement in the second cycle, reflective journal questions were provided to the participants after nearly every session. During the second cycle the participants were also assigned to give feedback to another specific teacher's DLP. This activity prompted them to reflect on the quality DLP criteria. Table 27 summarizes the design refinements for the second cycle.

Table 27. Design Principles and Related Refinements

Design Principles	Design refinements for the 2. cycle
1. Promote self-directed learning	Detailed explanations of the tasks provided in the weekly letters sent after each session. (Started during the first cycle) Reduced number of self-directed learning tasks (Reading presentations)
2. Use ill structured real-world problems	The data did not indicate a need for an improvement.
3. Promote collaboration	Encouragement of the participants to communicate with the facilitator via the group messaging platform (WhatsApp) rather than individually. Strategic intervention employed to address deadlocks, ensuring timely resolution. In response to uneven participation to collaboration, specific tasks devised to foster increased engagement among participants. Assignment of participants to provide feedback on another participant's artifact.
4. Tutors act as facilitators to support the PBL process	Facilitation during the problem-solving process when the group is stuck.
5. Use distributed scaffolding	Provision of weekly reviews including a summary of that session and detailed explanations of the weekly tasks after each session. (Started during the first cycle) Provision of videos demonstrating differentiated instruction practices. Provision of the links to the software, to be used during the sessions, a few days beforehand to allow participants time to familiarize themselves with the tools. Encouragement of the use of checklists.
6. Make use of reflection	Provision of reflective journal questions after each session. Teachers' reflection on the necessity of a DLP template before the activity "Developing a DLP Template," to cultivate a genuine necessity for its preparation. Assignment of a feedback peer to each participant.

5.3.3.3 Refinements to delivery via video-conferencing

The online PD delivery made it possible for the teachers to participate from various regions of Turkey, as well as one participant from Germany. One of the participants pointed out the convenience of participating in sessions from the comfort of one's own home. During the sessions, three participants occasionally encountered issues stemming from their limited technology skills, while two participants faced challenges due to inadequate technological infrastructure. One of these participants expressed a preference for face-to-face meetings. The participants' familiarity with using digital technology seemed to determine their level of active engagement in the sessions. Based on these experiences, in the second cycle, the digital tools were planned to be sent to the participants a few days prior to the sessions, allowing them to familiarize themselves with the tools beforehand.

The majority of participants expressed satisfaction with the length of the PD sessions, noting that the three-hour meetings were effective due to their active engagement.

5.3.3.4 Refinements to data collection tools

In the second cycle of design-based research, refinements were implemented in the data collection tools to ensure a thorough examination of participants' involvement with DI and PD program. Participants were requested to submit a lesson plan they believed included differentiated instruction components to assess their baseline level of practice. Additionally, the PD program evaluation questionnaire was planned to be administered twice: once during the PD sessions to gather immediate feedback, and once after the completion of the PD program to obtain participants' views on the program.

CHAPTER 6

SECOND CYCLE

6.1 Participants

The second cycle started with five participants. However, Aslı, one of the participants, dropped out after the fourth session stating time constraints and health issues as the reason. As indicated in Table 28 all the participants were female. Ayşe, aged between 36 and 40, was an elementary school teacher with 16 to 20 years of experience. She was the most informed and experienced participant about differentiation as she had completed an online course on the subject. She was teaching second grade at a private school and had prior experience in special education. Bianka, also an elementary school teacher aged between 20 and 25 with 3 years of experience, was teaching second grade in an Armenian school. Canan, aged between 36 and 40, had 11 to 15 years of teaching experience. She was on maternity leave during the professional development program and participated from Germany. However, due to a funeral, she returned to Turkey in the second week and continued her participation in the PD program from several cities in Turkey. Didem, aged between 36 and 40 and 11 to 15 years of experience, was the sole preschool teacher participant. At the time, she held an administrative position in a public preschool and had previous experience in special education.

Table 28. Participant Demographic Information for the Second Cycle

Name	Gender	Age	Graduation	Teaching Experience	Grade Level	School Type
Ayşe	F	36-40	Elementary	16-20	2	Private
Bianka	F	20-25	Elementary	3-5	2	Private
Canan	F	36-40	Elementary	11-15	-	-
Didem	F	36-40	Preschool	11-15	Preschool	Public
Aslı	F	36-40	Elementary	11-15	3	Public

6.2 The second cycle process

This second cycle began in April, during the second school semester, and lasted for nine weeks with one session held each week. Before the first session initial interviews were conducted with the five participants. At the end of the interview, participants were asked to provide a detailed profile of three students from their own classrooms, one average, one advanced, and one struggling, using an electronic form that was sent to them before the first meeting. Just like in the first cycle, these students constituted the fictional classroom for the PBL problem scenario.

Additionally, they were asked to submit one of their previously prepared lesson plans that they believed included elements of differentiated instruction. This was not requested from the participants in the first cycle and was employed as a design improvement to assess the participants' initial level of differentiation practice.

The PD program (See Appendix I) of nine sessions for this second cycle was mostly similar to the one in the first cycle, with some differences:

Session 1: The session started a bit late due to Ramadan, as Didem, who was fasting, requested to begin the meeting later. Aslı, who dropped out of the PD in the fifth week, also joined the session late due to a fasting dinner. Ayşe was ill, so she participated in the activities but mostly kept her camera off. For the ice-breaker activity (See Figure 6), the participants used an online collaboration tool to complete the statements. Didem couldn't join the tool because she was attending the session on her mobile phone, so she completed the statements orally. The statements were:

- If I won the lottery, I would...
- If I were an animal, I would prefer to be...
- If I had the chance to have dinner with anyone I wish, I would have dinner with...
- If I had the chance to have a superpower, I would prefer...
- Being a teacher in one word...

The participants were also asked to provide reasons for their answers.

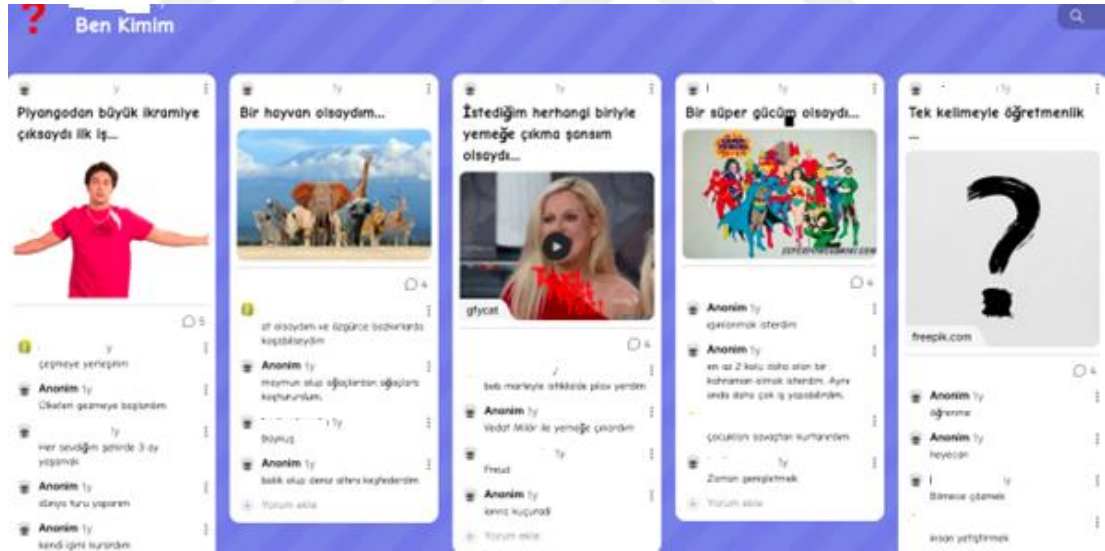


Figure 6. The ice-breaker activity

Here, I want to cite the participants' response to the last statement: Being a teacher in one word.

Ayşe: Teaching, in my opinion, is about cultivating a person, not just raising a child. It's about transforming a child into a good human being.

Bianka: Teaching, in one word, is 'learning' for me. This applies to both groups: learning for the teacher and learning for the student. I believe it's a process like that.

Canan: In a word, teaching is excitement, I think; the children truly evoke this feeling in a person.

Didem: Regarding the teaching profession, I would say it is about teaching how to learn. Teaching learning, life, and humanity as a whole. When one knows how to learn, there are no obstacles ahead, no barriers for the individual.

After the ice-breaker activity, I stated that our sessions would mostly proceed with collaborative activities and hence initiated a discussion about the participants' thoughts and experiences with collaboration. Ayşe emphasized that working with participants who are focused on producing quality products is essential for effective collaboration. The benefits of collaboration mentioned included the contributions of group members in their areas of expertise (Ayşe) and the opportunity to learn from each other (Didem, Aslı). The challenges noted were resistance to novelties (Bianka) and the presence of non-participatory, unwilling group members (Aslı).

This discussion was followed by a short video on the requirements of good collaboration. The requirements stressed in the video were: accountability, authenticity, commitment, give and take, diversity, and respect. Additional points included sharing responsibilities, risks, benefits, and credit; knowing our limitations; leaving our ego at the door; keeping an open mind; being physically and mentally present; ensuring everyone has an equal voice; trusting each other; stepping out of our comfort zone; and valuing each other's contributions. After the video, participants were asked to share what interested them most. Canan mentioned taking risks, and Didem highlighted leaving our egos and being stronger together as the most striking points for themselves.

Afterward, I introduced the PBL approach that guided this PD, highlighting collaboration as a core principle. I then elaborated on the rationale for selecting PBL

as the method for this professional development, emphasizing my role as a facilitator rather than a knowledge keeper, the importance of self-directed learning, and the entire PBL process. I also discussed the 8-week program structure, stressed the significance of attendance, and highlighted the weekly SDL tasks.

With the removal of the ‘A Letter to Teacher Sedat’ activity as a design improvement from the first cycle, the session proceeded directly to the presentation and analysis of the PBL problem, allowing for its thorough analysis within the allocated time. After reading the problem, each participant wrote their individual problem definition in a shared document (see Figure 7) and then read it aloud.

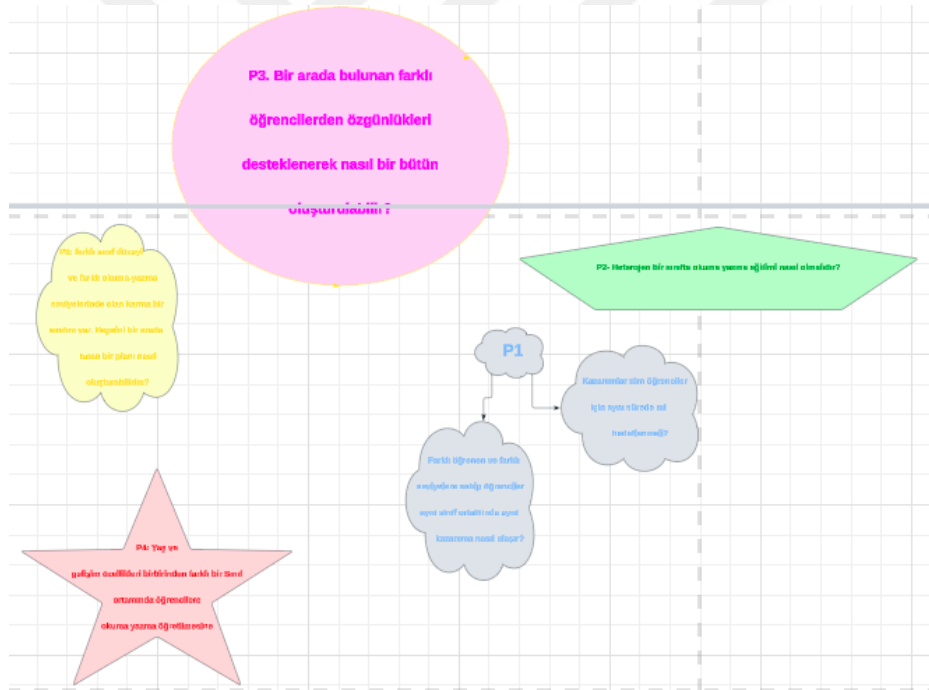


Figure 7. Participants' individual problem definitions

Following this, the five participants collaboratively wrote a common problem definition: Considering that students are at different learning levels in the same class, how can literacy education be effectively delivered to these students?

The session continued with the problem analysis, addressing the following questions:

- What might be the challenges of such a heterogeneous classroom?
- What might be the benefits of such a heterogeneous classroom?
- What is the problem solution?
- What are our learning needs to solve this problem?

The participants' answers to the questions, determined through a group discussion, are in Table 29.



Table 29. PBL Problem Analysis

Analysis Questions	Participants' Answers
What might be the challenges of such a heterogeneous classroom?	Advanced children might get bored. It may be difficult to adjust the pace of education. Too much repetition can bore the children, but if not done, the children who are behind will not get enough support. The teacher may struggle to teach in a group and may have to provide individual instruction. This requires effort, preparation, diligence, and time. It will be exhausting for the teacher. There will be challenges in classroom management. Difficulties will arise in planning within the lesson flow. A large space is needed for small group work or individual instruction. To position them at a distance. To prevent them from seeing and questioning each other's different work. Peer teaching is nice, but differences are not positively accepted by students. Preparing something for each student is not easy at all. Since parents communicate with each other, comparisons among children may occur, and pressure may be placed on the teacher. The teacher may be subjected to unfair criticism.
What might be the benefits of such a heterogeneous classroom?	Peer learning Emotional satisfaction because all students will learn (when DI is applied). There is no best or worst in the classroom. Everyone progresses at their own pace (when DI is applied). Students do not compete with each other. The teacher does not have to repeat themselves.
What is the problem solution?	We can differentiate instruction in reading and writing education. We should apply alternative teaching methods and techniques. We should implement individualized education plans. We can include students who already know how to read in large group writing activities and direct them towards reading comprehension exercises during phonics instruction. Additionally, homework can also be differentiated.
What are our learning needs to solve this problem?	Learning different teaching models Literacy assessment tools/scales Determining learning outcomes What is differentiation? How to align the curriculum with the child's needs? How to share differentiation with parents / How to convince parents? Explaining differentiation in the classroom to students and ensuring their acceptance. Administrative aspect. The approach of the school administration. How will classroom management be handled? How will time management be handled? How to maintain teacher motivation? To avoid starting DI and then abandoning it. Informing and involving other teachers about DI. Should students be informed about differentiation? How?

This problem analysis revealed that the participants recognized the necessity of differentiated instruction as a crucial strategy for addressing the diverse learning needs within a heterogeneous classroom. They identified various challenges, such as the potential for advanced students to become disengaged and the difficulties teachers face in managing varied instructional demands. The participants also recognized the emotional and social benefits of DI, emphasizing the importance of fostering a collaborative environment where all students can progress at their own pace without competition. Their proactive approach was evident in the practical solutions they propose, including individualized education plans and alternative teaching methods, alongside a commitment to ongoing professional development. This comprehensive insight reflected their dedication to enhancing instructional practices and creating an inclusive atmosphere that supports the learning and growth of every student.

At the end of the session, the learning area for the following week was determined to be the stages of reading, including the reading components and evaluation, similar to the first cycle. This was chosen as the first learning issue because the participants emphasized that student evaluation must be the initial step in differentiation to set appropriate goals for students. Participants agreed with my suggestion to invite an expert to deliver a lecture on this topic in the next session. Unlike the first cycle, as part of the design improvement aimed at reducing self-directed learning tasks, the reading components were not assigned as self-directed learning tasks. Instead, this learning area was planned to be covered solely through the expert lecture. Self-directed learning tasks were limited to the main focus of the PD: differentiated instruction. After the first session, reflective journal questions

were sent to the participants, accompanied by a request to review the PBL problem analysis document and make any changes or additions they deemed necessary.

Session 2: The expert, Dr. Nalan Babür, participated in the online meeting and delivered the same lecture as the one presented in the first cycle, covering Chall's stages of reading development, the five components of language, kindergarten pre-reading skills, and Spear-Swerling's six phases of reading development in typically developing children. Before the lecture the participants introduced themselves sharing their previous teaching experience and I reminded them to listen to the lecture with the SDL task in mind: Developing a reading evaluation checklist to evaluate our students to prepare a differentiated lesson plan. During the presentation the participants asked their questions and shared their related experiences.

At the end of the session, the details of the SDL task, which involved developing a reading evaluation checklist over a two-week period as an asynchronous collaborative task on a shared document, were discussed. Each participant was responsible for a different reading stage, and they were encouraged to provide feedback to one another. I recommended that participants use the expert lecture and reading materials I provided, and encouraged them to find additional resources as well.

After the session, reflective journal questions were sent to the participants. Two participants were absent for this session: Canan due to a family funeral and Aslı without any excuse. Due to data privacy concerns, I provided the audio recording of the lecture to these participants after undergoing editing to remove segments where participant teachers shared their experiences.

Session 3: Before the session, Aslı expressed her intention to withdraw from the PD program due to difficulties in completing the tasks. I encouraged her to continue attending the sessions. To address this issue with all PD participants, I initiated a discussion at the beginning of the session about their SDL experiences, similar to the first cycle. Canan was unable to share her thoughts due to connection problems throughout the session and only occasionally typed in the chat box. The other participants expressed their motivation but also highlighted time constraints, especially during the holiday week.

Bianka: I sometimes struggle with time, but since you are also trying to help, there's no issue of not being able to do it. I think as long as both sides show understanding, there is no problem.

Ayşe: Yes, as you said, we are busy. I am also a mother of two children. I come home from school. For example, today I had a private lesson. I came from there. Next week, it will be something similar again in the evening. But again... I think it is good that it is after eight o'clock. In terms of completing the assigned tasks, yes, it is important to set aside some time to brainstorm. We all want something good to come out of it. As teachers, we have our perfectionist sides. We want things to be good because we expect the same from ourselves as we do from our students. So, for me, honestly, this week was a bit challenging because my sleep schedule was disrupted after the holiday. I was thinking of doing it after putting my daughter A. to sleep, like Bianka, leaving it for the night. But unfortunately, I came home very tired this week. Also, we moved the April 23rd activities to this week at school. It was a very busy week. But I definitely want to continue and I sincerely want to support as much as I can.

Didem: When my caregiver gets back on schedule, I will be able to do things faster. This week I didn't have my caregiver.

Aslı, who did not participate in the second session without providing any reasons and had expressed hesitation about continuing with the PD before this session, reiterated the same concerns and decided to quit the PD after this session.

Aslı: So, last week I thought I could attend the session, but after a busy day, I couldn't manage it, honestly. I managed to arrange it for this week, but when I can't complete the tasks, I just feel guilty. I feel like I'm disrupting your work. Each day is different, honestly. Things come up, something happens. The problem with online meetings is that when they are in the evening instead of during the day, something spontaneous can come up in the evening or the day might not have gone well, and in such situations, I feel bad. I think

I'm disrupting you. But I am curious, of course, but I can't predict if I will disrupt the process again in the future. So, can I do it? or not?

To address concerns about SDL tasks, I emphasized the importance of regular attendance and giving their best effort in SDL tasks. I acknowledged the everyday challenges participants face, highlighting the need to persevere without being discouraged. I also reminded them that "perfect is the enemy of good."

The session proceeded with the discussion activity focusing on inclusive education. Two visuals were employed to initiate discussion among participants. The first visual (See Figure 8) featured four images depicting reality, equality, equity, and justice within learning environments.

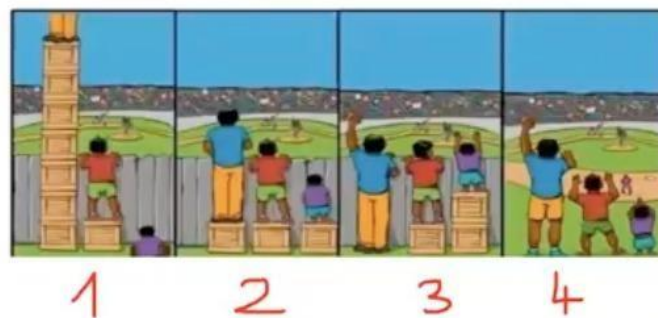


Figure 8. Visual 1 for discussion activity

I introduced the discussion activity:

F: Today, I want to start with an image that will help us focus on the session and discuss a bit. You can all have your microphones on. Is anyone familiar with this image? It's generally well-known. While researching this topic, I came across an updated version. Have you seen this one before?

The participants interpreted the visual in terms of individual differences, the types of support for these differences, and the consequences for the students. The participants' comments favored supporting individual differences with fairness rather than equally. They interpreted the barrier in the last image as an "obstacle" to learning.

Didem: There is an obstacle in between. So that obstacle has been overcome. Perhaps it's a kind of prejudice in front of them.

Bianka: In the end, by the removal of obstacles ...

Ayşe: But I think in the fourth image, all the obstacles have been removed. Now, they all see as they want. They have the chance to see it on their own now, whether it's the game or the scene there. The way they watch is entirely up to them. They can sit or jump if they want. Everything has been left to them, in my opinion. That's how I saw it.

Aslı: But of course, as we discussed about the last image, the obstacles we encounter in learning and at school... I'm questioning whether the last image represents treating all children equally. Is it about equality, or is it about justice?

Canan's comment on the last image, "The fourth image looks to me like a university without exams," was interesting in its interpretation of the barrier as exams. This perspective is reasonable if exams are viewed as a common, uniform expectation imposed on all learners. Moreover, Ayşe interpreted that obstacle as the curriculum treating each student equally. "I think the obstacles in the curriculum have been removed."

The first discussion with visuals concluded with my final comment, where I compared the last image to the "Universal Design for Learning" and provided information about it. The second visual for discussion (See Figure 9) displayed four images illustrating exclusion, segregation, integration, and inclusion within the education system.

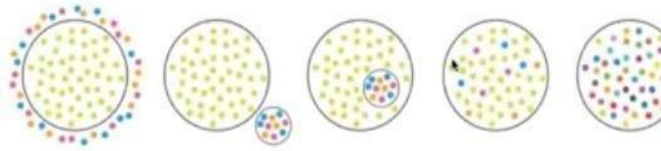


Figure 9. Visual 2 for discussion activity

F: If we think of these circles as the education system and classrooms, and the dots inside the circles as individual students, what does this visual make you think of? This time, if you prefer, let the speakers who haven't spoken yet go first.

The participants described the first image as the exclusion of students of different characteristics: "It's like those who understand are in, while those who don't are left out. There's the idea of including a group that is standard within that circle. And those who are different, in different colors, are left out." (Ayşe). The second image was interpreted as illustrating the exclusion and outside grouping of those different from the mainstream. "In the second one, it's like this: there is an upper group, a lower group, a good group, a bad group. A classroom environment that classifies students into front row and back row groups came to mind." (Aslı) "I thought the second image was a bit different. Now, the same type of homogeneous students are present, but the different ones are marginalized. Maybe something different is being applied, but it's outside the class in a separate bubble." (Didem) "In the classroom, we take the successful or unsuccessful child out, and we support

them. The others stay in the class and continue in the same way.” (Bianka). The third image was interpreted as depicting the students who don’t fit the norm now being in the classroom but still as a distinct group “In the third image, it seems that within the same classroom, the curriculum might be differentiated. Since it’s within the classroom, it implies that measures are being taken, but whether they are effective or not is uncertain.” (Didem) “In the third image, it seems that the children are grouped such that successful ones are on one side, and those of moderate success are within their own group. I thought of it as everyone being within their own group.” (Bianka) “Later, they enter the classroom and are accepted into the larger circle. However, they are told, ‘You can stay within your small circle. Remain here, but don’t interfere too much with us. Stay in your own group, as you are.’” (Ayşe). The fourth image was interpreted as the dispersion of the excluded group within the classroom environment, with individual needs being either met or not. “In the fourth image, it seems they have distributed the children who were in the same group throughout the classroom.” (Bianka). “After a while, they start to disperse gradually as a minority among them. They go beyond that circle.” (Ayşe). The last image was interpreted as inclusion of all students and the fruitful interaction within students. “In the last image, it seems that a whole is created with differences.” (Didem). “As a result of this distribution, in the end, all the children influence each other.” (Bianka). “In the end, everyone starts to blossom in their own color. ... So, truly being together, creating something together, finding one’s own color and path, but still enjoying and celebrating together, would be a beautiful thing. It would be colorful.” (Ayşe).

This discussion activity, involving two successive visuals, was designed to shift the participants' focus from their home environment, late on a school day, to the professional development content and to gather their thoughts on inclusion and the

consideration of students' individual needs. I believe that the interpretations provided reflect the participants' inclination toward inclusion and addressing students' personal needs.

Afterward, the website created as a repository for the PD resources was introduced (See Figure 10). Participants were encouraged to access the PD resources from this site, contribute by submitting content, and provide suggestions for organizational improvements. In this second cycle, participants utilized this PD component more actively compared to the first cycle; nevertheless, it still requires further development in future cycles.



Figure 10. The PD website

The session proceeded with a summary by Ayşe of the previous week's lecture given by the expert, Dr. Nalan Babür. I reminded the participants of the lecture's purpose, which was related to the development of literacy skills, specifically the creation of a reading evaluation checklist and proceeded with the third session's presentation. The first part of the presentation consisted of the types of evaluation: screening, diagnosis, progress monitoring, and summative assessment (Walpole & McKenna, 2017). In the second part Swerling's reading components, stages of

reading, and reading profiles were covered (Spear-Swerling, 2015). The participants shared and reflected on their personal experiences related to the topic and recommended related books. At the end of the presentation, the reading evaluation checklist developed by the participants was reviewed, feedback was provided by me, and possible additions and improvements were discussed.

At the conclusion of the session, participants were asked questions about differentiation to introduce the concept of differentiated instruction, and outline its core elements. These elements, including student characteristics such as readiness, interest, and learning profile, as well as lesson elements like content, process, and product, were then distributed among them to research and craft presentations for the week's SDL task.

Session 4: This session focused on the main topic of the PD: differentiated instruction. Participants shared presentations on the specific aspects of DI they were responsible for, which they had prepared during the previous week as part of their SDL tasks. I introduced the concept of DI by covering several key topics: the philosophy of differentiation, its general principles, creating a safe learning environment, proactive teaching, and the importance of ongoing assessment. Following this introduction, participants delivered their presentations on key elements of DI. Canan addressed readiness, one of the key aspects of student diversity to consider in DI. Ayşe presented on interest, the second area of diversity. Since she was also responsible for the learning profile but was unprepared, I stepped in to cover that topic. After discussing these student diversity factors, Bianka presented on the three instructional elements that can be differentiated: content, process, and product. The session also addressed additional concepts such as combined classrooms, flexibility, growth mindset, ethical compass, zone of proximal

development, scaffolding, teacher boundaries of accepting differences, competition versus collaboration, and the distinction between content and process differentiation.

At the end of the session, I provided feedback on the completed sections of the reading evaluation checklist, which had been collaboratively prepared by the participants over the past two weeks through asynchronous work.

The self-directed learning tasks for the week were:

- Finalizing the development of the reading evaluation checklist.
- Researching and presenting three selected DI strategies by each participant.
- Guided reading task: Reading the sample differentiated lesson plan and marking relevant sections with colors. Ex: Readiness: red, interest: green, Content differentiation: yellow.

After the session, reflective journal questions were sent to the participants.

Session 5: The session started with a discussion activity, initiated by a brief video illustrating a teacher's struggle to address small groups within the classroom. Following this, the reading evaluation checklist was completed with my support because the participants struggled to complete it on their own during the past two weeks; therefore, the task was accomplished during the session. Following this, the differentiation strategies were discussed through participants' presentations and videos. The collaborative task of preparing a DLP template was postponed to the next week, and the participants agreed to hold an additional ninth session to make up for the time allocated to completing the reading evaluation checklist this week.

The SDI tasks for the week:

- Assessing a student using the reading development evaluation checklist and determining their reading difficulty profile.

- Complete the guided reading task that was not finished the previous week.
- Watch the short videos on the prototype website.

Session 6 (Postponed and realized in later date due to two participants' absence on the original date): At the beginning of the session, I completed the presentation from the past session. It covered the reading instruction plan, emphasizing the need to include all components of reading in specific percentages and teaching them through flexible grouping. The session continued with a discussion activity based on a video demonstrating the use of small groups working in stations for reading instruction. Afterward, the main activity of the week took place: Preparing a DLP template. Through this collaborative activity, participants were expected to apply the DI knowledge they had acquired in previous sessions, enabling them to actively engage with and take ownership of the new content. This approach would deepen their understanding and help them integrate the new concepts into their instructional planning. After the session, reflective journal questions were sent to the participants.

The SDI task for the week:

- Completing the student reading evaluations using the reading evaluation checklist developed by the participants.

Session 7: The session started with the discussion probing question: “When you decide to implement this system regularly in your classroom, how do you think the students might react? What can you do to help students accept it and respond positively to the system?”. After gathering the participants' responses, I proceeded with a presentation on introducing DI into the classroom, aiming to help students understand and embrace DI and create a safe learning environment. After the

presentation the DPL template prepared in the previous session was reviewed and a few additions were done.

The session then continued with the main activity of the week: Preparation of the DLP for the fictional PBL problem classroom.

The SDL task for the week:

- Developing individual DLPs for the participants' own classrooms.

After the session, reflective journal questions were sent to the participants.

Session 8: Participants presented the individual DLPs they prepared for their own classrooms. Feedback was provided by both the participants and me.

The SDL task for the week:

- Preparing the revised DLPs based on the feedback received.

After the session, reflective journal questions were sent to the participants.

Session 9: Participants presented their revised DLPs and classroom implementations.

After the session, reflective journal questions were sent to the participants.

6.3 Findings

In this section, the findings will be reported for the two research questions regarding how the participants' knowledge of DI changed through the PD program, and the ways in which the embodiments of the PBL design principles supported this change as perceived by the participants themselves, with evidence from the participant artifacts and the sessions where relevant.

6.3.1 Findings regarding knowledge of DI

The changes in the participants' knowledge of DI are evidenced through the sessions, participant artifacts, and their responses to the pre-interviews and post-interviews. In the following section, the findings for the participants' initial knowledge of DI are reported as observed through their responses to the pre-interview questions. Next, evidence from the sessions 1-7 will be reported. Then the findings will be reported based on the participants' artifacts, pre-DLP, post-DLP and revised DLP. Finally, the findings based on the post-interview data will be given in comparison with the pre-interview findings.

6.3.1.1 Participants' initial knowledge of DI

The participants' knowledge of the elements of differentiated instruction was analyzed based on their definitions of DI and descriptions of their teaching practices as captured in the pre-interview data. The DI elements included in the analysis are student characteristics (readiness, interest, and learning profile), lesson components to be differentiated for these characteristics (content, process, and product), learning environment, assessment, and DI strategies.

The finding from the analysis of the data from the pre-interviews indicated that all four participants had a preliminary awareness of DI as an instructional approach to address individual student needs, prior to their participation in the PD. Ayşe emphasized that differentiated instruction involves addressing the diverse student needs within a classroom. Bianka highlighted how addressing a child's individual needs could lead to more effective learning, making the transition to the next stage smoother and better preparing the child for future challenges. Canan emphasized the importance of differentiated instruction, noting that "it's really

wonderful for students; they'll feel seen. Some students often feel invisible, but they'll start to see that school has meaning for them too. That's the biggest advantage for the student." By highlighting the importance of making students feel 'seen' and addressing their individual needs, she acknowledged one of the key purposes of DI: to ensure that all students, regardless of their abilities or backgrounds, feel included, understood, and engaged in their learning. Didem defined DI as: "An educational model tailored to the level of students, unlike traditional education."

It is not surprising that Ayşe, having participated in a prior PD on DI, demonstrated a more comprehensive understanding of differentiated instruction.

Ayşe: Differentiated instruction is about tailoring our program to meet the needs of students with varying levels, not just in terms of level but also in terms of different interests and learning needs within the classroom. (Readiness, interest)

It is possible to see in this excerpt Ayşe's knowledge of the necessity of using student readiness and interest in differentiating instruction. Among the four participants, Ayşe stood out as the sole individual whose expressions indicated an understanding and implementation of DI in her teaching approach.

Ayşe: To design our program while considering each child's learning stage and needs, or to divide them into groups we can present the same type of planning to them in different ways, and sometimes we can offer them choices to plan their own activities. (Content, process)

The mention of "designing our program while considering each child's learning stage and needs" aligns with content differentiation. This approach tailors the material or subject matter to the students' readiness levels, ensuring that each child engages with content that is appropriately challenging and accessible. The idea of "dividing them into groups" and "presenting the same type of planning to them in different ways" illustrates process differentiation. This involves varying the activities

or strategies used to help students make sense of the content, accommodating student diversity.

Ayşe: [Describing a tic tac toe activity which provides students choices of activities related to the book they read.] So, they choose from among these activities. A differentiation method using tic-tac-toe. Selecting three of them, we assigned a two-hour task, which also functioned as a performance evaluation. This allowed us to observe whether they genuinely grasped the book's content and what insights they derived from their reading. (Product differentiation for learning profile)

In this excerpt, Ayşe explains how she differentiated the product component of a lesson by allowing students to choose from the provided options to demonstrate their learning, which highlights her deliberate use of DI in teaching practices.

Regarding the elements of DI, Bianka showed some awareness of student readiness and learning styles as important factors to address in instruction. Her awareness of these elements can be primarily framed as a general approach to teaching, rather than as deliberate references to the DI framework.

Bianka: For instance, we progress from the simple to the complex. We're crafting material accessible to everyone, yet it appears that differentiated education operates on a different level, employing a distinct system. It might entail a system where all questions should conform to such standards. (Readiness)

Here Bianka seems aware of the importance of addressing students' diverse readiness levels when preparing teaching material, an indicator of a student-centered approach to teaching.

Bianka: DI might be a situation where multiple senses or learning styles are used, or where a child is gradually guided to accomplish something, they initially couldn't do, so that the child can reach the desired level without falling behind. (Learning profile)

Although limited and somewhat uncertain, Bianka recognized differentiated instruction as incorporating students' individual learning profiles. She also described her practice of considering student readiness when developing content.

Bianka: I identify both the areas where children may need support and provide questions tailored to each child's abilities, ensuring their self-confidence remains intact. (Content)

She demonstrated an awareness of the process element of DI as a crucial component of the DLP for helping students internalize content, though she did not explicitly refer to it as 'process' within the DI framework.

Bianka: They learn best through hands-on experiences. I always let the children try on their own, as I believe they naturally recognize whether they're capable of doing something at that moment."[a task regarding grouping objects to introduce multiplication]. (Process)

Canan's remarks, on the other hand, suggested an awareness of the three elements of student differences—readiness, interest, and learning profile—in ensuring that all students engage with the content effectively. However, she did not describe any specific DI practices she used to address these needs, nor did she reference the three core components of a differentiated lesson plan—content, process, or product.

Canan: For a child to grasp phonemic awareness, they absolutely need to perceive sound. Without this initial step, progress becomes quite difficult. Even after acquiring sound recognition, they need to master syllable blending or reading syllables to combine sounds. In other words, a child who can blend two sounds will somehow learn to read. The later stages are essentially a slightly intensified version of the initial stage, but once a child learns the first stage, they can acquire the others after putting in some effort. (Readiness)

Canan's comment underscores the critical role of readiness in reading acquisition, emphasizing that early mastery of basic skills is essential for subsequent stages of reading development. For instance, she points out that the later stages of learning to read, such as blending sounds into syllables and words, build on the initial readiness in sound recognition.

Canan: When we look at it from that perspective, differentiated education indeed becomes very important, I mean it becomes a necessary situation for children because they do not consist of a single skill area, they do not have a single area of interest. Especially with a classroom of 30 children, it forms an extensive pool in terms of both areas of interest and diversity. (Interest)

Canan acknowledges that differentiated education is crucial because children do not have a singular interest. This highlights the necessity of addressing the diverse interests of students to foster engagement and effective learning.

Canan: Especially from the perspective of multiple intelligence theory, I find this valuable. When we look at it from that standpoint, differentiated education truly emerges as crucial and necessary for children because they do not consist of a single skill area. (Learning profile)

Canan's reference to multiple intelligences aligns with the concept of the learning profile in differentiated instruction. By acknowledging that children do not consist of a single skill area, Canan emphasizes the need to tailor instruction to these diverse intelligences.

As for Didem, she appeared to have an awareness of incorporating readiness into instruction and reported some classroom practices aligned with the principles of DI, including the differentiation of content and process based on readiness.

Didem: During the early years of my career in a public school, while I was once again in Midyat, I had a crowded group of children with whom I worked on numbers. ... Some children expressed, "We already know this," and they showed no interest in participating. Conversely, others became highly engaged, even requesting to repeat the activity multiple times. It was then that I realized the importance of considering each student's level. While one worked on number 1, the other should have additional tasks beyond numbers 2-3. At the very least, to prevent boredom or idleness, those who were more enthusiastic should have the opportunity for more repetitions. This experience left a lasting impression on me. (Readiness and content)

Didem's recognition that students have varying levels of understanding and engagement highlights her belief that instruction should be tailored to each student's current readiness, ensuring that all students are appropriately challenged and engaged. Her suggestion that tasks be customized for students at different levels is an example of content differentiation.

Didem: Each child works at their own pace according to their own level. You can provide different types of work for different children using the same material. (Readiness and process)

Here, by allowing students to work at their own pace and offering different types of tasks with the same material, Didem tried to ensure that each student engages with the content in a way that is appropriately challenging, which aligns with process differentiation for readiness in the DI framework. Similar to Bianka and Canan, Didem did not explicitly reference these elements within the framework of DI. Moreover, she did not reference or provide examples related to interest, learning profile as student traits, or product as a lesson component.

Learning environment, another crucial element of differentiation, surfaced in three of the participants' comments. Ayşe and Bianka pointed out the importance of becoming a supportive and inclusive community, "a learning team," in Ayşe's own words. Canan focused on building individual relationships with students as a key strategy for fostering a positive learning environment to promote engagement and learning.

Canan: So, in my opinion, a teacher who has communication with the student is competent in providing literacy skills in every way, I think that's the greatest criterion. Because if the child doesn't want to, they won't learn. We can't force them to learn. So, it's essential to establish a good relationship with the child. I paid the most attention to this. Because there were students who were left behind. For example, there was a child they said couldn't learn. The parents themselves would say this. But we could clearly see that the child could learn afterwards, indicating there wasn't really a problem. This is a major issue.

Bianka's comments revealed that her predominant method of addressing students' individual needs were through individualized support in a big group, or outside the classroom.

Bianka: Afterward, when everyone is working, I go to the child who doesn't understand, offer them a little support, and then they naturally begin to grasp it and do it themselves. (Individual support)

Assessment, another fundamental element of differentiation, was highlighted by three of the participants. Ayşe stressed its role as a method to provide feedback, and empower students to take responsibility for their learning.

Ayşe: Assessment, in my opinion, is crucial in differentiated instruction. It's about providing feedback to the child. It's ensuring that the child knows where they stand in the learning process. Actually, differentiation is also about the child asking, "We're doing well as a class, but where am I in all this?" As Ali, how much further can I progress? What can I expect from myself? What are my goals, and what am I receiving from my teacher in this regard? The type of feedback I receive, evaluating the process, is also very important, I think, in differentiated instruction.

Bianka and Didem emphasized the role of assessment in tailoring the subsequent instruction to meet individual learning needs.

Bianka: Secondly, perhaps after children have learned all the letters, I believe it's important to take a somewhat individualized approach to identify any gaps. Because if there's a gap there, after that point, the child can't build additional knowledge on top of it. When faced with this deficiency, they may perceive themselves as more unsuccessful, which, in turn, diminishes their motivation for the subject.

Didem: At that point, it is crucial for teachers to thoroughly explore their students' strengths, weaknesses, and readiness levels. They should not solely be focused on literacy at once. Teachers should especially explore children first, when they proceed in a manner suitable for the students' level, primarily through individualized education, they will make faster progress.

As for differentiation strategies, Ayşe mentioned the use of flexible grouping, differentiating the number of tasks assigned to students, and providing choices to students through the tic tac toe method. Bianka mentioned flexible grouping, making use of associations, and concretization through manipulatives. Again, with no references to the DI framework, or deliberate use of DI terminology.

These pre-interview findings suggest that all four participants had an awareness of the aim of DI as tailoring instruction to meet the individual learning needs of students. As depicted in Table 30, while all participants acknowledged the overarching goal of DI, only Ayşe exhibited knowledge of the DI framework and its constituent elements. In contrast, the remaining three participants exhibited an

awareness of some of the elements of DI as part of their general approach to teaching, and demonstrated limited insight into specific implementation within the DI framework.

Table 30. Participants Pre-PD Understandings of DI Elements

	Readiness	Interest	Learning Profile	Content	Process	Product
Ayşe	X	X	X	X	X	X
Bianka	x	-	X	x	x	-
Canan	x	x	X	-	-	-
Didem	x	-	-	x	x	-

x: General awareness

X: DI specific knowledge

6.3.1.2 Changes in the participants' DI knowledge through the PD sessions

This section provides an analysis of the first seven PD sessions, which focused on learning about and developing knowledge of DI. These sessions were structured through self-directed learning tasks, within a problem-based learning process, and included an expert lecture, my presentations, as well as presentations by the participants. In the SDL tasks, the goal was to find a solution to the literacy learning challenges of a fictional classroom with a high diversity of student readiness levels.

The changes in the participants' DI knowledge will be reported below based on the core elements of DI serving as analytical themes, as defined in Tomlinson (2014) and Tomlinson (2017). The three student characteristics readiness, interest, and learning profile will be reported first. The report of the three lesson components content, process, and product will follow this. Lastly the learning environment, assessment and DI strategies will follow.

In this section, participants' quotes are labeled with their initials and a sequence number (e.g., C1 for Canan's first quote). These quotes will be included in Table 33, which presents the distribution of participants' references to the elements of differentiated instruction.

Readiness, interest, and learning profile:

Readiness is related to a student's existing level of knowledge, skills, and comprehension in a particular subject, which greatly affects how they interact with new material (Vygotsky, 1978). In differentiated instruction, teachers evaluate students' readiness levels to ensure that the tasks provided are appropriately challenging—striking a balance between being too easy and too difficult (Tomlinson, 2001; Tomlinson & Eidson, 2003).

In the first session, the PBL problem was introduced and analyzed by the participants. The problem definition developed by the participants was centered on student readiness, even though the term 'readiness' was not directly used: "How would you teach reading and writing to a diverse group of students at different learning levels?" This problem definition framed varying student readiness levels as a key issue to address in literacy instruction, laying the groundwork for the entire PBL based PD process.

After posing this question, I asked the participants whether this classroom of students with highly diverse academic readiness levels resembled their own teaching environments. Canan responded positively to this question:

Canan: I think this was true for all my classrooms. For example, one student would come in already knowing how to read and write, while another in first grade wouldn't even know how to count, or fail to figure out what comes after five. So, really, children with very different academic levels or skills come together in the same classroom, even though they're seemingly the same age group. (Session 1, C1)

Canan's comment highlights the variation in her own classes regarding student readiness, even within the same age group. She also elaborated on the challenges of this situation for reading instruction:

Canan: The more advanced students get really bored with the simple learning activities, like recognizing and writing letters. So, adjusting the pace becomes a bit difficult. It's partly an issue of pace, and too much repetition can bore the students, but if repetition isn't done, then the students who are behind don't get enough support and can't progress. These differences create various challenges in practice. (Session 1, C2)

Canan's comment reflects the challenge of balancing the pace of instruction to meet the needs of students at varying levels of readiness. This highlights her need to differentiate instruction to ensure that all students receive appropriate levels of challenge and support.

Didem also supported Canan's statement by highlighting the teacher's difficulty in addressing all students' readiness levels: "The teacher would struggle to teach in a group setting. They would need to teach individually, which requires significant effort, preparation, and time." (Session 1, D1)

Although the other participants did not explicitly express their opinions, they did not oppose these views, either. The discussion evolved from this starting point, indicating that student readiness is an important factor influencing literacy instruction and highlighting the need to tailor instruction accordingly.

Later in the PBL problem analysis, Bianka, Canan, and Didem highlighted the importance of assessing students' readiness levels through evaluations or parental input. As the PBL problem analysis progressed into the phase dedicated to determining learning issues, the participants identified the assessment of student readiness as their primary learning need which is essential for developing a differentiated lesson plan (DLP). In response to this, I proposed inviting an expert to deliver a lecture on reading development, which the participants accepted. The

purpose of this expert session was to provide participants with the necessary knowledge to develop their own reading evaluation checklist, equipping them to evaluate students' readiness levels more effectively.

The next session, just as planned, focused exclusively on readiness, aiming to equip participants with the necessary knowledge of reading development to create a checklist for assessing students' readiness levels. As a result, the session was entirely lecture-based, with no participant contributions or discussions regarding readiness.

Session three was also lecture-based, where I presented on types of evaluation, Swerling's reading components, stages of reading, and reading profiles (Spear-Swerling, 2015) to further address the participants' needs for assessing student literacy readiness levels. After the lecture, a transition occurred to differentiated instruction. I initiated this shift by asking participants about their existing knowledge of DI, marking the first introduction of DI elements. When asked directly about key student characteristics relevant to DI, Didem replied, "We can look at the child's visual or auditory conditions, or their readiness." (Session 3, D2) Bianka stated, "When observing a child, we need to consider their interests, needs, and readiness." (Session3, B2) Both participants highlighted readiness along with other factors. Despite their limited knowledge and formal understanding of DI theory, they intuitively recognized readiness as a crucial factor to consider.

In the same session, Ayşe, who was already knowledgeable about DI, discussed readiness within the context of DI theory:

Ayşe: I think it's essential to understand what differentiation is not. Differentiation is never about leveling students. It does not mean dividing the class into high, medium, or low levels. This is a common misunderstanding. We do not differentiate solely based on their academic skills. Yes, we can consider their learning speeds, or rather, their readiness. This is a better expression. (Session 3, A1)

Ayşe contributed valuable insights into the nature of differentiation, stating that it should not be oversimplified by merely leveling students, and emphasized the importance of recognizing students' individual readiness levels, among other factors. This statement from Ayşe further exemplifies her role as a knowledgeable participant in the group, as she actively contributes her understanding of DI and shares her experiences with the other participants.

The participants made presentations in the fourth session about the elements of differentiation, as part of their first SDL task. This session marked the beginning of their in-depth exploration of these elements. However, there were no specific references to readiness in this session aside from the participants' presentations.

In session five, the discussion shifted back to readiness as participants reflected on the DI strategies presented. They emphasized the importance of assessing students' readiness levels and discussed how certain strategies may be employed such as concept mapping, and self-evaluation, to promote student awareness of their readiness.

Canan commented on the power of concept maps to include students of diverse readiness levels: “In terms of differentiation, when children express their ideas, they all have a thought ... Every student is in a position to provide at least one example. I think it [concept map] can be used as a strategy that potentially includes all students in terms of participation in the process, but I'm not sure.” (Session 5, C3)

Concept maps, as she noted, offer a flexible strategy where each student can contribute based on their current understanding. This aligns well with the principle of readiness-based differentiation, where tasks are designed to meet students at their individual skill levels while encouraging progress. However, Canan's uncertainty about fully leveraging the potential of concept maps suggests a need for greater

confidence and clarity in applying such strategies. Her comment reflects an awareness of the inclusive nature of DI but also points to an area for growth in understanding how to ensure all students are meaningfully engaged in complex tasks.

Ayşe mentioned the use of concept maps for assessing readiness levels before beginning instruction: "It can actually be used as a pre-assessment before entering a teaching phase: Readiness." (Session 5, A2) Ayşe's comment highlights an important aspect of using concept maps within DI, particularly as a pre-assessment tool. By suggesting the use of concept maps as a pre-assessment strategy, Ayşe demonstrated an awareness of the importance of gauging students' initial knowledge and skills, which aligns with DI's focus on readiness.

Canan, when commenting on the strategy of self-evaluation, highlighted how it promotes readiness—though not mentioned directly—by encouraging students to reflect on their capabilities through increased self-awareness: "It's an important tool for students to understand themselves ... recognize their own abilities." (Session 5, C4)

Ayşe also emphasized self-evaluation's role in fostering students' self-awareness of their readiness and taking responsibility for their own learning by giving the example of an exit card:

Ayşe: The child actually becomes aware of where they stand. The topic may be finished, but there are areas where I really struggled... And by expressing this, the child takes responsibility for it. For instance, I struggle with addition within a hundred, but I do very well with addition within fifty. ... The child is taking responsibility for this. (Session 5, A3)

Bianka also agreed on the importance of self-evaluation in promoting student engagement and self-awareness of their readiness. She provided an example of her practice to illustrate how self-assessment can stimulate curiosity and encourage students to reflect on their knowledge and learning goals: "Before we start a topic,

let's say we are working on butterflies. We ask, 'What do I know about butterflies? What do I want to learn?' Then, after the topic is finished, we discuss what I learned. This not only stimulates their curiosity and encourages them to start researching but also allows them to evaluate what they do and do not know." (Session 5, B3) Bianka also highlighted the importance of students' awareness of their readiness levels and their responsibility for their own learning while discussing learning contracts and rubrics:

Bianka: Learning contracts are used to increase students' active participation in the educational process, help them develop independent study habits, and ensure they take responsibility for their own learning. (Session 5, B4)

These participant statements underscore the importance of not only assessing readiness but also empowering students to take ownership of their own learning. This realization may prompt participants to adopt self-evaluation strategies that not only assess students' readiness but also encourage students to reflect on their learning processes. Such student empowerment is crucial in developing a sense of agency, where students become active participants in their education rather than passive recipients of information. By engaging in self-evaluation and reflection, students are encouraged to identify specific challenges they face, and recognize their successes along the way.

Bianka also referred to readiness when presenting scaffolding. She introduced scaffolding as a strategy to support students in proportion to their readiness levels: "It refers to the support provided by those around the child who help them gain knowledge and experience. As the child's knowledge and skills increase, it is said that this support can be gradually reduced." (Session 5, B5)

Bianka's reference to readiness in the context of scaffolding emphasizes the importance of tailored support in the learning process. By defining scaffolding as

support that aligns with a child's readiness levels, she highlighted a critical aspect of differentiated instruction. The gradual reduction of support as students gain knowledge and skills is a key principle that not only fosters independence but also encourages confidence in their abilities. Bianka's insights contribute to a deeper understanding of how readiness and scaffolding work together to enhance student learning outcomes.

By the sixth session, participants acknowledged the benefits of differentiated instruction for addressing readiness levels. They acknowledged that differentiated instruction, which tailors teaching methods and activities to the varying needs and abilities of students, can significantly enhance learning outcomes. Bianka highlighted how DI allows for more efficient use of instructional time by accommodating varying readiness levels from the outset, rather than adhering to a one-size-fits-all, gradual approach. This ensures all students can engage at their appropriate level without unnecessary delays.

Bianka: I think if the system [DI lesson outline] is familiar [for the class], the entire lesson can be effective for all students. For instance, instead of explaining a concept in simpler terms first and then gradually making it more difficult [for all students], the learning process will start simultaneously for every child, and each can use every minute of the lesson learning at their own level. (Session 6, B6)

Her comment demonstrated a deep understanding of the critical role differentiation plays in addressing students' readiness levels, reflecting her awareness of how it fosters a more personalized learning environment where every student can progress at their own pace, thereby enhancing overall engagement and effectiveness.

The participants also emphasized several challenges associated with implementing and adapting these methods. Bianka expressed concern about effectively grouping students based on their level, particularly as a new teacher, highlighting the difficulty in managing these distinctions.

Bianka: But one of my other concerns is that I am a new teacher. Sure, there are easy and difficult questions, but grouping students appropriately and adjusting for the subtle differences can be a challenge. I think this is a distinct issue to manage. (Session 6, B7)

Canan was concerned about classroom management in conducting a readiness based small group activity:

Canan: I can't imagine doing this currently in the classroom. It seems very difficult to me. I'm not sure if the size of the class plays a role in this, or if I'm just making it seem more daunting than it is. To me, the biggest challenge could be the large number of students. ... Even though I really like the idea, these difficulties make me a bit apprehensive. These are my thoughts. (Session 6, C5)

In response to Canan's concerns about classroom management, Ayşe and Didem noted that these challenges are often experienced during the initial stages of implementing small group instruction. However, they added that over time, these management difficulties tend to diminish as students become more familiar with and accustomed to the strategy. Ayşe emphasized the importance of the teacher's role in facilitation before beginning the activity by providing clear instructions.

Ayşe: Now, of course, while doing these kinds of activities, as Canan mentioned, introducing the activity to the children first is very important. When they understand what they will be doing in the large group... You know, like, 'This is what I expect from you. In a little while, you will break into groups, and here are your tasks. I will come around to you. From time to time, I will give you feedback. I will remind you of where you are, where you're headed, what point you're at, your gaps, or areas where you might need support. And when you're doing well, I will also constantly provide feedback.' Reminding them that they are not alone and that we are there to coach them is actually important here. (Session 6, A4)

Ayşe pointed out here the significance of setting clear expectations and providing ongoing support during group activities. By explaining the structure of the activity and the role of the teacher in guiding and offering feedback, she ensures that students feel supported throughout the process.

During the sixth session, as the participants were jointly developing a DLP template, student readiness was again the first to be mentioned when asked which

student characteristics to consider in differentiating instruction. It was then integrated into the three components of the template: content, process, and product.

The seventh session was dedicated to developing a DLP for the fictional PBL classroom. During this session, the participants used the template they had created in the previous session to differentiate the content and process based on readiness. This was the phase where participants combined the literacy development and DI knowledge acquired during the PD and applied it in developing a DLP, specifically for the PBL problem solution. Below are participant expressions regarding their use of readiness in differentiating learning outcomes and instructional activities for the fictional classroom students.

Didem: In this class, there are children of different grades. For example, the child in preschool, who needs support, can only separate the book material from the other materials and assume a reading pose. There's no tracking of lines or anything. So, I will take a different learning objective based on this and differentiate. (Session 7, D3)

Didem's comment highlights the importance of tailoring learning objectives to meet the diverse needs of students, especially in this mixed-grade classroom. As a preschool teacher, she emphasizes that preschool children may require more fundamental support. Canan also pointed out the importance of considering the developmental stage of young learners, specifically kindergarten and first-grade students.

Canan: But if we consider the achievement of becoming a fluent reader in this situation, since children at the kindergarten level won't be able to do this, or even a first-grade student at that level won't be able to reach this learning objective, will we need to start with the basic sounds? I mean, will we need to offer a different learning objective for them? Because becoming a fluent reader would be meaningless for them at this stage. (Session 7, C6)

Ayşe contributed by suggesting a differentiation activity based on readiness. This allowed for students with diverse readiness levels to focus on predicting the story based on visuals and creating related materials, such as drawings.

Ayşe: We could choose a book and have the whole class study it together. Fluent readers could go to a station for reading comprehension. This could include both first-grade and second-grade students.... We might ask the preschool student to make a prediction by examining the visuals, perhaps even asking them to design materials. For example, we could say, 'Make a picture based on what you understood from this story.' (Session 7, A5)

Bianka further suggested that for another readiness group, matching short sentences with visuals could be effective to support students struggling with reading fluency. By providing these students with shorter, more manageable sentences alongside corresponding images, the teacher can help students focus on meaning without the added challenge of long passages.

Bianka: Matching what they read with visuals. For example, they might be reading, but because they read slowly, they don't understand. Maybe giving them short sentences and having them match those with the pictures could help. (Session 7, B8)

This progression illustrates the participants' growing recognition of readiness as a foundational element in differentiating instruction. Throughout the PD sessions, their understanding of the assessment of readiness and their response to varying levels of student readiness evolved gradually. As discussions unfolded, participants not only acknowledged the importance of readiness in shaping instructional strategies but also began to articulate specific ways to integrate this concept into their teaching practices. By the seventh session, readiness was actively incorporated into the DLP of the fictional classroom. This shift reflects their deepening awareness of the complexities involved in addressing diverse learning needs and their commitment to fostering a more inclusive learning environment. Ultimately, the emphasis on readiness highlights the necessity of tailored instruction in promoting student engagement and success, suggesting that the participants are now better equipped to create learning experiences that meet the unique needs of each student. The concept of readiness evolved over the course of the PD sessions, starting with a basic concept

and gradually developing into a deeper understanding of its significance in addressing the diverse needs of students. As participants' knowledge grew, they began to see readiness not only as a foundational element but also as a dynamic factor influencing their instructional choices. Ultimately, this expanded understanding was applied in the development of a differentiated learning plan for the fictional classroom, allowing participants to tailor their teaching strategies to meet the varying readiness levels of their students.

Interest is another component that also varies based on the individual student, influencing academic progress greatly. Identifying and creating tasks that engage the motivation of specific students is central to interest-based differentiation (Tomlinson et al., 2003).

In the initial session of PBL problem analysis, where the fictional classroom emphasized students of varying readiness levels, the participants' focus was on readiness, and neither interest nor learning profile—two essential elements of differentiation—were mentioned by any participant. The second session, as discussed earlier, concentrated solely on readiness, with the goal to provide participants with essential knowledge about reading development, enabling them to create a checklist for assessing students' readiness levels.

In the third session, following my presentation about reading development and evaluation, Bianka mentioned interest besides readiness when directly asked about key student characteristics pertinent to DI.

Bianka: When observing a child, we need to consider their interests, needs, and readiness. Differentiation should be based on their interests, i.e., we need to understand which areas they are more inclined toward. If there is a cognitive difficulty, we recognize that. However, differentiation should align with their interests because success is unlikely if the content does not engage them. (Session 3, B9)

By emphasizing the need to consider students' interests alongside their readiness, she underscores the multifaceted nature of differentiation. This approach recognizes that engaging students in learning is not solely about meeting their cognitive needs but also about tapping into their passions and inclinations. Ayşe also mentioned the importance of interest within the context of DI theory: “When teaching a topic, we can offer different content by differentiating it according to their interests.” (Session 3, A6)

In the fourth session, Ayşe continued to share her experiences and contribute to the group's understanding, although she also exhibited an alternative conception of interest. Despite being highly knowledgeable, Ayşe shared a lesson as an example of differentiation for interest that included engaging activities to convey content to students. However, the lesson did not actually include differentiation to address the varying interests of students:

Ayşe: In the second grade, there's a learning objective about celebrating national holidays. So, I started the lesson with this story: Finnair had a flight to New Delhi on the day of India's Independence Day, which is also their Republic Day. This was in January. The plane was prepared, all the passengers were seated. You can find this on YouTube, by the way. Suddenly, all the flight attendants—tall, blonde, beautiful Finnish attendants—lined up in the aisles wearing Indian outfits. And then, they started dancing to Bollywood-style music that played, and they were all prepared for this. Later, the captain came on and said, "Happy National Day." For example, I asked the students, "If you were a British Airways flight attendant flying from London to Istanbul on the 29th of October, how would you present something like these attendants did?" We differentiated the content like this. We even asked the students to create videos as part of the activity. (Session 4, A7)

This alternative conception of viewing engaging, motivating, or student-centered lesson plans as DI was also evident in the lesson plans submitted by Ayşe and Bianka at the beginning of the PD, which they believed incorporated differentiation practices. In the same session, while discussing interest, Ayşe exhibited another alternative conception of interest while providing examples of

differentiation for interest. The following excerpt illustrates one of the appropriate examples given by Ayşe.

Ayşe: Presenting current examples related to students' interests. For instance, if a child plays the piano and we're going to give them a text, it could be about Fazıl Say's life or perhaps a news article about a pianist. Or if the child plays the violin, the text could be about a violin virtuoso's concert, simplified to an elementary school level or adapted to different levels.” (Session 4, A8)

However, she also offered examples that revealed an alternative conception of interest: “You can also form groups such as math experts, poetry experts, or story experts.” (Session 4, A9) In this second example, student learning profiles are considered rather than their interests. In the DI framework, students' interests are the areas that engage or motivate them, such as hobbies and topics they are passionate about. However, a learning profile focuses on how students process information or prefer to study. Ayşe's example of grouping students by their expertise—math, poetry, or story experts—reflects instruction tailored to how students learn and process information, which falls under the learning profile category.

During the discussion in the fifth session, only Didem and Ayşe mentioned interest, each referencing it once while discussing concept maps as strategies for differentiated instruction. Didem stated, “If we conduct individual work, the child can prepare a topic based on their interests. If we do small group work, it can also be used to collaborate in creating a concept map based on their interests.” (Session 5, D4)

Didem's comment on the use of concept maps in DI highlights her awareness of the importance of considering individual student interests in DI. By actively identifying and considering students' interests, educators can tailor instruction to meet the diverse needs of their learners, making learning more relevant and engaging. This awareness allows teachers to create a learning environment where

students feel valued and understood, ultimately enhancing their motivation and success.

In the sixth session, while developing the DLP template, participants were asked to identify student characteristics that should be considered in differentiated instruction. During this discussion, interest was highlighted as a key characteristic influencing differentiated instruction. Consequently, it was incorporated into the three components of the template—content, process, and product—as an element of differentiation.

In the seventh session, where the DLP for the fictional classroom was developed, interest was not incorporated into the differentiation of any of the three lesson components: content, process, or product. Only, when I asked how they could incorporate differentiation for interest did the participants provided suggestions.

Bianka: Should we provide something based on the topic that interests them?

Facilitator: It's possible. We could add this differentiation that as well.

(Session7, B10)

Ayşe: We don't necessarily have to give the same text to everyone. (Session 7, A10)

These suggestions revealed Ayşe and Bianka's understanding of interest as a form of differentiation, and the probable reason for not using it could be the prioritization of readiness and my emphasis on not being obliged to incorporate all types of differentiation in this lesson plan.

Throughout the PD sessions, the participants demonstrated a clear trajectory of growth in their understanding and incorporation of interest within DI. Initially, interest was overlooked, with participants focusing solely on readiness in the early sessions. For the first time, in the third session, Bianka highlighted the significance of interest alongside readiness, signaling the beginning of a more nuanced perspective. By the fourth session, Ayşe acknowledged the importance of interest but

also demonstrated alternative conceptions about its application. In the fifth session, Didem and Ayşe referenced interest while discussing DI strategies, reflecting a growing awareness of its relevance. By the sixth session, interest was recognized as a key characteristic influencing differentiation, leading to its incorporation into the DLP template's components—content, process, and product, however was not incorporated into the DLP developed for the PBL problem fictional classroom. This evolution illustrates participants' movement from overlooking interest to recognizing its essential role in effective instruction, though misconceptions and areas for further development remained. The learning path for interest mirrors that of readiness, progressing from concept level to understanding and practical application.

Learning Profile, the third student characteristic, is equally crucial for addressing students' needs. This term describes a student's preferred learning mode, which can be influenced by various factors, such as learning style, intelligence type, gender, and cultural background (Tomlinson et al., 2003).

In the first session of PBL problem analysis, featuring a fictional classroom with students at different readiness levels, learning profile was not addressed by any of the participants. Likewise, there was no mention of learning profile in the second session, as it focused on the phases of reading acquisition.

During the third session, after my presentation on reading development and its assessment, the focus shifted toward differentiated instruction. As mentioned earlier, I initiated this transition by inquiring about the participants' prior knowledge of DI, marking the first introduction of its components. When asked directly about important student characteristics relevant to DI, Bianka indirectly referred to the learning profile, even if with no explicit terminology:

Bianka: We can look at the child's visual or auditory conditions, or their level of readiness. For instance, some children prefer to progress through learning

by playing games. They are able to grasp concepts more easily that way. Maybe something like that could be the case. (Session 3, B11)

She added: “We can design materials based on the child's auditory or visual learning preferences, for example.” (Session 3, B12) when asked how a lesson plan can be differentiated considering the individual student differences.

Although Bianka did not explicitly use technical terminology, she recognized the importance of individual learning preferences, such as auditory and visual modalities. Her mention of designing materials based on these preferences suggests an understanding of tailoring instruction to meet diverse needs, even though her lack of confidence implies she may not yet fully grasp the broader scope of DI or how to articulate it.

Although Ayşe also did not explicitly mention the term 'learning profile,' she vaguely referred to it using the phrase “the skills they want to produce.” (A11) She was referring to differentiating the product based on student preferences in how they create outputs to express their understanding. She framed this as a key parameter that should always be considered when differentiating a lesson plan. She also gave examples of individual student learning profile preferences: “... maybe the child wants to do math through music, or perhaps through dancing. They might want to do it by drawing or learn in a different way altogether.” (Session 3, A12)

Ayşe's comments indicated her understanding of the concept of learning profile in differentiated instruction as an already knowledgeable participant, even though she did not use that specific terminology when discussing her ideas. Her reference to differentiating the product based on student preferences in creating outputs demonstrated an awareness of tailoring assessments to meet diverse learner needs. Furthermore, her examples—suggesting that a child might prefer to engage with math through music, dance, or drawing—illustrated her recognition of varied

learning modalities. By framing these elements as key parameters for lesson planning, Ayşe was advocating a personalized approach to instruction, which is essential for fostering engagement and promoting deeper learning among students.

During session 4, the participants presented the essential elements of differentiation. While presenting the learning profile as a factor of student diversity in DI, I asked whether students should work in their preferred learning mode or if the teacher should occasionally vary the methods to enrich their learning profiles. In response, Ayşe and Bianka shared their opinion that teachers should vary the approaches through which students learn or demonstrate their knowledge, to enrich overall learning experience for a better preparation for future grades.

Ayşe: For example, let's say we have a kinesthetic learner. Should we always keep them moving, or should we also consider that they can learn when they're stationary? This means they can learn while seated, lying down (not in the traditional sitting posture but perhaps reclined), or in other relaxed positions. It's about recognizing that learning doesn't always have to be through constant movement. ... Why do we always have to make every active child run quickly? I believe children also need to be able to learn when they are stationary. (Session 4, A13)

Here Ayşe questioned the common assumption that “kinesthetic” learners always need to be in motion to learn effectively. She argued that these students can also benefit from stationary learning environments, such as sitting, lying down, or reclining, rather than constantly moving.

Bianka: I think so, too. What concerns me most is that while elementary school teachers can provide individual support and address every gap with constant assistance, students may not receive the same level of support in middle school. If a child hasn't learned how to learn in elementary school, I'm concerned that, due to the lack of individual support in middle school, there is a risk of losing the child. Therefore, I believe they need to experience all learning styles. I think it is important to provide them with other methods besides their preferred one. (Session 4, B13)

Bianka's comment reflects a perspective that differs from the typical focus of differentiated instruction on providing choices. Instead, the emphasis here is on the

importance of exposing students to a variety of learning styles, regardless of their preferences. Bianka strongly argues that relying solely on the students' preferred learning styles might not adequately prepare them for future educational environments where they will need to adapt to different teaching methods and less individualized attention.

The comments from Ayşe and Bianka raised important considerations regarding differentiation, particularly in relation to varying learning modes for students with different learning profiles. While they emphasized the value of offering diverse learning experiences to enrich students' overall skills, this approach may risk not fully embracing differentiated instruction, especially in terms of honoring student choice and learning preferences.

In DI it is essential to provide choices that align with students' learning preferences while students can also be offered opportunities for growth in other modes. Striking a balance between choice and variety can ensure that students remain engaged and feel supported, while also helping them develop the flexibility needed for more complex learning environments in the future.

During the discussion on DI strategies in the fifth session, the learning profile was mentioned only once by Bianka in defining learning contracts in her presentation: "The learning contract is an agreement made between the teacher and the student based on the students' readiness, interests, and learning profiles." (Session 5, B14) However, it was not addressed in the discussions.

In the sixth session, while working on the DLP template, the participants were prompted to identify student characteristics relevant to differentiated instruction. During this discussion, the learning profile was also emphasized as a crucial factor impacting differentiated instruction. As a result, it was included in the

three components of the template—content, process, and product—as a differentiation option. However, it was the last characteristic mentioned and the most difficult for the participants to remember, when I asked the student differences considered in DI:

“Facilitator: What will we use as the basis for differentiation?
Canan: Was it readiness, interest, and... learning profile? I can’t remember.”
(Session 6, C7)

Learning profile was also the last to be remembered and with hesitation, while incorporating the three student difference areas in the DLP template:

Bianka: I’ll write interest here.
Facilitator: Uh-huh.
Bianka: Readiness. First readiness.
Facilitator: That works.
Bianka: Interest. What did we say?
Canan: Learning profile. (Session 6, C8)

In the seventh session, while developing a DLP for the PBL problem’s fictional classroom, the participants differentiated the product for learning profile.

Bianka: For the first group, the teacher might ask the students to act out the sentence she reads. (Session 7, B15)
Ayşe: For example, in Group 3, a child who can read might read a book aloud to Group 1. Or in Group 2, children could be given a maraca to create music—like a soundtrack for the book. (Session 7, A14)
Canan: Give an unfinished piece of text. The students who wish to do so, can continue the story by writing to complete it. Others may choose to illustrate it, or act it out through drama (Session 7, C9)
Didem: As we mentioned, some might use only paper products, while others may create their products using soft fabrics. Some might create a one-dimensional product, which could involve coloring or drawing. (Session 7, D5)

In Table 31 sample comments are provided from the participants, exemplifying their knowledge of student characteristics, including readiness, interest, and learning profile. The emphasis on readiness in the initial discussions during the early sessions reflected a common starting point in understanding student diversity. However, the gradual introduction of learning profiles with interest signifies an

essential shift toward a more holistic understanding of differentiated instruction. The fact that the learning profile was the last to come to mind suggested a need for a more prominent focus on this aspect of differentiation throughout the sessions. Learning profile was incorporated into the DLP template in the sixth session and into the DLP for the fictional classroom in the seventh session. The learning path for learning profile seemed to progress similar to readiness and interest, starting from the concept level, advancing to comprehension and application.



Table 31. Evidence from the Participants' Comments from Sessions for Student Characteristics

DI elements	Participant quotes
Readiness	We can consider their learning speeds, or rather, their readiness. (Session 1/Ayşe) Children with very different academic levels or skills come together in the same classroom, even though they're seemingly the same age group. (Session1/Canan) When observing a child, we need to consider their interests, needs, and readiness. (Session 3/Bianka) We can look at the child's visual or auditory conditions, or their readiness. (Session3/Didem) Instead of explaining a concept in simpler terms first and then gradually making it more difficult [for all students], the learning process will start simultaneously for every child, and each can use every minute of the lesson learning at their own level. (Session 6/Bianka) Fluent readers could go to a station for reading comprehension. This could include both first-grade and second-grade students.... We might ask the preschool student to make a prediction by examining the visuals, perhaps even asking them to design materials. (Session 7/Ayşe) For example, they might be reading, but because they read slowly, they don't understand. Maybe giving them short sentences and having them match those with the pictures could help. (Session 7/Bianka) ... student at that level won't be able to reach this learning objective, will we need to start with the basic sounds? I mean, will we need to offer a different learning objective for them? (Session 7/Canan) In this class, there are children of different grades. For example, the child in preschool, who needs support, can only separate the book material from the other materials and assume a reading pose. There's no tracking of lines or anything. So, I will take a different learning objective based on this and differentiate. (Session 7/Didem)
Interest	When teaching a topic, we can offer different content by differentiating it according to their interests. (Session 3/Ayşe) Differentiation should be based on their interests, i.e., we need to understand which areas they are more inclined toward. (Session 3/Bianka) For instance, if a child plays the piano and we're going to give them a text, it could be about Fazıl Say's life or perhaps a news article about a pianist. (Session 4/Ayşe) If we do small group work, it can also be used to collaborate in creating a concept map based on their interests. (Session 5/Didem)
Learning Profile	Maybe the child wants to do math through music, or perhaps through dancing. They might want to do it by drawing or learn in a different way altogether. (Session 3/Ayşe) We can look at the child's visual or auditory conditions, or their level of readiness. For instance, some children prefer to progress through learning by playing games. They are able to grasp concepts more easily that way. (Session3 /Bianka) For example, in Group 3, a child who can read might read a book aloud to Group 1. Or in Group 2, children could be given a maraca to create music—like a soundtrack for the book. (Session 7/Ayşe) For the first group, the teacher might ask the students to act out the sentence she reads. (Session 7/Bianka) Give an unfinished piece of text. The students who wish to do so, can continue the story by writing to complete it. Others may choose to illustrate it, or act it out through drama. (Session 7/Canan) As we mentioned, some might use only paper products, while others may create their products using soft fabrics. Some might create a one-dimensional product, which could involve coloring or drawing. (Session 7/Didem)

Content, Process and Product:

The three lesson components, content, process, and product, which are the areas where differentiation is applied for students' readiness, interest, and learning profiles were much less discussed during the first five sessions compared to the student attributes themselves—readiness, interest, and learning profile. This is likely because the three-part structure of lessons in the DI framework, such as content, process, and product, was new to the participants, whereas the student attributes, readiness, interest, and learning profile, were concepts they were already familiar with, outside the context of differentiated instruction.

In the first and second sessions, these three components were not mentioned, as the professional development content had not yet focused on differentiated instruction. Instead, these early sessions covered PBL problem analysis, reading development and assessment. At the end of the third session, the three DI concepts were introduced for the first time through my introductory question, which aimed to engage the participants by prompting them to list the basic elements of differentiated instruction. During the discussions, none of the participants directly mentioned content, process, or product, except for Ayşe. Already familiar with these concepts, Ayşe referred explicitly to content, process, and product differentiation, and identified all three components of a lesson

Ayşe: First, we can differentiate the product. We can differentiate performance tasks the students prefer to create or assessment activities. It's important that students are not required to produce the same outcome and that the criteria for differentiation are clearly defined. Additionally, we can differentiate the process. When doing so, it's important to clearly and explicitly outline how we plan the process and for what are we differentiating. We can also differentiate the content. While teaching a new topic, we can provide different content tailored to the students' interests if we are differentiating based on interest. (Session 3, A15)

Ayşe's explanation not only showed her prior DI knowledge, but also demonstrated her practical understanding of how to implement these strategies in a way that benefited all students.

Didem and Bianka, on the other hand, indirectly referred to these three components of a lesson when discussing differentiation to meet students' needs through varied instructional strategies and materials. Didem highlighted the importance of differentiating instructional methods to address various student interests, stating, "We can differentiate teaching methods, including strategies and techniques. Instead of using a single approach for all students, we can implement different strategies tailored to each child's interests." (Session 3, D6) Bianka, on the other hand, emphasized the need to differentiate materials for visual or auditory learners, saying, "For example, we can design materials based on whether a child learns best through auditory or visual methods." (Session 3, B16). Although Bianka did not mention it directly, these differentiated materials can be utilized across all three lesson components. These comments demonstrate an awareness of the importance of differentiating the lesson components, even though Didem and Bianka did not explicitly name it.

In the fourth session, the participants presented the DI elements they had been assigned to research in the previous session as part of their SDL tasks. While presenting interest, Ayşe referred to content, process, and product, providing examples of differentiation for interest for each.

Ayşe: How can we use interest in content? For example, let's say there are children in the class who are always playing soccer. If we're going to have them solve math problems, we could give them a math problem based on a story that involves soccer, something like a match recap. They could create a scoreboard, figure out how many matches were won, how many goals were scored, and solve those problems. (Session 4, A16)

Here Ayşe suggested an effective application of differentiated instruction by tailoring content to students' interests. By incorporating soccer into a math problem, a subject the students are passionate about, Ayşe wanted to connect the lesson to something familiar and engaging for the students, which hopefully would affect student motivation positively.

Ayşe: [For process] The students are working to piece together the parts they have gathered in order to focus on the bigger picture and achieve their larger goal. They are doing this by incorporating their interests into the process. It is important to have various centers or stations in the classroom. Ideally, the activities should allow each student to track their own progress. (Session 4, A17)

Ayşe's comments touched on key principles of process in differentiated instruction, which emphasized how students engage with the content and develop skills. By incorporating various centers or stations in the classroom, Ayşe intended to provide opportunities for students to engage with the material in multiple ways allowing students to explore the content at their own pace and according to their own interests.

Ayşe: [For product] The child is preparing and producing a product according to their own readiness and interest area, creating something that allows them to express themselves. (Session 4, A18)

Ayşe's perspective on product in differentiated instruction highlighted a crucial aspect of student engagement: giving students the freedom to create and express themselves in ways that align with their readiness and interests. By doing so, they are more likely to invest in the task and feel a sense of ownership over their learning.

The above examples provided by Ayşe for each of the three elements of DI illustrate a comprehensive understanding of how to implement DI strategies in content, process, and product to cater to diverse learner needs.

In the same session, Bianka discussed content, process, and product in general terms in her presentation, without providing examples of implementation. Consequently, I needed to clarify these components further and provide additional support for her presentation because these were new concepts for her and the other two participants.

During the sixth session, the lesson components were discussed in detail while the participants were developing a DLP template. When I asked the participants what DI specific sections would be necessary if they were to create a differentiated lesson plan template, Didem mentioned process and product: “We need to include what we will differentiate, the process or the product. I believe these must definitely be included in the plan.” (Session 6, D7) Later, in response to my request to name the third lesson component, she also mentioned “content”. These components were for the first time articulated by a participant other than Ayşe and outside of Bianka’s presentation. Didem’s ability to articulate these components during a discussion without direct prompting indicated a growing understanding on her part of how to effectively structure lessons to accommodate diverse learners.

These three components of a differentiated lesson were subsequently integrated into the DLP template (See Appendix L), with a section under each component—content, process, or product—designed to specify the type of differentiation applied, such as for readiness, interest, or learning profile, by checking the appropriate box.

During the discussions on developing the DLP template, an alternative conception of “process” emerged with Canan, who suggested that readiness, interest, and learning profile should only be incorporated into the process component of the lesson plan. Her omission of content or product differentiation may suggest an

alternative conception of process as the process of the lesson as a whole, rather than recognizing it as the specific segment of a lesson where students engage with the material for deeper understanding. Canan's later statements regarding methods, techniques, and strategies belonging solely to the process further supported her alternative conception: "I think methods, techniques, and strategies are things that fall within the process." (Session 6, C10) Her understanding evolved in the process of DLP template development and in the later sessions of DLP development.

In the seventh session, where they used the DLP template and collaboratively prepared a DLP for the fictional classroom, the participants' following exchange is noteworthy.

Ayşe: In this situation we will primarily make a group for preschool now. We might differentiate the content for that group. Bianka and I will also split our six children into two groups.

Canan: Then, would it be appropriate to write an objective like 'Group 1 will perform visual reading'?

Ayşe: Yes, yes, I think so too. That's exactly it, actually.

Bianka: Should I write it here?

Canan: Yes. These are Didem's students in Group 1. Now, Group 2

Bianka: It could be something like, 'Combine what they've listened to or read with an appropriate visual.

Facilitator: These children can read themselves. Think about it accordingly.

Bianka: Then, we're moving forward with reading now. Matching what they've read with a visual. (Session 7, content differentiation for readiness) (A19, B17, C11)

This discussion demonstrates an understanding of content differentiation, particularly how to tailor lessons to meet the varying readiness levels of the students. The participants' consideration of students' individual needs and abilities ensures that the content is appropriately challenging, fostering an environment where all students can engage meaningfully with the material.

Ayşe: I think the teacher could work with the first group by asking, "Which of these visuals relates to the text I've read?" Afterward, the teacher could ask a student from the second group, "Which words do you remember from the paragraph I just read?" Or instead of visuals, the teacher could give them words. For example, the teacher could ask, "Which of these words appeared

in the text I just read? Rabbit, fox, or squirrel." The second group would find the rabbit. And what could we ask from the third group? We could ask them to explain it. (Session 7, process differentiation for readiness) (A20)

The above extract demonstrates Ayşe's understanding of process differentiation, as she suggested varying the methods and activities based on the readiness levels of different student groups. Her approach reflects the core principles of differentiated instruction, where the process of learning—how students engage with the content—is adapted to meet students at their current level of readiness. This tiered approach to process differentiation allows students to work at their own level of readiness while still engaging with the same core content, promoting an inclusive and supportive learning environment.

Bianka: Maybe students who want to can draw the visuals themselves.

Didem: We can use materials. We mentioned recycled materials, right? Some might use only paper products. Others might create their product using something with a soft texture. Some might make it one-dimensional. It could involve painting or drawing.

Bianka: For the first group, maybe the teacher could ask the students in that group to act out the sentence she reads. (Session 7, product differentiation for learning profile) (B18, D8)

In this exchange, the participants demonstrate an understanding of product differentiation by considering various ways for students to express their learning based on individual preferences and learning profiles. This includes offering flexibility in how students demonstrate their understanding, such as through drawing, using various materials, or acting out sentences.

Table 32 includes sample extracts from the sessions, providing evidence for the participants' knowledge of lesson components that can be differentiated based on student characteristics. The learning process for the three DI lesson components mirrored the progression observed with student characteristics. Initially, the participants were introduced to these components as new DI concepts through their self-directed learning research and presentations. This understanding deepened

during collaborative discussions and the development of the differentiated lesson plan template.

Table 32. Evidence from the Participants' Comments from Sessions for DI Lesson Components

DI elements: Lesson components	Participant quotes
Content	How can we use interest in content? For example, let's say there are children in the class who are always playing soccer. If we're going to have them solve math problems, we could give them a math problem based on a story that involves soccer. (Session 4/Ayşe) We can differentiate teaching methods, including strategies and techniques. Instead of using a single approach for all students, we can implement different strategies tailored to each child's interests. (Session 3 Didem) For example, we can design materials based on whether a child learns best through auditory or visual methods. (Session 3, Bianka) Ayşe: In this situation we will primarily make a group for preschool now. We might differentiate the content for that group. Bianka and I will also split our six children into two groups. Canan: Then, would it be appropriate to write an objective like 'Group 1 will perform visual reading'? Ayşe: Yes, yes, I think so too. That's exactly it, actually. Bianka: Should I write it here? Canan: Yes. These are Didem's students in Group 1. Now, Group 2 (Session 7)
Process	They are doing this by incorporating their interests into the process. It is important to have various centers or stations in the classroom. Ideally, the activities should allow each student to track their own progress. (Session 4/Ayşe)
Product	The child is preparing and producing a product according to their own readiness and interest area, creating something that allows them to express themselves. (Session 4/Ayşe) Give an unfinished piece of text. The students who wish to do so, can continue the story by writing to complete it. Others may choose to illustrate it, or act it out through drama. (Session 7/Canan) Bianka: Maybe students who want to can draw the visuals themselves. Didem: We can use materials. We mentioned recycled materials, right? Some might use only paper products. Others might create their product using something with a soft texture. Some might make it one-dimensional. It could involve painting or drawing. Bianka: For the first group, maybe the teacher could ask the students in that group to act out the sentence she reads. (Session 7)

Learning Environment:

The learning environment, recognized as the fourth component of differentiation alongside content, process, and product, was addressed during discussions in the third, fourth, and fifth sessions.

In the third session Ayşe stressed the importance of deliberate planning in creating a learning environment where students feel a sense of belonging and enjoy learning together as a group. This marked the first clear reference by a participant to the learning environment's vital role in DI within the PD process, highlighting how it contributes to inclusive and supportive spaces for diverse learners.

Ayşe: So, here it's about the individual feeling a sense of belonging in the learning environment. This needs to be planned. I think it's about everyone within that circle feeling they belong there together. Like, "I'm good, I'm happy here. I enjoy learning. I enjoy learning together. And we can create something together, embracing our differences". (Session 3, A21)

Ayşe emphasized the significance of purposeful planning in creating a learning environment where students feel a strong sense of belonging and enjoy learning together as a group. She highlighted how such an environment fosters collaboration and celebrates differences, making students feel accepted and comfortable. The learning environment is a crucial component of DI as it ensures the inclusion of students with diverse characteristics and needs. In such a setting, every student feels comfortable, expresses themselves without hesitation, and is empowered to realize their full potential.

In the fourth session, when asked about what constitutes a safe learning environment, Didem and Ayşe highlighted the importance of a setting where students feel both physically and emotionally secure, and where they are not afraid to make mistakes.

Didem: A child feeling safe both emotionally and physically. Psychological safety is just as important—being in an environment free from anxiety, fear, and other negative emotions, where the child feels good. Just like in a family setting, even when there are arguments or moments of anger, children still feel secure because they know their parents accept them unconditionally. The anger quickly fades, and they feel good again. It's about creating a safe environment similar to a family atmosphere, even if it's not always entirely possible, doing our best to achieve it. (Session 4, D9)

The above extract demonstrates Didem's grasp of the role of emotional and psychological safety in creating an effective learning environment for differentiated instruction. She highlighted the importance of students feeling both emotionally and physically secure, emphasizing that an environment free from anxiety and negative emotions is essential for learning. Similarly, in her response to the same question, Ayşe emphasized the need for a classroom atmosphere where students feel safe to make mistakes, seeing them not as failures but as opportunities for growth:

Ayşe: A classroom environment where students are not afraid of making mistakes. Or a classroom where the teacher leads by explaining that mistakes are not irreversible errors. It's about conveying the message that it's okay to make mistakes and encouraging students to see them as opportunities for learning... A differentiated environment should also be applied in areas such as playtime, breaks, and classroom management. (Session 4. A22)

At the same time, she also pointed out that differentiated instruction extends beyond teaching methods to include behavior, playtime, recess, and classroom management, highlighting the teacher's role in creating a safe learning environment: "A differentiated environment should also be applied in areas such as playtime, breaks, and classroom management." (Session 4, A23)

The following contribution from two participants in Session 4 revealed their concerns and the obstacles they faced, in fostering a collaborative classroom environment, particularly the competitive pressures driven by parents. Canan and Bianka were both concerned about how parental influence shaped children's attitudes, making it difficult to shift the classroom environment towards collaboration.

Canan: In the classes I've worked in so far, the environment has been more competitive than collaborative. It's as if the students have to surpass something, and that "something" is never themselves; it's always another child. They target someone they have in mind. I remember a parent once objecting on an exam paper, asking how another student could have scored higher. It wasn't really about their own child's score being low, but about the other student's score being higher. Once children start with this mindset, it

becomes very difficult to pull them towards collaboration. At least, that's been my experience. (Session 4, C12)

Canan's reflection highlighted the significant role that parents can play in reinforcing a competitive mindset among students. The example of the parent objecting to another student's higher score illustrated how external pressures and expectations can shape a child's approach to learning. Bianka agreed: "Sometimes, with the influence of parents, a very competitive environment develops among the children. They inevitably end up competing with each other." (Session 4, B19)

A learning space that emphasizes collaboration is essential for DI, as it promotes inclusivity and allows students with diverse needs and strengths to work together. However, the competitive nature of some classrooms, as pointed out by Canan and Bianka, influenced by external factors like parental expectations, complicates the goal of building a truly inclusive and supportive learning space. This makes deliberate planning even more crucial to counterbalance such pressures and foster an environment where students can thrive together.

In Session 5, Didem voiced another challenge to the differentiated learning environment, during the group discussion on self-assessment. She expressed her hesitation about openly sharing student performances with the class. Her concern arose from the fear that revealing individual self-assessment results could trigger negative reactions among students as they became aware of each other's evaluations: "So, should we conduct these self-assessments aloud in the classroom? Once the students have completed their self-assessments, do we share their results?" (Session 5, D10) Didem had actually expressed a similar concern in the first session, during the problem analysis, as well

Didem: If we're going to have small groups or provide individual instruction, we need to position the students distantly from each other so that they don't wonder, "Why is this person doing something different?" or "Why am I doing

something different or working on something else?” To avoid creating this feeling, the physical arrangement of the space needs to be adjusted. (Session 5, D11)

This concern highlights the importance of a safe learning environment for effective DI. Teachers' tendency to hide individual differences due to fear of peer reactions can undermine open discussions about the students' strengths and areas for growth. In such an environment, students may not feel free to make mistakes, which is crucial for their learning and development. This approach can be seen as an alternative conception, as it overlooks the acceptance of differences by students, which is central to differentiated instruction and essential for fostering an inclusive, supportive classroom culture.

After Didem voiced this concern, Ayşe emphasized the importance of orientation week activities in creating a positive learning environment, sharing examples from her own practice. She noted that these activities contribute to building a supportive classroom culture where students could feel safe and valued.

Ayşe: When setting class rules or routines—whichever term you prefer—the climate we want to create in our classroom will be defined. This can include expressions of courtesy, self-assessment, and creating a positive class environment. For example, our routine every Monday involves reflecting on three positive things we did over the weekend. This helps children to assess themselves and their families, and to appreciate their friends' positive qualities. By focusing on positive aspects and recognizing each other's strengths, students are encouraged to think more positively and consider how they can build on these strengths for further improvement. (Session 5, A24)

The discussions surrounding the learning environment during the PD sessions provided valuable insights into the critical role this component plays in DI. The participants engaged in meaningful conversations that underscored the necessity of creating inclusive and supportive spaces for all students. Deliberate planning for a safe learning environment, the crucial role of psychological safety in alleviating the fear of making mistakes, and the impact of parental influence on fostering a

competitive learning environment—which hindered the development of a collaborative atmosphere—were key points of discussion.

Assessment:

Assessment, a foundational component of DI, provides ongoing insights into student readiness, interests, and learning profiles, enabling educators to adapt instruction responsively. Assessment was first brought up by Didem during the first session in the PBL problem situation, in response to my question about where DI should begin.

Facilitator. When starting or taking the first steps in differentiation, where should we begin?

Didem: We should begin by assessing students and identifying their specific needs and readiness. (Session 1, D12)

Didem's response, while not deeply informed by specific DI strategies, reflected a common-sense understanding of the principles behind DI. Canan further added that gathering input from their parents can provide valuable insights into the students' unique circumstances or past experiences that may not be observable in the classroom:

Canan: We can get information from parents about the students. Perhaps there are specific situations or past experiences that we haven't observed in the classroom; we could learn about these. (Session 1, C13)

Canan's suggestion to gather insights from the students' parents introduced an additional dimension, recognizing that differentiation benefits from a holistic understanding of each student's background.

Further, during the discussion of addressing specific learning needs, Didem expressed her need of assessment tools:

Didem: Preparation for learning, we need something like a scale so we can test the child with it, to determine, "Oh, they're at this level." I say "scale," but maybe it has a different name.

Facilitator: Assessment scales, yes...

Didem: Yes, I would need support at that point, personally. (Session 1, D13)

Didem's request demonstrated not only an awareness of the importance of accurately assessing students' readiness levels but also a recognition of her own professional learning needs in this area. This signals her commitment to deepening her assessment skills, to apply differentiated instruction more effectively.

Later in the discussion, Bianka added a valuable perspective, raising a critical question about the alignment of assessment with mandated learning outcomes and individual student readiness. She pointed out a potential challenge:

Bianka: This could also be an issue. For instance, the Ministry of National Education expects us to achieve certain learning goals with the children, but a child's readiness might not match these expectations. In such cases, what criteria will we use to evaluate the child? (B20)

Bianka's question reflected a nuanced understanding of the complexities inherent in assessment within a DI framework, where standardized expectations may not align with individual students' readiness levels. Her question underscored the need for an assessment tool that covers the entire spectrum of reading development—a key focus within our PD context—rather than one limited by grade level, enabling a more accurate evaluation of each student's true readiness, independent of their grade level.

Overall, by emphasizing the importance of assessing student needs and readiness, the participants established that effective differentiation begins with a clear understanding of each learner's unique starting point. This PBL problem analysis phase reflected an awareness that DI extended beyond a one-size-fits-all approach, necessitating instruction tailored to individual profiles. The expressions from participants marked an initial step, providing a baseline from which the PD could address their evolving needs.

In the fourth session, while formative assessment was discussed again, Ayşe contributed by reflecting on how she came to understand formative assessment.

Ayşe: I came to understand formative evaluation after attending several PD programs. One analogy I heard during a PD session helped me grasp the concept clearly. Imagine a chef preparing soup in their restaurant. Before serving the soup to customers, the chef first tastes it to make any necessary adjustments—that's formative evaluation. Once the soup is served, the feedback from the customer represents summative evaluation. This analogy was a turning point for me, and I wanted to share it with you because I struggled for a long time to truly understand what formative evaluation means. (Session 4, A25)

The analogy Ayşe shared was insightful, illustrating the difference between formative and summative assessment in a way to which she could relate, clarifying the purpose of formative assessment as an ongoing, process-focused evaluation, and summative assessment as the final feedback. She also emphasized that assessment tools not only help tailor instruction to meet individual needs but also empower students to take an active role in their own learning.

Ayşe: It might not be possible to bring everyone to the same level, but each student can progress from where they started. In non-competitive classrooms, self-assessment becomes particularly important at this point. During this learning process, when we use self-assessment and peer assessment forms, scales, and rubrics in activities, students recognize their own progress internally. For example, they might say, "I couldn't write before" or "I couldn't do addition before, but now I can at least add two-digit numbers. I still can't do three-digit addition, but I can do two-digit. (Session 4, A26)

Ayşe's comment was valuable in highlighting a second key function of assessment, which is essential for DI. Ayşe emphasized that tools like self-evaluation and peer evaluation encourage a sense of ownership and reflection, fostering growth from within by helping students develop self-awareness rather than relying solely on external validation. These tools promote internal reflection and self-improvement, allowing students to become more active and invested in their learning.

During participant presentations in session 4, Canan referred to assessment while presenting the concept of readiness in DI:

Canan: We can say that measuring readiness levels is important to ensure each student benefits at the highest level. Differentiation builds an ongoing assessment related not only to the student's progress but also to their readiness. Teachers should continuously assess students' needs. (Session 4, C14)

By stressing the importance of assessing readiness levels, she underscored that DI is not solely about monitoring progress but also involves understanding each student's starting point and evolving needs. Her point about continuous assessment aligned well with effective DI, as it enabled teachers to adapt their strategies to each student's readiness and growth over time.

Ayşe referred to assessment one more time in discussing the product component a differentiated lesson plan while presenting interest.

Ayşe: Students develop their products based on their readiness and interests, enabling them to express themselves and create something meaningful. Through this process, they begin to recognize both what they are learning and how they are learning it. By engaging in this self-discovery, they also come to understand their own needs along the way. (Session 4, A27)

By relating assessment directly to the students' interests and the products they create, Ayşe highlighted how assessments can be designed to encourage meaningful engagement rather than merely serving as a tool for evaluation. Additionally, Ayşe's point about students recognizing what and how they are learning highlighted the reflective nature of assessment. By engaging in self-assessment and creating products, students not only demonstrated their knowledge but also gained awareness of their own learning needs, fostering greater autonomy. This integration of assessment as a formative, reflective process is essential for effective DI, as it ensures that assessment contributes to learning rather than simply measuring it.

In the first part of the fifth session, the reading evaluation tool was finalized in my facilitation. Although it was intended to be completed through asynchronous collaboration, the checklist required substantial revisions and additions. In the rest of

the session, assessment was once again emphasized during the participant presentations of DI strategies, such as concept maps, exit cards, cubing, and rubrics, specifically for formative assessment purposes. While presenting rubrics as an assessment strategy used in DI, Bianka focused on the two types of rubrics and highlighted the use of analytical rubrics as formative assessment tool.

Bianka: Holistic rubrics provide a general assessment score that does not provide information about where the student needs to improve. It is said that it is not good for formative assessment. However, the analytical one is more reliable, as it helps us understand the specific points we need to support the student. The only downside is that the assessment process takes a bit longer. (Session 5? B21)

The participants' references to assessment during their discussions of DI strategies reflected their understanding of the crucial role assessment plays within the DI framework. Not only to evaluate learning but also to guide instructional modifications, thereby creating a more tailored learning experience.

In the sixth session, the participants created a differentiated lesson plan template, incorporating all the relevant DI elements, to use as a reference in their future practice to develop DI lesson plans. The participants also discussed how the product component could function as assessment. In Canan's words, "we can place the assessment at the bottom as product." (C15) This statement reflects her understanding of the product component in the DI framework, an essential tool for assessing the students' mastery of the content and their unique learning progressions. Initially, however, she associated differentiation in readiness, interest, or learning profile primarily with the process component in DI rather than product. Through my probing questions, she came to recognize that the product component, like content and process, can also be differentiated if needed. She then stated: "Since there will also be differentiation in the product, we should have three groups again. That doesn't mean we must use them, though." (C16) Here, Canan referred to the need for

a designated place in the DLP template to record the differentiated products for each of the three groups, specifically if small group instruction is implemented. In addition, she clarified that designated space for each group's differentiated products offer flexibility without requiring teachers to use them, based on the dynamics of the classroom and the specific needs of their students.

In session 7, when the participants collaboratively developed a DLP for the fictional classroom, they formed readiness groups considering their prior knowledge of the students' literacy readiness levels, and utilizing the assessments covered in the PD, including the reading evaluation checklist they had developed themselves. Furthermore, they planned the product component of the lesson to evaluate the students' achievement of the learning objectives, which were tailored to three distinct readiness levels.

Throughout the PD sessions, the group's approach to assessment evolved, revealing a deepening understanding of its essential role in differentiated instruction. Assessment emerged as a foundational tool, not merely to measure learning but to actively inform and adapt instruction to meet students' readiness, interests, and learning profiles. The initial discussions focused on assessing students' readiness, with participants identifying assessment as the starting point for differentiation. A key progression in the sessions was the collaborative creation of a reading development evaluation tool, which allowed participants to put theory into practice, assessing students to develop differentiated lesson plans responsive to varied learning needs. This exercise underscored the importance of tools that capture the students' starting points and development trajectories, aligning with the overarching DI framework discussed throughout the PD program. Moreover, formative assessment took on a central role, with participants sharing analogies and personal

experiences that illuminated the distinction between formative and summative assessments. These insights reinforced the importance of ongoing evaluation as an integral part of responsive teaching. Later sessions expanded the focus to include strategies such as concept maps, rubrics, and peer assessments, allowing the participants to view assessment as an interactive process fostering self-awareness and active engagement among students.

Differentiation Strategies:

Differentiation strategies were covered during the sessions as essential tools for implementing DI in the classroom, addressing the diverse needs of students, acknowledging their unique readiness levels, interests, and learning profiles. The flexible grouping strategy was a key focus, which enables teachers to form dynamic groups based on specific learning goals, student interests, or learning profiles, thereby fostering collaboration and peer support.

Ayşe was particularly active in the sessions, sharing the strategies she implemented in her classroom as part of her DI practice. The other participants showed great interest in her experiences and sought clarifications on her methods.

Ayşe discussed her use of flexible grouping for teaching literacy skills in Session 4.

Ayşe: I use it a lot in teaching reading and writing. For students who come in with reading skills, we give them multiple-choice comprehension tests and similar exercises while explaining phonics to the other students. Meanwhile, those students work on phonics and writing until they are ready to advance. (Session 4, A28)

This example illustrates her application of differentiated instruction by varying the tasks according to students' readiness levels, underscoring the role of flexible grouping in effective DI practice. She also shared strategies to facilitate small group work, such as using a color-coded system to indicate students' needs for teacher assistance (green: everything is okay, yellow: need some help, red: need

immediate help) and implementing a four-level voice system in the classroom (e.g., level 1 for listening to the speaker, level 2 for group work, level 4 when needing help) as aids for classroom management. These strategies reveal her understanding of creating a supportive classroom environment where students can signal their needs, which is essential for effective DI and classroom management.

On the other hand, Didem shared her own experience as an elementary student in a combined classroom, which illustrated both the crucial role of the flexible grouping strategy for student readiness, and the potential negative effects on some students if not accompanied by a safe learning environment.

Didem: I attended a combined classroom myself. For example, when I was in 1st grade, there were 3rd grade students in the same class who still had difficulties with reading. The teacher would seat me next to them and have me work on reading with them. Initially, I probably wasn't affected, but since they were older, probably they were negatively impacted by it. In the following years, they didn't talk to me anymore. (Session 4, D14)

Her reflection indicated a nuanced understanding of how the successful implementation of flexible grouping would require attention to the emotional and social context of students, reinforcing the necessity of a supportive learning environment in DI.

During the fifth session, the participants and I presented and discussed DI strategies, including rubrics, scaffolding, learning contracts, the equalizer, think-pair-share, cubing, self-evaluation, concept maps, and exit cards. Below are some participant comments on the use of DI strategies to tailor instruction to individual needs.

While discussing the use of concept maps, Canan, though unsure, highlighted this strategy's potential to engage all students in the learning process. She noted that concept maps can encourage each student to contribute ideas, making it an inclusive

strategy that fosters participation and ensures no one is left out, regardless of their readiness level.

Canan: In terms of differentiation, when children are sharing their thoughts, each of them inevitably has an idea. I think its benefit lies in continuously involving them. Every student is somewhat able to give an example. In terms of participation, I think it could be used because it's a strategy that potentially includes all students, though I'm not entirely sure. (Session 5, C17)

Didem added that concept maps can also be used to differentiate instruction by considering students' interests in small groups. Meanwhile, Ayşe suggested concept maps for assessing the students' readiness and interests before beginning instruction. She highlighted that concept maps offer "direct, pinpoint accuracy" (Session 5, A29) in evaluating student readiness, providing valuable insights for tailoring instruction.

At the beginning of the sixth session, after watching a video of learning stations as a DI strategy, Didem shared her teaching experience with small group instruction in a Montessori setting and noted that the students who struggled to grasp the content were provided individual support.

Didem: I really liked it. I also liked the video. For example, not everyone grasps the concept at the same time. In a group of 15, for instance, I work with 15 people during Montessori sessions. Inevitably, at least 3 of them struggle to understand the concept. It seems that these children develop differently. With them, you need to work more individually, especially in terms of how they move and how they adjust. They need verbal cues. For instance, if they get stuck in a particular area, they need teacher support to either join another group or move to a different station. (Session 6, D15)

She did not mention using readiness grouping, which may indicate that she relied more on individual instruction to support students rather than on differentiation in small readiness groups. While this method can be effective in fostering a deeper understanding of content for students who struggle with certain concepts, without readiness grouping, students might miss out on the advantages of engaging with peers at similar learning levels. While her strategy can support individual learning

needs, it may not fully capitalize on the potential benefits of differentiated small group instruction, which aims to create a more inclusive and collaborative learning environment. Moreover, in a large group setting without differentiation, students who require additional help might be left without the necessary guidance, leading to missed learning opportunities. This situation underscores the importance of readiness grouping, which can maximize instructional time for both teachers and students, ultimately fostering a more inclusive and productive learning environment.

Bianka expressed her classroom management concerns regarding the use of learning stations.

Bianka: I've never tried group work like this, setting up stations. But I do have some concerns in my mind. After setting up those stations, each child will be working in a different group, and it may be necessary to provide help or support as needed. However, when we divide the last group and take them aside, if there are two teachers while one is teaching, then yes, it can progress in some way. But this system needs to be adopted by the school as a whole beforehand, and that entire organization needs to be in place. (Session 6, B22)

Bianka's comments highlighted the importance of a well-structured approach when implementing learning stations in the classroom. Her concerns emphasize the need for adequate support and organization to ensure that every student's needs are met effectively.

In the rest of the sixth session, the fundamental DI strategy of flexible grouping was integrated into the DLP template. Each lesson component—content, process, and product—was structured to include both whole group and small group instruction. Additionally, a section for individual support was added to address any specific needs that may arise.

The development of the DLP for the fictional classroom during Session 7 reflected the participants' growing understanding and application of DI strategies. Both flexible grouping and learning stations were highlighted by the participants as

strategies employed in the plan, demonstrating their awareness of these key methods for addressing diverse student needs.

Facilitator: Which differentiation strategies did we use today?

Didem: Learning stations. (Session 6, D16)

Canan: Flexible grouping. (Session 6, C18)

Additionally, the participants considered incorporating a self-assessment activity into the plan which indicated their recognition of the importance of fostering student autonomy and reflection in the learning process.

Facilitator: Does anything else come to your mind? What other strategy could we use?

Canan: We could add a self-assessment at the very end. (Session 6, C19)

Ayşe: Yes, I think self-assessment is necessary as well. (Session 6, A30)

The differentiation strategies discussed throughout the PD sessions provided participants with practical tools to enhance their teaching practice. The participants' reflections and the integration of these strategies into the DLP demonstrated a deliberate and thoughtful engagement, highlighting their potential to foster inclusivity and encourage active student participation.

Table 33 provides a list of the participants' references to the DI elements reported in the findings session. The distribution of participant contributions in the table shows that, in the first session where the participants were analyzing the PBL problem only readiness and its assessment came up, while references to DI elements diversified over the course of the sessions. In the third session my question about the DI elements prompted the participants' reflections about DI. The fourth session was the main session where the DI components were presented and discussed which is reflected in the table. Table 33 also includes information about which DI element was presented by which participant. In the fifth session, the comments related to student characteristics, the learning environment, and assessment originated from the discussions on the application of DI strategies in the video-prompted discussion and

the DI strategy presentations. The participant comments in the sixth session were prompted both by the video discussed at the beginning of the session and the joint activity of developing a DLP template. Likewise, in the seventh session both the question-prompted discussion and the collaborative preparation of a DLP for the fictional classroom prompted the participants' reflections. As can be seen in the Table 33, the learning environment was mainly referred to in the fourth session during the discussion on students' acceptance of the DI practices while the DI strategies were mostly discussed in the seventh session during the development of the DLP for the fictional classroom of PBL problem.

Table 33. The Distribution of the Participants' References to DI Elements Throughout the Sessions

Sessions	Readiness	Interest	Learning Profile	Content	Process	Product	Learning Environment (LE) Assessment (A) DI Strategies (DI ST)
S1	A1 B1 C1, C2 D1	-	-	-	-	-	B20 (A) C12, C13 (A) D13 (A)
S2		-	-	-	-	-	-
S3	B2 D2	A6 B9	A11, A12 B11, B12	A15 B16 D6	A15 B16	A15 B16	A21 (LE)
S4	(C, Pr)	(A, Pr) A7, A8, A10	(F, Pr) A13 B13	(B, Pr) A16	(B, Pr) A17	(B, Pr) A18	A22, A23 (LE) B19 (LE) C12 (LE) A25, A26, A27 (A) C14 (A) A28 (DI ST) D14 (DI ST)
S5	A2, A3 B3, B4, B5 C3, C4	D4	B14	-	-	-	A24 (LE) D10, D11 (LE) B21 (A) A29 (DI ST) C17 (DI ST)
S6	A4 B6, B7 C5		C7, C8	-	C10 D7	D7	C15, C16 (A) B22 (DI ST) D15 (DI ST)
S7	A5 B8 C6 D3	A10 B10	A14 B15 C9 D5	A19 B17 C11	A20	B18 D8	B18 (A) D8 (A) A30 (DI ST) C18, C19 (DI ST) D16 (DI ST)

(C, Pr): Canan's presentation for readiness

(A, Pr): Ayşe's presentation for interest

(F, Pr): Facilitator's presentation for learning profile

(B, Pr): Bianka's presentation for content, process, and product

6.3.1.3.1 Participant artifacts: Lesson plans from pre-DLPs to revised post-DLPs

This section reports the analysis of the participants' pre-DLPs, post-DLPs, and revised post-DLPs and their responses to post-interview questions related to the DLPs. The pre-DLPs were lesson plans submitted by the participants as their sample lesson plans incorporating DI elements prepared for their own classrooms before participating in the PD. The post-DLPs were differentiated lesson plans the participants prepared individually after Session 7, and presented in Session 8. Revised post-DLPs are these lesson plans revised according to peer and facilitator feedback provided in Session 8. The revised versions were implemented by the participants in their own classrooms, and Session 9 was dedicated to the presentation of the revised post-DLPs and their implementation.

The analysis below will focus on Ayşe and Bianka's pre-DLPs, post-DLPs, and revised DLPs, while for Canan and Didem, only their post-DLPs and revised DLPs will be covered, because Canan and Didem did not submit pre-DLPs, as Canan was on maternity leave, and Didem was currently serving as an administrator in a preschool.

Ayşe's lesson plans and implementation:

Pre-DLP:

The pre-DLP lesson plan prepared by Ayşe prior to the PD program followed the Understanding by Design (UbD) framework, which serves as a solid foundation for differentiated instruction, but it lacked essential elements of DI that are critical for addressing the diverse needs of learners. Specifically, the plan did not address the essential components of DI, such as adjusting the content, process, or product to meet the diverse readiness levels, interests, or learning profiles of her students.

For instance, although the plan included an initial assessment for readiness, as seen in the screenshot from Ayşe’s pre-DLP (See Figure 11), there was no indication of how the assessment results would inform or guide the instruction in the rest of the lesson plan.

Stage 3: Learning Plan	
Code	INITIAL ASSESSMENT
DK1	Students' recall of banknotes and coins learned last year is evaluated through the "What Do I Remember?" activity.

Figure 11. Initial assessment in Ayşe’s pre-DLP

Furthermore, the plan set the same learning objectives for all students without incorporating differentiated objectives that reflect the results of the initial assessment. (See Fig. 12)

Stage 1: Desired Outcomes		
Standards M.2.3.2.1. Identifies the relationship between kuruş and lira. M.2.3.2.2. Compares different amounts of money not exceeding 100 TL. M.2.3.2.3. Solves problems related to our currency.	<i>Transfer</i>	
	T1. Calculate profit from a self-produced product. T2. Do calculations with money for shopping	
	<i>Meaning Making</i>	
	UNDERSTANDING U1: Calculates change during a purchase. U2: Ensures the product's selling price is higher than the production cost.	ESSENTIAL QUESTIONS EQ1. What do producers consider when making sales? EQ2. What are our currency units?
	<i>Achievement</i>	
	KNOWLEDGE K1: Recognizes paper and coin money. K2: Understands that every product has a monetary value.	SKILLS S1: Performs money conversions (e.g., 4 coins of 25 kuruş equal 1 TL). S2: Calculates change. S3: Calculates expenses during production.

Figure 12. Objectives in Ayşe's pre-DLP

The rest of the lesson plan included a description of the activities, provided instructions for the main activity, an extension task, and formative assessment instruments. However, there was no information about differentiation at any level, except for an extension task.

As can be seen, Ayşe's pre DLP overlooked the fundamental principles of differentiated instruction, such as differentiation for student characteristics in the

lesson components of content, process, or product. Without such differentiation in Ayşe's lesson, some of her students may struggle to engage with the material meaningfully, potentially leading to gaps in understanding and achievement of the learning objectives she meticulously listed at the beginning of her lesson plan

Post-DLP and Feedback:

For post-DLP, Ayşe again submitted one of her pre-existing lesson plans designed for first graders, even though she was teaching second graders at the time. The plan, being a previously prepared one rather than created after the PD, included very limited differentiated elements. She later explained that she could not prepare a brand-new DLP due to time limitations. Ayşe stated that the plan included some differentiation of the process for the entire class:

Ayşe: Well, it can be said that it was based on readiness. However, I actually focused more on differentiating the content. What I did here was to plan a collaborative activity. The differentiation comes from working together, and while doing so, there are groups; everyone has a partner. I determined the tasks they would complete with their partner in advance, but before that, the book is read aloud to the entire group. They read it themselves.

Ayşe's explanation here once again highlighted a common misconception: equating student-centered lessons with differentiated instruction. She described a collaborative activity in which students worked in pairs, but without explicitly addressing individual readiness levels, learning preferences, or interests. While she alluded to differentiation by referencing readiness, this approach does not fully align with true differentiation, which involves adjusting the content, process, or product to meet each student's specific needs.

One of the tasks Ayşe identified to as a differentiated task involved giving students the opportunity to choose their own vocabulary to write sentences. She stated, "Yes, they are all doing the same activity; the only thing that varies is that they select the content themselves. They are not choosing the words I provided;

instead, they are constructing sentences using the words they have chosen.” This task can be seen as differentiation for both readiness and, to some extent, interest. By allowing students the autonomy to select their own vocabulary, Ayşe ensures they can choose words that resonate with their existing knowledge, experiences, and interests, fostering a sense of ownership over their learning. However, while allowing students to choose their own vocabulary can be a form of differentiation, it’s not a particularly powerful or deep way to differentiate instruction. The activity gives some flexibility, but it doesn’t necessarily address the varying readiness levels, learning profiles, or interests in a meaningful way. Powerful differentiation would involve more targeted adjustments, such as offering different levels of vocabulary based on student readiness, varying the complexity of the tasks, or allowing students to engage with the material in different formats. Simply allowing choice of vocabulary without more substantial adjustments may not fully address the diverse needs of learners.

The use of an extension task for early finishers can be considered a differentiation strategy Ayşe had incorporated. This is a valuable activity, as it helps advanced learners stay engaged by providing them with meaningful, extended tasks rather than unproductive downtime.

In summary, Ayşe’s post-DLP included a single overarching objective for the entire group, without an evaluation of individual readiness or differentiated learning outcomes. There were no clear distinctions in content, process, or product tailored to different readiness levels, interests, or learning profiles, aside from some superficial content differentiation for readiness and the use of an extension for early finishers.

The PD participants and the facilitator provided feedback to Ayşe’s DLP after her presentation. Her feedback peer, Canan, praised the use of the film 'Wall-E' and

other instructional activities, finding them highly motivating. She also pointed out that some of the learning objectives were not sufficiently supported by the classroom activities. However, her feedback did not focus on the DI elements of the lesson.

Bianka's feedback was more focused on DI, particularly addressing her concerns about student pairing, assessment, and classroom management.

Bianka: I also liked the plan. When I think about doing something like this in the classroom, I consider the classroom dynamics. One thing came to my mind. Yes, it's great that students get to choose individually, but sometimes one student is more advanced, while the other might need more support. So, when two such students are paired together, I thought that the more knowledgeable student might end up answering the questions more and saying, 'I can write the answers.' That might be a problem during the assessment phase.

As seen in the above extract, Bianka raised concerns about student pairing, noting that when a more advanced student is paired with one who needs additional support, the advanced student may dominate the task, particularly in responding to questions. This awareness suggests that she values equitable participation and engagement among students, which is central to effective DI. She also pointed out that such pairings could create challenges during the assessment phase, as the contributions of the stronger student might overshadow those of the student needing support. This is a critical issue in DI, where assessments should reflect each student's progress and understanding. This instance highlighted Bianka's commitment to ensuring that all students' achievements are recognized.

After the participants finished giving feedback, I emphasized that this was a quality lesson plan, featuring activities aligned with the goals of the lesson and engaging students meaningfully in the learning process. However, since we were in a PD program focused on DI, it would be beneficial to include more differentiated elements to truly practice it. I then suggested that Ayşe include varied learning objectives for students with diverse readiness levels, encouraging her to rethink the

activities so that students with different levels of readiness could work according to their own learning needs. Additionally, I recommended integrating the small group activity into the process section of the lesson plan, rather than placing it in the content section, as this was the part where students were active and implementing what they had learned.

Revised post-DLP and implementation:

It was possible to see that the above feedback was taken into account in Ayşe's final DLP, developed after the participants and I provided feedback. The new version took student readiness into account in several DI elements. Although the assessment for readiness was not explicitly stated in the plan, the groups were formed based on the teacher's previous assessment and observation. The content was differentiated for readiness, with varied learning objectives tailored to three groups of students at different readiness levels, as seen in Figure 13.

School:		Date:	
Content			
Subject:	Turkish	Grade	
Unit and key terms:	Symbol, shape, reading, comprehension, group work		
Topics:	Prerequisite skills for the unit: Sentence concept, word concept, spelling rules	• Readiness • Interest • Learning Profile	
	Unit's core objectives: Reading comprehension Understanding spelling rules		
Suggested duration:	3 class hours		
General objectives: T.2.3.14. Answers questions related to the text read. T.2.4.1. Writes meaningful and grammatically correct sentences. T.2.4.3. Writes short texts. T.2.4.10. Edits what they have written.			
Group 1: Objectives Answers questions related to the text read by choosing one of the multiple-choice options. (BOOKLET)		Group 2: Objectives Completes the true/false exercise related to the expressions from the text read. (BOOKLET)	
		Group 3: Objectives Answers questions related to the text read in their own words. (BOOKLET)	

Figure 13. Content differentiation in Ayşe's revised post-DLP

The process was also differentiated for readiness, utilizing stations with activities marked with different color codes to represent the various readiness groups (See Figure 14).

Process		
• Readiness • Interest • Learning profile		
Whole group: Students are informed that during the station work section, they will complete the sections in their booklets according to the colors of the corresponding sections in the booklet. Example: If the station section in their booklet is green, they will work at the green station. - The first station will last 10 minutes. - The second station will last 5 minutes. - The third station will last 10-15 minutes.		
Group 1: Station 1: Adds a sentence describing Robot Robi's feelings to the section on page 6. Station 2: In the book, 25 words contain the same letter next to each other. Finds and marks 3 of these words within 5 minutes. Station 3: Corrects the sentences containing spelling mistakes from the words in the book. Writes the correct version again.	Group 2: Station 1: Rewrites one of the sentences on the last page of the book, changing it in a way that doesn't alter its meaning. Station 2: In the book, 25 words contain the same letter next to each other. Finds and marks 10 of these words within 5 minutes. Station 3: Selects three of these words and uses them in sentences.	Group 3: Station 1: Rewrites a section from a page of the book, without changing the topic. Station 2: In the book, 25 words contain the same letter next to each other. Finds and marks 12 of these words within 5 minutes. Station 3: Writes a short paragraph using three of these words.

Figure 14. Process differentiation in Ayşe's revised post-DLP

As for the product, it was differentiated based on learning profiles by offering students a choice among preparing a book promotional poster, creating or designing a new character for the book, or composing a piece of music related to the book in heterogeneous readiness groups. Students were also given the choice to work individually, in pairs, or in small groups (See Fig. 15).

Product		
• Readiness • Interest • Learning profile		
Whole Group: In this section, students are informed that they can carry out various activities to introduce and explain the Robot Robi book. There are options in the activities. Group selection: 5 minutes, preparation: 20 minutes, presentation: 15 minutes.		
Group 1: They can work individually, in pairs, or in groups of three. They prepare a promotional poster on an A3 sheet using the work completed at the stations.	Group 2: They can work in pairs They design a new robot character for the book using waste materials and present it. They explain the features of the new robot and describe the materials used and their purpose.	Group 3: They can work in pairs or groups of three. If the Robot Robi book were a movie, what would the background music be like? While one student reads the book with appropriate emphasis and intonation, other group members apply sound effects and background music.

Figure 15. Product differentiation in Ayşe's revised post-DLP

Ayşe explained her rationale for employing heterogeneous readiness groups in the product component of her lesson plan:

Ayşe: Sometimes working together [in heterogeneous groups] supports peer teaching and collaborative learning. For example, children who usually argued or fought during recess, the ones who tended to get into power struggles, started making music together. There was one girl, for instance, who chose to focus solely on making music. She usually loved drawing and was very good at it, but this time she said, 'I want to create background music for a film.' Interestingly, she decided to work on music with the same boys she usually argued with during games. It turned out to be a beautiful, peaceful way for them to collaborate.

Ayşe's reflection highlighted the positive impact of differentiated instruction on both academic engagement and social dynamics in the classroom. By allowing students to choose tasks based on their interests, such as making music instead of drawing, the teacher fostered greater engagement and collaboration. Students who

typically argued during recess found a peaceful way to work together, demonstrating how interest-based activities can transform social interactions. This flexibility also allowed students to explore new learning profiles, encouraging growth in areas beyond their usual strengths. Overall, the teacher's approach to differentiation not only supported individual learning needs but also promoted positive peer relationships.

Ayşe described how she supported the groups during the product phase when she implemented her DLP

Ayşe: Later on, of course, while they were working, I gave them feedback. Sometimes they tend to get carried away and drift away from the goal. So, I remind them, “Look, this needs to relate to the book. I want to see this or that in your work.” For example, I’d tell them, “I want to see that concept in the poster you’re making.” It’s important to walk around the groups and give feedback during this process. That’s what the teacher does at that moment—providing guidance.

This reflection highlights a critical aspect of differentiated instruction: the active role of formative assessment and ongoing feedback during the learning process. Ayşe recognized that while students are deeply engaged in creative tasks, they may occasionally stray from the core learning objectives. She actively supported them throughout the process to ensure that the students effectively conveyed their learning in their products. This ongoing support is crucial in DI, as it ensures that while students have the freedom to express their learning in diverse ways, the final product still demonstrates mastery of the required objectives. An evaluation rubric was also utilized to assess students' work, providing a structured framework for evaluating their products.

Ayşe emphasized that students exhibited high engagement and motivation, with no conflicts arising, due to the incorporation of choices that considered their interests and learning profiles. She also noted the classroom's familiarity with

differentiated instruction practices, which contributed to a smooth implementation. Additionally, Ayşe highlighted the teacher's role as a facilitator, providing necessary feedback throughout the process to support student learning and ensure that they remained focused on their goals.

From Pre-DLP to Revised Post-DLP:

As reflected in Table 34, Ayşe's differentiated lesson plans showed a marked improvement from the pre-DLP to the revised post-DLP. The pre-DLP, which followed the Understanding by Design framework, lacked essential elements of DI, failing to adjust the content, process, or product to accommodate the diverse readiness levels, interests, or learning profiles of her students. This omission meant that while the plan offered a solid instructional foundation, it did not adequately address the varied needs of individual learners. In contrast, Ayşe's revised post-DLP demonstrated a robust incorporation of multiple differentiation components. The plan effectively addressed student readiness by forming groups based on prior assessments. It included content differentiation with varied learning objectives for three distinct groups. The process was differentiated using color-coded stations for different readiness levels, allowing for tailored activities. Product differentiation was enhanced by providing students with choices considering diverse learning profiles. Furthermore, the revised plan included clear evaluation rubrics for assessing student products and extension activities for early finishers.

Table 34. Comparison of the Pre-DLP, post-DLP and the revised post-DLP (Ayşe)

Ayşe	Pre-DLP	Post-DLP	Revised Post-DLP
Learning objectives for different readiness levels	-	-	+
Content Differentiation	-	-	Readiness
Process Differentiation	-	-	Readiness
Product Differentiation	-	-	Learning profile
Strategies/ Flexible Grouping	Small group activities with no differentiation	Small group activities with no differentiation	Individual, Pairs, small groups
Strategies/ Other	-	Extension Activities	Learning stations Extension activities
Assessment	Assessment of readiness Process evaluation	Assessment of readiness	Assessment of readiness (Conducted prior to forming groups and creating the lesson plan), Student Products, Rubrics for assessment
Differentiated Materials	-	-	+

Ayşe's Reflections on Future Post-DLP Refinements:

After implementing the revised post-DLP in the classroom, Ayşe highlighted several considerations during the post-interview for improving future implementations of this DLP. First, she intended to incorporate a broader range of DI strategies, such as learning menus, think-pair-share, and tic-tac-toe. Secondly, she

planned to introduce role play as an option within the product choices, enabling students to demonstrate their understanding in diverse and meaningful contexts. Additionally, Ayşe intended to diversify the assessment tools by integrating self-assessment and peer assessment, allowing students to reflect on their learning and provide feedback to one another.

Ayşe identified her own areas of strength and room for growth during the post-interview. Her areas of strength, as expressed by herself, included her ability to effectively differentiate instruction based on students' readiness levels, particularly in reading, while maintaining a harmonious classroom environment. She noted that she created a climate where advanced readers focus on comprehension, while others work on foundational skills, all without causing students to feel bored or inadequate. Ayşe highlighted how this approach respected individual development and encouraged student growth. Additionally, she noted the importance of collaborating with parents and working in a school that supported these strategies, which enabled her to implement differentiation more effectively.

Ayşe's areas for growth, as expressed by herself, were about expanding her use of differentiated instruction strategies and exploring diverse assessment tools, particularly for younger students. She recognized the need to keep her instructional methods fresh by staying up-to-date with new strategies. While she felt confident in using assessment techniques for older students, Ayşe acknowledged a gap in her approach to younger learners, especially those in pre-literacy stages. To address this, she aimed to research and implement developmentally appropriate strategies that better meet the needs of early learners.

Ayşe demonstrated a strong reflective practice, articulating both her strengths and areas for growth. She commented that her ability to effectively differentiate

instruction while maintaining a positive classroom environment showcases her deep understanding of her students' varied needs, particularly in reading. Her collaboration with parents and the support of her school further enhance her teaching approach. At the same time, her recognition of the need for continuous improvement—especially in updating her strategies and exploring better assessment tools for younger learners—reflects a growth mindset, which is one of the DI factors, as identified by (Coubergs et al., 2017). Ayşe's self-awareness and commitment to professional development indicated that she may actively work to enhance her teaching and meet the evolving needs of her students.

Bianka's Lesson Plans and Implementation:

Pre-DLP:

The lesson plan Bianka submitted at the start of the PD program included 10 lessons for the first weeks of a second-grade Armenian language class. Its objectives included reading, writing, and naming the letters of the Armenian alphabet; visual reading; retelling a listened-to or watched text; inferring the meaning of vocabulary from visuals; answering who, what, and where questions about a text; and reading a text. The plan was comprehensive in revisiting the basic first-grade objectives for a review at the beginning of the second grade. Even though it included engaging, play-based activities that utilized multiple modalities, it lacked key elements of differentiated instruction. It included diverse learning activities, such as games and hands-on exercises, which are effective for reinforcing foundational skills. However, there was no evidence of tailored instruction to meet diverse student needs regarding readiness, interest, or learning profile. The handling of this plan as one incorporating differentiation elements reflected a common alternative conception of DI, that student-centeredness allows for a differentiated lesson.

Post-DLP:

After participating in the PD, Bianka adapted one of her existing lesson plans for the Armenian language for her second graders as her post-DLP. The lesson focused on reading comprehension, and the plan specified distinct learning objectives tailored to students across three different readiness levels. These groups were established based on previous assessments and teacher observations, although this information was not explicitly mentioned in the post-DLP. The first group consisted of students with ongoing fluency challenges, while the second included fluent students who faced comprehension difficulties. The third group comprised proficient readers. To address these varying needs, the content was differentiated for readiness, resulting in distinct learning objectives for each group. The respective learning objectives for the three groups were to guess the meanings of unknown words, arrange the story parts in order, and make comparisons. The process was also differentiated for readiness, featuring tasks tailored to each group's specific learning outcomes. The product was differentiated for readiness and learning profiles, although students were not provided with choices.

While presenting the product component of her post-DLP, Bianka referred to "learning profile" as "interest," which can be considered a sign of the persistence of alternative conceptualizations. Her statement suggested that she viewed "interest" as a subset of "learning profile" or used the terms interchangeably.

The participants and I provided feedback to Bianka's DLP after her presentation. Her feedback peer, Ayşe, focused on DI elements, revealing her ability to identify and articulate how content, process, and product are adapted in the lesson plan. This suggests Ayşe was well beyond foundational DI knowledge by then, with the capacity to critically evaluate lesson components while considering both the

purpose and the practical implementation of differentiation. Following her initial feedback, Ayşe continued with constructive suggestions for adjusting activities within the process to better align with students' varying levels and make them more accessible. She proposed incorporating a dictionary activity after students make predictions to reinforce vocabulary development in the first group: "A dictionary activity could be done after the prediction, after the children make their own guess." Ayşe also raised concerns about whether requiring students to write unfamiliar words they hear might be too challenging, particularly for struggling students. She suggested that providing the text could offer additional support for these learners: "Would it be hard for a child, especially one who struggles with reading in their first year, to note that down? I wondered if we should give them the text here." Ayşe's suggestions reflect her sensitivity to potential learning barriers and her focus on making the lesson's content manageable for all learners.

Another piece of feedback from Ayşe concerned the absence of assessment tools in the lesson plan. When I reminded her about the product component as a form of assessment, she proposed including rubrics in addition to the student products to clarify the expectations from students: "In our lessons plans, there's always some form of assessment—whether it's the child's self-assessment, peer assessment, or an assessment by the teacher, ideally through a rubric." When Bianka asked how she might provide rubrics to students for peer assessment in this context, Ayşe replied with a suggestion:

Ayşe: Peers can rate their understanding: "I understood it very well," "I understood some of it," or, "I didn't understand it at all." For the poster, criteria can include whether they used colors appropriately, or selected appropriate visuals. Peer assessment can vary depending on the teacher and student group. It's also related to what we aim to measure—if it's about reading comprehension, it can focus on how well they convey the story. In our case, we often include peer assessments in book presentations.

Ayşe's suggestions demonstrate her understanding of formative assessment tools and her emphasis on providing students with clear, structured criteria. Her ideas for self-assessment and peer evaluation showcase her awareness of varied approaches in assessment, aligning with differentiated instruction's focus on accessible, student-centered feedback.

Bianka sought feedback on the differentiation for readiness she implemented with the third group in reading comprehension, particularly regarding her use of comparisons as an advanced reading activity. She expressed uncertainty about whether sequencing a text or making comparisons would be the more advanced task.

Bianka: I was wondering about this, and I'd like to get your opinion. I asked myself: would sequencing events be more challenging for a child, or would comparing them be harder? For someone who understands the text, is it more difficult to make comparisons or to sequence information? I went back and forth on it. After speaking with another teacher, they suggested that comparison is likely the more advanced skill, so I organized it accordingly. I'd be glad to hear if you agree.

Ayşe responded by referencing the expert lecture in Session 2:

Ayşe: It's similar to what we learned in the lecture on reading theory. If I recall correctly, comparing texts is one of the steps, and to my knowledge, it engages higher-order thinking skills.

The conversation between Bianka and Ayşe showed a reflective approach to differentiated instruction, particularly regarding cognitive complexity in reading comprehension tasks. By questioning the complexity of each task, Bianka aims to align her lesson with the students' developmental stages, demonstrating her nuanced understanding of readiness and cognitive demand in DI. Ayşe's response, which draws on insights from the expert lecture, further elevated the discussion by grounding her perspective in research-based theory. This exchange not only reflects both teachers' strong engagement with DI principles but also underscores their

commitment to aligning instructional decisions with theoretical frameworks, thereby enhancing their ability to effectively scaffold students.

Canan, similar to her comments on Ayşe's lesson, provided feedback that primarily focused on how motivating and engaging the lesson was, rather than on aspects of DI. She also appreciated that it was easy to follow, and noted that the timing allowed enough room to cover the objectives. Her only feedback related to DI was her positive view on the differentiation of the product for learning profiles and interest: "The differentiation of the product, in terms of interests and learning profiles, was something I appreciated."

My feedback on Bianca's post-DLP included the following. The content was differentiated for readiness, with tailored learning objectives for the three readiness groups; however, the differentiation of instruction itself (the 'how'), including differentiated materials and strategies, was not included in the plan. While Bianca's efforts to tailor learning objectives for different readiness levels were commendable, the lack of differentiated instructional strategies—such as varied materials and approaches—may have limited the effectiveness of her plan. Hence, I recommended considering content differentiation not only in terms of learning objectives but also through varied instructional strategies and materials.

Regarding the DI strategies, I addressed her labeling of the small group activity as 'learning stations.' I explained that this was actually a small group activity, as students were working on tasks within their respective groups rather than rotating through different stations in the classroom. I also recommended considering extension activities for those who finish tasks early. I stressed the importance of detailing the lesson plan so that another teacher can easily read and implement it. This included listing the names of students in each group, specifying which group the

teacher would support more during the activities, explaining how students would transition to their groups and how this would be communicated to them, and clarifying whether the teacher would read the story or if the students would read it themselves, as well as whether this varies among groups.

Revised post-DLP and implementation:

Bianka addressed most of the feedback provided on her lesson plan by her feedback peer and me. She assigned students to the small groups She clarified whether the story would be read by the students or the teacher in each group, specified which groups the teacher would support and which would work independently, and considered the potential difficulty the first group might face in writing down unknown words, offering a solution for this issue. Additionally, she renamed the product differentiation as learning profile instead of interest and expanded the plan with more detail. However, she did not provide a detailed explanation of how the students were divided into small groups, simply stating that "the teacher divides the students into four groups."

The revised post-DLP's general lesson objective was reading comprehension. The content was differentiated for readiness, with different readiness groups assigned varying learning objectives. The first group consisted of students with limited Armenian vocabulary, which affected their reading comprehension. The second group had grade-level reading skills, while the third group demonstrated advanced reading skills. The specific learning objectives for the three groups included inferring the meanings of unfamiliar words, sequencing the story elements, and making comparisons (See Figure 16).

School:	Date:		
Content			
Subject:	Arminian	Grade	2. Grade
Unit and key terms:	Avantaj, dezavantaj		
Topics:	Prerequisite skills for the unit:	• Readiness • Interest • Learning profile	
	Unit’s core objectives:		
Suggested Duration:	70 minutes		
General objective: Reading comprehension			
Group 1: Predicts the meanings of unknown words.	Group 2: Numbers the text according to the sequence of events in the story.	Group 3: Makes comparisons.	

Figure 16. Content differentiation in Bianka's revised post-DLP

The process was also differentiated based on readiness. Each readiness group was assigned activities aligned with their respective learning objectives. For the first group of students with limited vocabulary, the task was to identify unfamiliar words in the story. A newly arrived student from the earthquake area, who had minimal knowledge of Armenian, was included in this group and had a slightly adjusted learning objective: to infer the meanings of words using visuals and to write them down with the co-teacher's support. The co-teacher also assisted the other students in the first group. The second group was tasked with sequencing the story parts in the order of occurrence, receiving guidance from Bianka. Meanwhile, the third group, consisting of advanced readers, worked independently to compare various elements of the story (See Figure 17).

Process		
• Readiness • Interest • Learning Profile		
Group 1: Predicts the topic. Improves knowledge of words. Group2: The teacher reads the book and asks students to write unknown words on the distributed papers.	Group 3: Students illustrate and write the book <i>If We Had Wool Like Sheep</i> in sequential order as "first–then–finally."	Group 4: Students compare the advantages and disadvantages of wool.

Figure 17. Process differentiation in Bianka’s revised post-DLP

The product component of the lesson was differentiated for both readiness and learning profile. At this stage, the readiness groups were maintained, ensuring that each group received tasks appropriate to their readiness levels (See Figure 18).

Product		
• Readiness • Interest • Learning Profile Whole Group: Student products are combined		
1.Group: Students attach the Armenian words to the visuals in the book. 2.Group: Students create a song using words they do not know.	3.Group: The topic is dramatized in the order of occurrence.	4.Group: A poster is prepared on advantages and disadvantages.

Figure 18. Product differentiation in Bianka’s revised post-DLP

Within these groups, differentiation based on learning profiles was also implemented, with activities designed to cater to various learning styles and preferences such as writing and composing a song, engaging in role play, or preparing a poster to compare the advantages and disadvantages presented in the story. However, students were not given the opportunity to select their activities based on their individual learning profiles. Bianka highlighted the benefits of small group product activities, particularly noting how they fostered a supportive environment that encouraged participation from more hesitant students.

Bianka: For example, in composing music, the children in this subgroup were feeling more hesitant. Then, when everyone in the class participated, it created motivation for them. That was a plus. Also, in role play, for instance, we had a student who was initially reluctant to engage in role play activities. At first, she kept her distance. When her friend slowly began to participate, she got a bit panicked because she didn't know what to do. We encouraged her by saying, "You can do it like this; you can act it" After that, her friend showed her an example, saying, "You can do it like this." ...the child added their own interpretation and did similar work.

This emphasis on small group activities reflects Bianka's understanding of the importance of creating an inclusive and nurturing learning environment that meets the needs of all students, especially those who may need extra encouragement to participate fully. Bianka's experience exemplifies how differentiated instruction can foster a more inclusive and responsive learning environment.

As for student reactions Bianka expressed that they were 'happy'. She highlighted that the novelty of different tasks per group sparked student interest, particularly benefiting students with varying strengths. She highlighted how the tailored task motivated the students of the first readiness group:

Bianka: It was just different for them this time because each group was doing something unique. I think it was good for the first group because some students, for instance, were able to stand out more in terms of expression. Another student, for example, didn't know a particular word, but was able to remember more words compared to the other three friends. She tried to form more sentences. There was one word related to the shearing of wool, and she

tried to explain it in Armenian. I think, from their perspective, it was a productive and enjoyable lesson.

This reflection suggested that differentiation not only supported but also motivated students by meeting them at their current skill level, fostering a supportive learning environment where each student can actively contribute and feel accomplished.

Overall, Bianka's differentiated lesson plan demonstrated a strong effort to address the varying readiness levels within the classroom, with Bianka carefully adapting content, process, and product based on student needs. The general lesson objective of reading comprehension was consistently maintained, while differentiation was applied to ensure all students, regardless of their language proficiency or prior knowledge, can work towards the same goal. While the plan effectively tailored tasks based on readiness and learning profile, it lacked the flexibility in allowing students to select activities based on their individual preferences or strengths. Incorporating opportunities for students to choose tasks aligned with their interests or preferred modes of expression (e.g., visual, auditory, kinesthetic) could further enhance engagement and motivation.

From Pre-DLP to Revised Post-DLP:

As indicated in Table 35 Bianka's lesson plans demonstrate a significant evolution from pre-DLP to revised post-DLP in terms of the level and diversity of differentiation. The pre-DLP plan lacked differentiation elements, failing to address the diverse needs of students and offering a one-size-fits-all approach. In contrast, the revised post-DLP plan established clear learning goals for three distinct readiness groups, including newly arrived students with no prior knowledge of Armenian, and incorporated differentiated content, processes, and products tailored to each group's readiness level. Additionally, the revised post-DLP plan integrated strategies that

considered students' learning profiles, engaging them through various modalities, such as song writing and role-play. This enhanced flexibility in grouping and the inclusion of differentiated materials significantly improved accessibility and engagement, resulting in a more responsive teaching approach. Overall, the revised post-DLP plan exemplifies effective differentiated instruction, ensuring that all students work towards the shared objective of reading comprehension while accommodating their individual needs.

Table 35. Comparison of the Pre-DLP, post-DLP and the revised post-DLP (Bianka)

	Pre-DLP	Post-DLP	Revised Post-DLP
Learning objectives for different readiness levels	-	+	+
Content Differentiation	-	Readiness	Readiness
Process Differentiation	-	Readiness	Readiness - The activities were further tailored for readiness groups
Product Differentiation	-	Readiness Learning profile	Readiness Learning profile - The confusion between "learning profile" and "interest" has been cleared up
Strategies/ Flexible Grouping	-	+	+
Strategies/ Other	-	-	The confusion between "small group activity" and "learning stations" has been cleared up
Differentiated Materials	-	+	+

In the post- interview Bianka mentioned the implementation challenge of student collaboration problems in small groups: “They struggled a bit with group work. The more dominant students wanted to do things themselves, etc. But if we continue to be consistent with this at the beginning of the term, they will likely improve over time.” Bianka's observation highlighted a common challenge in implementing differentiated instruction, namely balancing group dynamics and ensuring equitable participation among students. In group settings, dominant personalities can overshadow quieter peers, which can hinder collaborative learning. However, Bianka seemed to take a proactive approach to address the challenges encountered in group work, as she specifically stated that consistency of implementation early on would help meet such a challenge. By emphasizing consistency at the start of the term, Bianka acknowledged that establishing clear routines and expectations can significantly influence the students' comfort and confidence in collaborative settings.

Bianka’s Reflections on Future Post-DLP Refinements:

For future implementations of this DLP, Bianka shared her plans to incorporate the creation of animated films at the product level, providing students with additional ways to showcase their learning. She also intended for the students to share their final products with students from other grade levels.

Areas of Strength and Growth Identified by Bianka upon completion of PD on DI:

When asked about her strengths and areas for growth in preparing DLPs in the post-interview, Bianka did not mention any strengths but shared her areas for development.

The areas Bianka identified as open for growth included enhancing her differentiation strategies to better accommodate the diverse readiness levels and learning profiles of her students. She expressed a desire to innovate her teaching practices by exploring beyond traditional methods like music and art, recognizing the need for more engaging techniques that capture student interest and prevent monotony by incorporating a wider range of activities that resonate with various learning preferences. She also emphasized classroom management problems in group activities.

Canan's Lesson Plans and Implementation:

As Canan did not submit a pre-DLP due to maternity leave, the following analysis is based on her post-DLP and revised post-DLP.

Because she was not teaching at the time, she prepared her post-DLP for a fictional classroom comprising 12 students, drawing three students from the real classrooms of each of the four participants. These students represented three readiness levels: struggling, proficient, and advanced. The objective of the DLP prepared collaboratively for this same classroom in Session 7 was 'reading comprehension,' while Canan's objective for her post-DLP focused on fluent reading. Canan differentiated the content based on readiness by tailoring the learning objectives for each group. However, while she articulated these objectives verbally, she did not explicitly include them in her written plan. The groups were highly diverse regarding the reading skills in this fictional classroom. As a result, the objectives were also highly diverse. The first group's objective focused on developing phonological awareness, specifically targeting sound recognition skills. Second group's objective was fluent reading, and the third group's reading comprehension as far as they were already fluent in reading. In the content section,

the teacher was to read the text aloud to the whole group to model fluent reading, with *wh*- questions also planned for comprehension.

In the process phase, the tasks were tailored to align with the learning objectives of the three readiness groups. The first group's task was to listen to a tongue twister and then choose a word from it to play a game: finding a new word that begins with the last sound of the chosen word. The second and third readiness groups would work together, each focusing on their own learning objective. The third group would read the text to the second group to model fluent reading, after which the second group would read the same text independently. While reading, the third group would underline words that the second group finds difficult to read, and they would practice these words together until they can be read fluently. Afterward, both groups would answer the *wh*- questions, allowing them both to engage in the comprehension task.

Canan: I included the second group in the reading comprehension task, even though it was originally intended solely for the third group. Their collaboration will allow the second group to benefit from the process as well. I view this as a positive outcome, which is why I designed the activity for both groups to work together.

Canan's small group design for the two readiness groups was an effective strategy, allowing each group to work toward its own learning objectives while benefiting from peer learning in a heterogeneous setting. This setup enabled both groups to benefit from each other's primary learning objectives collaboratively.

Canan differentiated the product based on roles—songwriters, composers, vocalists, and rhythm performers—though she was unsure whether this differentiation targeted learning profile or interest: “I’m not sure if the learning profile is included here. However, interest seems to be more prominent in the product.” As evident from her statement, Canan's understanding of the distinction

between interest and learning profile was unclear, prompting further discussion to clarify their differences and applications.

Following Canan's presentation of her post-DLP, feedback was provided by both the participants and me. Since Canan's feedback peer, Didem, was absent from the session, Ayşe began by suggesting to specify readiness-based tasks for the product learning profile groups. Bianka also addressed the product asking:

Bianka: While developing the product, I aimed to ensure it aligned with the objectives, but I'm unsure if this was necessary. For instance, since our topic was reading comprehension, I planned for the products created by the children in the three groups to focus on reading comprehension. Should it be structured this way, or not?

I responded to Bianka by reinforcing her point and restating the role of the product as an assessment of the lesson's learning objectives. I suggested that Canan reconsider the product to serve as an indicator of the students' learning. I then clarified the distinction between content and process, noting that Canan included the large group reading comprehension instructional activity, where the teacher reads the text to model fluent reading, addresses unknown vocabulary, and answers the wh-questions, in the process section of the DLP instead of the content section. Additionally, I recommended incorporating extension activities into the plan.

Revised post-DLP:

An examination of her revised DLP reported below shows that Canan was able to incorporate the feedback provided to her discussed in the previous section. In the content component of her revised DLP, Canan explicitly documented the learning objectives for the three readiness groups, which had only been mentioned verbally during the presentation of her first draft. She also specified the differentiation type as readiness, which had previously been omitted (See Figure. 19).

School:		Date:	
Content			
Subject:	Turkish	Grade:	1.Grade
Unit and Key terms:	Fluent reading, creative writing		
Topics:	Prerequisite skills for the unit: Ability to read at an appropriate level for the class. Ability to pay attention to what is read.	• Readiness • Interest • Learning Profile	
	Basic Objectives of the Unit: Can read fluently at an appropriate level for the class. Applies reading strategies.		
Suggested Duration:	3 Lessons		
Objectives:			
Group 1: Develops phonological awareness.		Group 2: Reads fluently.	Group 3: Comprehends what is read.
Teaching and Learning Methods and Techniques:	Modelling Whole group		
Instruction:	In a large group, the text appropriate for the class level ("Our Home") is read by the teacher. The teacher draws students' attention to voice tone, stress, reading speed, posture, and correct pronunciation. If the teacher mispronounces any words, students are asked to underline those words. Then, the 5W1H questions are answered.		

Figure 19. Content differentiation in Canan's revised post-DLP

There were no changes in the process component, which was differentiated for readiness (See Figure 20).

Process		
• Readiness • Interest • Learning Profile		
It is stated that individual work will be done with Group 1 students. The teacher works one-on-one with these students. It is stated that Group 2 and Group 3 students will work together. The students are paired.		
Group 1: This group's reading skills have not developed. For this reason, phonological awareness activities focusing on sound recognition will be conducted with Group 1. The teacher works one-on-one with the students in this group. Students listen to a tongue twister (the tongue twister titled "The Needle Stuck, It Hurt Me"). They are asked to repeat the tongue twister they listened to. A word is chosen from the tongue twister by the teacher. The students are asked to find a word that starts with the last letter of the chosen word.	Group2 ve Group3: Students paired by the teacher first read the given text ("The Teacher," a poem) to their friends in Group 2. Then, the students in Group 2 take their turn reading. The words that the reading student struggles with or cannot read are marked by the listening student. These words are then read again together, with the students helping each other. Afterward, the 5W1H questions about the text are answered by the paired students. Once the activity is finished, the teacher asks the students to provide the correct answers to the questions.	
Individual Support:		
Teaching and Learning Methods and Techniques:		
Teaching Technologies, Tools and Resources:	Grade-level appropriate texts, tongue twisters, 5W1H question worksheets	

Figure 20. Process differentiation in Canan's revised post-DLP

Canan made the most significant revision in the product differentiation, addressing feedback that the initial draft lacked a clear function for the product as the assessment component of a differentiated lesson. The product was differentiated for readiness, with tasks designed to demonstrate students' mastery of the learning outcomes (See Figure 21).

Product		
• Readiness • Interest • Learning Profile		
Whole Group: One of the poems appropriate for the grade level (Child and Play - Ismail Uyaroglu) is selected by the teacher. The chosen poem is read by one of the students who reads fluently.		
3.Group: The students in this group modify the verses of the poem while adhering to the topic determined by the teacher. The teacher tells the students that a new poem will be written. This new poem will be titled 'Child and Book.' They are encouraged to write words suitable for the new title to create a new poem.	2. Group The students in this group read the modified poem. The teacher records the readings. The audio recordings are listened to, and attention is drawn to the students who read fluently.	1. Group They find a new word that starts with the last letter of the words in the poem. While doing this activity, the teacher will not work one-on-one with this group of students in the product section. The students are expected to carry out this skill on their own.
Individual Support:		
Differentiation strategies: Stations, exit cards, thinking points, flexible grouping, learning contracts, RAFT, Think-Pair-Share, self-assessment, mind maps, jigsaw, cubing, balancing, simulation, learning centers, anchor activities, extension activities.		
Extension Activities: Group 1: These students color visuals related to the text. Group 2: Those in this group have their friends from Group 1 do reading exercises to increase their phonological awareness. A worksheet provided by the teacher is used for this purpose. Group 3: Students who finish their work help their friends in Group 2 with reading comprehension exercises. For this purpose, they answer 5W1H questions on a new worksheet.		
Assessment:		
Explanations Regarding the Implementation of the Plan:	In the first group, choosing a rhythmic poem with music and having the product be a song is important to emphasize the rhythmic aspect of fluent reading.	

Figure 21. Product differentiation in Canan's revised post-DLP

Canan noted that she differentiated the product based on learning profile, although it was primarily differentiated for readiness. However, the activities also targeted varied learning profiles, as they included tasks like poem composition,

poetry recitation, and generating new words using the final sound of given words. Additionally, extension activities were included in the revised post-DLP.

From Pre-DLP to Revised Post-DLP:

Table 36 summarizes the differences between Canan's post-DLP and revised post-DLP, as she did not provide a lesson plan prior to the PD. In the revised post-DLP, the learning objectives for the readiness groups were explicitly stated, which were previously missing. The types of differentiation were clearly outlined in the plan, except for the differentiation of product for readiness. Additionally, extension activities were included in the revised post-DLP.

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Table 36. Comparison of the post-DLP and the revised post-DLP (Canan)

	Pre-DLP (not submitted)	Post-DLP	Revised Post-DLP
Learning objectives for different readiness levels	X	+(Not stated in the plan)	+
Content Differentiation	X	Readiness (Not stated in the plan)	Readiness
Process Differentiation	X	Readiness	Readiness
Product Differentiation	X	Learning Profile	Readiness (Not stated in the plan) Learning Profile
Strategies/ Flexible Grouping	X	+	+
Strategies/ Other	X	Peer learning	Extension activities Peer learning
Differentiated Materials	X	+	+

Canan's Reflections on Future Post-DLP Refinements:

During the post-interview, Canan stated that she acknowledged the shortcomings in the DLP she had prepared and made revisions based on the feedback provided. She expressed a desire for more experience to better identify her areas for improvement, emphasizing the value of practice: "By developing a variety of lesson plans, I believe I can gain valuable experience and become more adept at addressing diverse learning outcomes."

Regarding her areas of strength, Canan expressed in the post-interview that she felt confident in grouping students based on their readiness: "I felt confident in this

area; I realized that I had no difficulty in dividing the class into groups [considering readiness]. However, Canan noted that she faced challenges in determining what tasks to assign to each group based on their readiness levels and aligning them with the learning objectives. She mentioned: “I struggled with deciding what tasks to assign to those groups based on their levels. I realized that sometimes the tasks could go beyond the intended outcomes.”

Didem’s Lesson Plans and Implementation:

Since Didem had not submitted a pre DLP, the following analysis is based on the post and revised post DLP she developed.

Didem prepared a DLP for one of the classrooms in the preschool where she served as a principal, with the objectives to develop the kindergarteners’ book awareness and narration through a picture book. However, the learning objectives for the three readiness groups were not specified in her plan, even though there were differentiated materials. In the content section, she outlined a group activity where students would select books based on their areas of interest and then work together to narrate the visuals in the books to each other. The teacher facilitated the group formations, organizing students according to the topics of the books chosen. While presenting the content section, Didem made a brief mention of differentiating based on student readiness, interest, and learning profile.

Didem: Some children may narrate exactly what’s in the picture, while others may describe it in a sentence or two. This is because each of our children is in a different place developmentally. That’s why I differentiated for interest and learning profile. It’s essential here.

Although Didem mentioned different readiness levels and learning profiles, these elements were not clearly identified in her plan, which also lacked a whole-group instructional component. As for the DI strategies, she indicated that she used

think-pair-share—referring to the group work described above—as well as flexible grouping.

For process, she briefly described another small group activity in which students gather in groups and role-play the book they narrated. The type of differentiation was also not specified in this section.

For product, another small group activity was included, this time differentiated for learning profile. The students were grouped based on their own preferences: those who preferred to illustrate and those who preferred to narrate. Although differentiated for learning profile, this aspect was not explicitly stated in the written DLP.

As Didem was absent and shared her post-DLP at a later time when only Canan and I were present, feedback on her post-DLP was provided solely by Canan and me.

Canan generally found the plan appropriate for addressing the learning objectives with sufficient differentiation. Her feedback regarding product differentiation indicated a good understanding on her part, of the product as a DI component:

Canan: I had pointed out that the assessment seemed to be lacking [in the written feedback provided before the session]. Yesterday [During the session where the post-DLPs were shared] we learned that the materials created in the product section can serve as an alternative form of assessment. Therefore, the images, masks, or other works produced by the children, as well as recordings of their narration, can all be used for assessment purposes.

My feedback as the facilitator included the following suggestions: adding the learning objectives for the three readiness groups, and if applicable, any instruction provided by the teacher to students in the content section of the DLP; including differentiated materials in the content section, if available; reevaluating the process phase to ensure alignment with the learning objectives for each readiness level;

explicitly indicating the types of differentiation used—readiness, interest, and learning style—within the three components (content, process, product) of the lesson; incorporating extension activities for early finishers; writing the plan in sufficient detail for another teacher to read and implement effectively; and specifying which group would receive support from the teacher or assistant teacher.

Revised post-DLP and implementation:

A comparison of Didem's (post) DLP and revised DLP showed that the feedback provided by Canan and myself was considered and incorporated into the new version. In the content section of the revised post-DLP, Canan clearly outlined the learning objectives for the three readiness groups, included large group instruction, and explicitly stated the type of differentiation—readiness (See Figure 22).

School:		Date:	
Content			
Subject:	Turkish Language Activity	Grade	Preschool
Unit and Key Terms:	Book Author, illustrator, visual storytelling		
Topics:	Prerequisite Skills for the Unit: Understanding what is listened and being able to focus on what is being conveyed. Being able to express what is listened in different ways.	• Readiness • Interest • Learning Profile	
	The main objectives of the unit:		
General Objectives: Describes what is in the pictures. Knows that the book has an author and an illustrator.			
Group 1: Answers questions asked based on the visuals in the book. What animal is in the picture? Where does the event take place?		Group 2: Describes the visual in the book in 2-3 sentences.	Group 3: Describes the visual in the book.
Teaching and Learning Methods and Techniques		Narration, think-pair-share	
Teaching Technologies, Tools and Resources		Storybooks, puppets	

Figure 22. Content differentiation in Didem's revised post-DLP

However, she provided the full description of the whole lesson in the content section, because she was unsure how to organize it into the specific sections—content, process, and product: “I wrote the entire instruction here, because I couldn’t exactly determine which part should go in the process section and which in the content section.” This statement prompted a further clarification of the two lesson components: content and process. In the rest of the presentation Didem showed her understanding of the concept ‘content’:

Facilitator: Now, up to this point, is this content or process?

Didem: This was content. Because I conducted instruction.

Facilitator: Yes, great. This was content.

The process was differentiated for both readiness and interest and explicitly stated in the plan. Student interest was considered by allowing them to choose books based on their preferences, while readiness was addressed by aligning expectations with the learning outcomes for each readiness group (Figure 23).

Process		
• Readiness • Interest • Learning Profile		
While the teacher works with the first group, the intern student works with the second group. The teacher assigns the third group to work independently. After finishing with the first group, the teacher gives the group the task of matching the objects in the pictures with the puppets and explaining them to each other. Then, the teacher works with the third group after the first group. While the teacher works with the second group, the intern conducts peer teaching with groups one and three.		
Group 1: The teacher gives verbal instructions to the children in this group to help them understand the book they listened to and asks them to describe two pages. What do you see in this picture? Animal, object. Where does this event take place? Forest, house. A picture is taken from a basket prepared for children who do not want to speak: Can you show me this in the picture? What is this? Can you repeat it?	Group 2: The children in this group are at a level where they can describe the pictures in 2-3 sentences. Therefore, the teacher asks them to narrate the entire book.	Group 3: The teacher asks the children to narrate the book they have according to the visuals.
Individual Support: While the groups work among themselves, the teacher selects a simple book with visuals for the child who is behind in narration and conducts an activity where they will describe it in a single sentence.		
Teaching and Learning Methods and Techniques		
Teaching Technologies, Tools and Resources	Voice recorder, visual materials (paint, colored papers, glue, scissors), costumes, accessories.	

Figure 23. Process differentiation in Didem's revised post-DLP

The product was differentiated based on both learning profile and interest, and this was explicitly stated in the plan. Additionally, an extension activity was

included, along with differentiated materials, such as puppets for students who require more concrete representations. The plan also specified which teacher would support each group, and the activities were presented in more detail compared to the previous version. (See Figure 24).

Product		
• Readiness • Interest • Learning Profile		
Whole Group:		
Group 1: Illustrators They draw a picture of the story they listened to.	Group 2: Dramatizers They act out the story they listened to.	Group 3: Audio Recorders Those who make an audio recording of the story they listened to.
Individual Support:		
Differentiation strategies: Stations, exit cards, thinking points, flexible grouping, learning contracts, RAFT, Think-Pair-Share, self-assessment, mind maps, jigsaw, cubing, balancing, simulation, learning centers, anchor activities, extension activities.		
Extension Activities: Children who finish early are given inter-group work. They are asked to match the product they created with the storybook. Those from the audio recording group who finish are asked to match the picture created by the illustrating group with the storybook.		

Figure 24. Product differentiation in Didem's revised post-DLP

As for the classroom implementation, Didem stated that classroom management was challenging. She attributed this difficulty to not knowing the students well enough. Didem found that providing options and flexibility in both the learning activities and the grouping system significantly increased student engagement and made the learning process more enjoyable. Additionally, Didem observed positive social dynamics emerging among the students as they navigated new seating and collaboration arrangements. The flexibility in groupings allowed students to interact with different peers, promoting socialization and communication skills. Table 37 summarizes the changes from Didem's first DLP to her revised DLP, which were discussed above.

Table 37. Comparison of the Post-DLP and the Revised Post-DLP (Didem)

	Pre-DLP (not submitted)	Post-DLP	Revised Post-DLP
Learning objectives for different readiness levels	X	-	+
Content Differentiation	X	-	Readiness
Process Differentiation	X	Interest (Not stated in the plan)	Readiness Interest
Product Differentiation	X	Learning Profile (Not stated in the plan)	Learning profile
Strategies/ Flexible Grouping	X	+	+
Strategies/ Other	X	Think-Pair-Share	Think-Pair-Share Extension activity
Differentiated Materials	X	Books Flash cards Voice record machine	Books Flash cards Voice record machine Puppets

Didem's Reflections on Future Post-DLP Refinements:

During the interview, Didem recognized the need to enhance the extension activity in her future DLP revisions. She noted that the extension activity did not suit the group that finished early. She realized that for early finishers, she should provide 2-3 different options to better cater to their varying interests. Didem acknowledged that this adjustment was important to better engage the early finishers in future implementations. Additionally, Didem reflected on the materials she had used, such as storybooks, and realized that it was not necessary to always use storybooks for the

activity. She observed that a single-page poster or flashcards could have worked just as well, and that visual materials like brochures could be just as effective. She noted that the requirement for a storybook was not essential, as the visual aspect itself was what captured the children's attention.

When asked about the areas of strength and opportunities for growth, Didem responded that she did not face significant challenges in the product phase of the lesson. She noted that she could easily differentiate the product. However, Didem acknowledged that she struggled with identifying the content and process phases of the lesson. While the product phase was clear, she found it challenging to distinguish when certain elements should be included in the content section versus the process section. Didem expressed the importance of drawing from different sources to develop a clearer understanding and strengthen her skills in this aspect of lesson planning.

Summary of findings based on the participants' DLPs

The DLPs developed by the participants for their own classrooms revealed that the participants were all able to include a minimum of one aspect of DI, however, it was only after getting detailed feedback were they able to truly differentiate their lessons. They were able to incorporate DI elements in the revised DLPs. A closer analysis of the lesson plans showed that the participants used similar differentiation practices. They were free to choose the type of differentiation they preferred and were not required to utilize all the variations of differentiation, as occurs in authentic differentiated instruction practices. It was found that all four participants opted for content and process differentiation for readiness. Only Didem differentiated process also for interest in addition to readiness. This focus on

readiness may be attributed to the PBL problem's focus on addressing the diversity of student readiness for literacy.

In terms of product differentiation, readiness and learning profile were the preferred choices among the participants, with no utilization of interest. Except for Ayşe, the participants did not mention any other means of assessment apart from the products prepared by the students. Ayşe utilized a rubric to assess the students' attainment of the learning goals. An examination of the DI strategies employed by the participants for differentiation revealed that these were somewhat limited.

Flexible grouping and extension activities emerged as the most frequently employed methods. This underscores the need for further practice with various differentiation strategies to broaden the participants' repertoire.

As shown in Table 38, all four participants improved their lesson plans by incorporating differentiated content, processes, and products. They identified differentiated learning objectives for different readiness groups. Readiness and learning profile were used by all the participants, while interest was employed by only one. Flexible grouping, a fundamental strategy for differentiation, was implemented by all the participants. Additionally, all four lesson plans included differentiated materials in their revised post-DLPs.

Table 38. DI elements in Participants' Revised Post-DLPs

	Revised Post-DLPs			
	Ayşe	Bianka	Canan	Didem
Learning outcomes for different readiness levels	+	+	+	+
Content Differentiation based on	Readiness	Readiness	Readiness	Readiness
Process Differentiation based on	Readiness	Readiness	Readiness	Readiness Interest
Product Differentiation based on	Learning profile	Readiness Learning profile	Readiness (Not stated in the plan) Learning Profile	Learning profile
DI Strategies: Flexible Grouping	+	+	+	+
DI Strategies: Other	Learning stations Extension activities	-	Extension activities Peer learning	Think-Pair-Share Extension activity
Assessment	Assessment of readiness (Conducted prior creating the lesson plan) Rubrics for assessment	Assessment of readiness (Conducted prior creating the lesson plan)	Assessment of readiness (Conducted prior creating the lesson plan)	Assessment of readiness (Conducted prior creating the lesson plan)
Differentiated Materials	+	+	+	+

Post-Interviews

In this section, the findings from the analysis of the post-interview data are reported. The data from the post-interview conducted after the professional development program was examined to detect any changes in the participants' knowledge of the key elements of DI compared to the pre-interview data. This included their insights into student characteristics (readiness, interest, and learning profile), the lesson components tailored to these characteristics (content, process, and product), the learning environment, assessment in DI framework, and DI strategies. Their definitions of DI and reflections on their experience of the PD process shared during the interview formed the basis of the analysis.

Upon completion of the PD program, much like at the beginning of the program, the participants reaffirmed the aim of DI as considering individual student differences. However, Canan demonstrated growth in her understanding. In the pre-interview, she emphasized the importance of individually noticing students and meeting their needs. Yet, after the PD, she articulated this as an obligation.

Canan: I see it very clearly now that as a teacher, it's crucial to be able to address all differences. It's a necessity. I mean, this should have been the priority. I can see it very clearly now. Before, I used to say something like, 'This needs to be done' but now it's a must.

While defining DI, all the participants either independently mentioned the six elements of DI or did so when specifically asked to name them. The expressions they used in their definitions, as while presenting the DLPs they prepared, made it evident that they were familiar with these concepts in the context of DI practices.

Ayşe, the most knowledgeable participant already had the conception of the six DI elements. However, in her example of differentiation for learning profile before PD, she did not explicitly mention the term learning profile. After the PD, she

incorporated the term "learning profile" into her definition of DI as one of the areas encompassing student differences.

Ayşe: Not only for children with disabilities, but also among typically developing children, even if they learn at the same pace or have the same level of intelligence, it is important to consider different perspectives, different interests, and different learning profiles, in my opinion.

Ayşe demonstrated growth in her understanding of readiness in the context of reading development, integrating key aspects of reading progression into her statement about the assessment of readiness.

Ayşe: Especially after the sessions we did together, I've researched a bit the theories of learning to read. Readiness is important, especially readiness for reading and writing. It is crucial to correctly understand and recognize this in students. It needs to be identified first. For instance, aspects like phonemic awareness, what we call phonological awareness, and moving toward fluent reading as well as progressing through the leveled stages of reading must be considered by the teacher. ... Following this, the lesson planning, and if necessary, differentiated lesson planning, should be determined based on these readiness levels, primarily focusing on their level of readiness.

Ayşe's statement reflects a deepened understanding of the concept of readiness, particularly in the context of reading development. By linking readiness to specific components such as phonemic awareness, phonological awareness, and progression toward fluent reading, she demonstrated an ability to connect theory to practice. Moreover, her emphasis on identifying readiness levels before planning instruction underscores her recognition of the foundational role of assessment in DI.

She also identified the three elements of a lesson that can be differentiated as content, process, and product. This indicates that Ayşe had already integrated some DI elements into her practice, and had some knowledge of DI theory before the PD. However, participating in the PD program prompted her to refresh her understanding of it and articulate the terminology.

Ayşe also emphasized the flexibility of DI, which can be considered an indication of her deepened understanding, and aligned with the core characteristic of

DI as an educational philosophy rather than a method with rigid rules and procedures.

Ayşe: First and foremost, we can begin by differentiating for student readiness. Alternatively, differentiation can be based on their interests or learning profiles. This allows us to adjust the process, modify the content, or vary the product. We can choose to use one approach alone or combine two. For example, I might differentiate the product based solely on readiness, or I could differentiate both the content and the product using readiness as the sole factor. Alternatively, both the content and the product could be differentiated based on either readiness or interest. By using these variations, we can effectively address the needs of the learning group and meet their learning objectives.

As for assessment and DI strategies, Ayşe shared her need to consistently explore different strategies for differentiated instruction. This indicates her growing awareness of the need for flexibility and diversity in both instructional and assessment practices to effectively cater to students' individual learning profiles, readiness levels, and interests. By acknowledging the necessity to explore these strategies, Ayşe demonstrated a commitment to refining her approach to ensure it remains responsive and effective in meeting the needs of all learners.

Before the PD, Bianka's understanding of the DI elements such as readiness, learning profile, content, and process were not directly linked to DI. Instead, she viewed these elements in a broader context as integral components of student-centered quality instruction. However, after the PD, her comprehension expanded, and she began to recognize and apply these elements within the context of DI.

Bianka: We developed a lesson plan tailored to students' readiness, interests, and learning strategies. In this process, we divided it into three components: content, process, and product. In terms of content, the teacher takes on a more passive role, while in the process, the students are more actively engaged. The product phase is also an element of evaluation, where the students produce tangible outcomes.

Bianka's statement reflects a comprehensive approach to differentiated instruction, emphasizing differentiation for readiness, interests, and learning strategies. Her acknowledgment of dividing the lesson plan into three key

components—content, process, and product—demonstrates an understanding of how each element can be tailored to meet students' diverse needs. The distinction she made between the teacher's passive role in the content phase and the students' active engagement in the process phase highlights her growing understanding of these two components, which were previously challenging to differentiate during the PD sessions. Additionally, Bianka's recognition of the product phase as both a form of evaluation and a tangible outcome shows her understanding of its role in DI.

Bianka: For instance, I was wondering if they had learned. But if the product is well-designed, at the end of the teacher's plan, we can truly see whether the child understood through the product.

Moreover, just like Ayşe she incorporated the stages of reading development in her statements regarding readiness.

Bianka: I think a teacher needs to be aware of all the stages. For example, I'm not a classroom teacher by background, but I've been in this profession for three years now. We assess the child based on the second-grade learning outcomes, but maybe there's a gap from preschool that needs to be addressed. It's important for this gap to be identified early on, and all teachers need to be aware of it. The teacher should be aware that, for example, if a child skips syllables, what should be done, or if a specific challenge arises.

Through the PD, Bianka gained a deeper insight into the continuum of reading skills and the necessity of incorporating this understanding into her lesson planning and teaching strategies. This new understanding allowed Bianka to better assess and address individual student needs, fostering a more holistic approach to differentiated instruction that takes into account the full spectrum of reading development.

Additionally, in her definition of DI, Bianka referenced her previous practice of removing some students from the classroom to provide individual support.

However, after the PD, she expressed doubts about the necessity of this approach:

“Before, I used to have the children study by taking them outside the classroom. We

used to take them out individually, but now, is there really such a need for that?”

Bianka’s reflection reveals a significant shift in her understanding of DI at the end of the PD program. Previously, her practice of removing students from the classroom for individual support suggests a more traditional, one-on-one approach. However, after engaging in the PD, Bianka now questions the necessity of this practice, indicating a growing recognition of the potential benefits of keeping students engaged within the classroom setting. This change in perspective reflects her evolving understanding of how differentiation can be effectively integrated, fostering a more inclusive and collaborative approach to addressing individual needs without isolating students.

As for the learning environment, Bianka highlighted the challenges of cultivating a DI culture in the classroom. She acknowledged the complexity of establishing clear rules and a structured atmosphere conducive to DI, emphasizing the time and preparation required to ensure that students fully understand and internalize the expectations.

Bianka: I wonder if I can establish classroom rules. Can I provide that culture to the students in that class? I have doubts there. How much time will it take for them to accept this? I think I need to prepare well for this preliminary work. If I don’t do the preliminary work well, the planning during the lesson will likely be disrupted, and achieving the goal will become difficult. This is what worries me. But by focusing on the preliminary work, teaching the students how the activities will be conducted, or how the assignments and instructions will be implemented, they will realize it. Through repeated trials, the students will accept it. It will be challenging at first, but I think they will learn.

Her comments reflect a balanced approach: while she acknowledges the challenges, she remains optimistic about the long-term benefits of setting clear expectations and preparing students for the learning process.

Bianka’s comment about the role of assessment depicts her understanding of the crucial role assessment plays in differentiated instruction.

Bianka: If the teacher doesn't follow up on this [student progress] the student won't progress forward or backward. They will get lost in the gap in between. Following up on this, ensuring systematic work, having clear timeframes, and adjusting based on the child's needs or taking notes accordingly might help.

She underscores the necessity of continuous monitoring of student progress to prevent students from becoming stagnant or lost in the learning process. By ensuring clear timeframes and adjusting instruction based on the students' individual needs, Bianka shows a solid understanding of formative assessment's role in guiding differentiation and supporting personalized learning pathways. This proactive approach is key to ensuring that every student progresses according to their readiness, which is a central tenet of DI.

Bianka emphasized the necessity for teachers to be familiar with DI strategies, noting that such knowledge is crucial for enriching lesson content and tailoring it more effectively to meet students' diverse needs: "We also need to know the strategies, such as exit cards, task cards, and stations. Because if teachers are familiar with these, they can enrich the content of their lessons more effectively."

Her focus on the importance of teacher familiarity with these strategies underscores that the successful implementation of DI requires educators to be well-equipped with a range of methods to support varied learning styles, interests, and readiness levels.

As for the changes detected in Canan's interview comments, she had mentioned in her pre-interview only three elements, all student related aspects of DI: readiness, interest, and learning profile, for which she had not used the particular DI framework, but rather in a general sense as essential components of high-quality, student-centered instruction. Regarding the three classroom elements, i.e. content, process, and product, she had not referred to them before the PD. However, after the PD, she began to recognize and incorporate all six elements within the particular

framework of DI, which can be interpreted as an indication of the development of her DI knowledge

Canan: We were doing it based on their readiness, interest and learning profile. Regarding content, it wasn't entirely clear for me before, but now, if a teacher is going to conduct instruction or group work, we can specify this in the content when planning. We can outline the main points of the lesson and determine whether there are objectives to be achieved by the child within the content. Later, in the process, we select the methods to achieve these objectives outlined in the content. In the product section, we assess these objectives in a manner that can be evaluated through a tangible outcome. We attempt to observe or evaluate it by obtaining a product.

It is possible to infer from this statement that Canan now grasped most of the DI elements, except for the process phase. It appears that she was beginning to conceptualize the process phase within DI, though there was still room for deeper understanding. Her reference to choosing paths to reach the outcomes or goals indicates an awareness that the process phase involves selecting specific strategies and approaches to help students achieve learning objectives.

Canan also benefitted from the PD regarding developmental stages in reading, which is fundamental in differentiating literacy instruction for readiness.

Canan: I used to think that focusing more on letter awareness and teaching letters and blending them was more important for teaching reading and writing. However, after this training, I realized that introducing fundamental skills or developing things like vocabulary—building a rich vocabulary—are just as important as other teaching competencies. I now believe that more emphasis should be placed on pre-reading activities.

Canan's reflection illustrates a significant shift in her understanding of literacy instruction. This novel understanding of the developmental stages of reading highlights her growing ability to differentiate instruction based on student readiness levels, ensuring that a more comprehensive and well-rounded approach to literacy instruction.

Moreover, Canan realized that flexibility is a core feature of DI as an educational philosophy rather than a strict set of rules or procedures. She now

recognized that the differentiation of content, process, and product can be adjusted based on students' readiness, interests, or learning profiles, allowing for a more dynamic and adaptable approach.

Canan: So, each section can be tailored to their readiness, interests, or learning profile. We can adjust them accordingly. It's not necessary for one of them to be. I saw that it can vary according to our purpose; I realized it's more flexible.

As for assessment, Canan emphasized the critical role of the teacher's observational skills in effectively implementing differentiated instruction. She recognized that to tailor instruction based on students' readiness, interests, and learning profiles, teachers must be able to carefully observe and assess their students.

Canan: The teacher needs to have good observational skills because we separate students based on their readiness, interests, and learning profiles. To do this effectively, strong observation and analysis are required. I think both good observational skills and experience are necessary to guide students toward appropriate activities.

Canan highlighted the importance of formative assessment in DI, where teachers continuously monitor student progress and make adjustments to instruction. Her comment illustrates an understanding of assessment as a dynamic, ongoing process, integral to providing the individualized support that DI promotes.

Canan: The teacher needs to have good observational skills because we separate students based on their readiness, interests, and learning profiles. To do this effectively, strong observation and analysis are required. I think both good observational skills and experience are necessary to guide students toward appropriate activities.

Canan also emphasized the importance of student interaction and engagement within the learning environment, highlighting the value of DI strategies such as learning stations and small group interactions to cultivate a collaborative and active learning atmosphere.

Canan: I believe it is very important for students to interact with each other and learn within their environment. For this, activities learning stations or various interactive small group activities should be implemented. I think the

more children take an active role in the process, the more they will learn. This approach will undoubtedly lead to active learning.

Her statement demonstrated her expanding grasp of a differentiated learning environment as well as DI strategies, highlighting their importance in fostering a supportive and interactive classroom. Her observation that the more children are actively involved in their learning, the more they will benefit, reflects her understanding of active learning as a key component in supporting diverse student needs.

Finally, for Didem, it was possible to detect a general understanding of three DI elements, readiness, content, and process, much like Bianka and Canan, as characteristics of high-quality, student-centered lessons, rather than the components of a differentiated classroom. She had not mentioned the other DI elements, i.e. interest, learning profile, and product. In her post-interview, on the other hand, she discussed five elements, leaving out only the learning profile.

Didem: We can tailor our approach according to students' interests, readiness, and characteristics. ... During the planning phase we differentiate in terms of content, process, and product.

However, in her lesson plan, Didem differentiated the product based on the learning profile. So, when asked if she used the learning profile in her DLP, she replied:

Didem: Yes, I used this in the thing... actually, I used it in the product, but this developed completely spontaneously. I mean, the way children express themselves, their learning profile, I learned this from you, thank you. ... In the product part, I offered choices. Those who wished could select their preferred table; for instance, those inclined to draw could choose one table, while those interested in acting could choose another.

Her explanation of offering choices in the product phase, such as selecting drawing or acting, demonstrated her ability to incorporate students' learning preferences and modes of expression into her lesson design. This suggests that while

she may not have initially articulated the learning profile in her post-interview, she effectively implemented it in practice, marking an important step in her understanding and application of DI.

As for readiness, Didem mentioned the importance of understanding the stages of reading development to differentiate instruction for readiness. She emphasized that teachers must have a thorough knowledge of these stages to effectively assess and support students' literacy development.

The teacher must have a thorough understanding of the stages of reading and writing. They need to know this in order to get to know the children and continue working at a level appropriate for each child. I am someone who tries to involve myself in every new thing. For example, I saw that I was very lacking in this area. I realized that I was mixing up these stages. I saw this very clearly. The stages have a specific order, they have priorities. Something should come first, something later—this is important. I saw this very clearly in this study. I thank you for contributing to us with such a study. I think this should be the foundation.

Reflecting on her own practice, Didem acknowledged her previous lack of awareness in this area and emphasized that she had been confusing the stages of reading and writing, highlighting the significance of the order and priorities within these stages.

Didem stated that the product component was the easiest to plan for her: “While preparing my plan, only the product section was very easy for me. I was able to complete it very quickly.” However, she reflected on her difficulty in understanding of the components of content and process: “I had difficulty distinguishing between content and process. In fact, I had mixed them up, but I separated them later.” She also shared her intention to improve her understanding in the near future: “I need to improve myself. I need to know when I should include something in the content section and when it should be part of the process. I should

feed myself with different sources.” This statement highlights Didem’s awareness of her areas of growth and her intention to further develop her understanding.

Didem finally referred to the challenges posed by trying to establish a differentiated learning environment, especially during the initial phases. She anticipated that the first month or so would be particularly difficult as students adjusted to new routines and expectations.

Didem: Of course, I will struggle at first, until it settles with the students. For example, I might face challenges during that first month or month and a half. Things like, 'I want to be in their activity,' or 'I don't want to be separated from them,' or 'My friend doesn't want to be with me.' I will face these kinds of classroom difficulties.

Table 39 provides a summary of the participants' knowledge of the six DI elements, based on their pre- and post-interviews. In terms of readiness, interest, and learning profile, the participants demonstrated notable growth in their understanding of these key elements of DI. Initially, the participants, except for Ayşe, displayed general awareness of these concepts in the pre-interviews, by the post-interviews, they had gained an understanding of these elements in the DI framework. Their growth in this area reflected a deeper comprehension of how to tailor instruction to address students' readiness, interests, and learning profiles, highlighting the impact of the PD in enhancing their ability to integrate these principles into their classrooms effectively.

In terms of the lesson components—content, process, and product—the participants showed significant progress in their understanding and application of these elements specifically in the DI framework. In the pre-interviews, only Ayşe exhibited an understanding of them in the DI framework, while others had general awareness. By the post-interviews, all participants demonstrated a stronger grasp of how to differentiate content, process, and product based on students' readiness,

interests, and learning profiles. This development highlights the impact of the PD program in helping the participants recognize the importance of tailoring lesson components to meet diverse learner needs, and incorporating flexibility in their planning to support more individualized and effective instruction.

Table 39. Participants Knowledge of DI Before and After the PD Program

DI Elements	Pre-Interview				Post-Interview			
	Ayşe	Bianka	Canan	Didem	Ayşe	Bianka	Canan	Didem
Readiness	X	x	x	x	X	X	X	X
Interest	X	-	x	-	X	X	X	X
Learning Profile	X	x	x	-	X	X	X	X
Content	X	x	-	x	X	X	X	X
Process	X	x	-	x	X	X	X	X
Product	X	-	-	-	X	X	X	X

x: General awareness

X: DI specific knowledge

6.3.2 Findings based on PBL principles

As discussed in Chapter 3, the PD program is designed based on the problem-based learning principles. This section presents the findings on participants' perceptions of the PBL design principles with respect to their learning experiences, organized under six design principles. Data for this analysis was collected through the post-interview questions conducted at the end of the second cycle PD implementation. Additionally, representative excerpts from the sessions are included when relevant, to provide concrete examples of how design principles were embodied.

6.3.2.1 Design principle 1: Self-directed learning

Self-directed learning (SDL), one of the PBL principles that guided the design, was operationalized through a series of structured steps. The process was initiated by the presentation of the PBL problem to the participants, who analysed it to identify their learning issues. Following this, they conducted SDL research for the learning issues they determined together, and completed tasks using this information. Ultimately, they applied their newfound knowledge to address the problem effectively (Savery, 2015).

The weekly tasks provided after the sessions to be completed by the following session, were self-directed in that they were specifically designed to address the learning needs identified through the participants' PBL problem analysis. The participants had the opportunity to choose from various subtopics in the research and presentation tasks, using both the resources provided by the program and those they found independently. Additionally, the program included both asynchronous and synchronous collaborative group activities. The participants were encouraged to complete the tasks to the best of their abilities, with the assurance that I would

provide support if needed. Participants were also given feedback and opportunities for self-reflection to assess their own self directed learning processes.

The sub themes that emerged for the first design principle included participants' SDL experiences, time spent on the SDL tasks, and the challenges faced by the participants. Participants elaborated on how the SDL tasks influenced and evolved their learning experiences. Bianka highlighted her learning through research: "I came across a lot of sources while researching, and there I encountered things I didn't know." Canan, on the other hand, shared that her learning process through the weekly tasks became increasingly manageable over time, stating:

Canan: Initially, I struggled with the tasks when I encountered concepts I didn't understand. However, after learning them, I realized I was capable of completing the tasks. I felt a bit confused about the concepts as I worked through them and their differences, but once I grasped the material, I was able to clarify those distinctions as well. In essence, I progressed through learning. By the end, I appreciated the insights I had gained and the knowledge I had acquired.

Canan's statement provides a profound reflection on her SDL journey, beginning with her acknowledgment of initial struggles when encountering unfamiliar concepts. This struggle is a relatable experience for many learners and underscores the realistic challenges inherent in the SDL process. Her transition from confusion to recognizing her capability to complete the tasks highlights how SDL empowers participants to confront difficulties and discover their potential for growth through independent effort.

The SDL process was scaffolded for the participants by providing translations, taking into account the limited resources available in Turkish. While they were encouraged to independently seek out resources, the participants were also provided with a variety of materials relevant to their research tasks. The participants confirmed that, although their searches were limited, they actively sought additional

materials on their own. For example, Bianka described her process: “When I was unsure whether something was a process or content, I consulted additional references for clearer definitions. Similarly, Canan shared “I looked at the provided sources, and beyond that, I also wanted to do some research on my own, even if it wasn’t very systematic.” Didem mentioned downloading two additional articles and a presentation by a PhD student, which she found insightful and offered to share with me: “I can share these with you as well, though you may already have them.” Bianka highlighted how she developed her skills in searching for information on the Internet. As she became more adept at expressing her research needs more clearly, she was able to access a broader range of high-quality resources.

Bianka: When I wanted to look into something related to teaching, I didn't know exactly how to articulate it. Now, these lessons have supported me in that regard. When I do a search, I can express my queries with clearer terms, which allows me to reach more and better sources.

Bianka's experience underscores the potential of SDL in empowering learners to take ownership of the learning goals, and effectively navigate their learning needs.

While the participants' individual resource searches may not have been extensive, they still served as a positive indicator of SDL within the context of professional development. These efforts of engaging in independent research reflect the participants' initiative and willingness to take charge of their own learning processes.

Time management was expressed as a challenge to SDL. Didem commented about the time management challenges associated with the SDL tasks, focusing on the advantages of timely completion, stating: “Having completed the PD, I believe that if we were to engage in a similar activity again, we would aim to finish our tasks on the very first day. This would allow us to receive your feedback in a timely manner.” Her statement underscores a perceived challenge with time management

during the PD, suggesting that delayed task completion may have limited opportunities for timely feedback. Canan expressed similar difficulty with time management, stating: “I realized I struggled, since I didn’t do it on time and left it until the end”. Ayşe also stated, “Honestly, I was unable to deliver my presentation because I couldn’t complete my tasks due to time constraints because of my job at the school.”

Although participants reported challenges related to time management, they still found the tasks to be manageable. Bianka expressed that the tasks were adequate and feasible, stating, “I thought it was sufficient and good. Even if we didn’t have much time, they didn’t take an excessively long time.” Canan, on the other hand, acknowledged that although the tasks were not particularly exhausting, she faced difficulties especially during the personal DLP development stage. She attributed this struggle to her lack of planning, affirming, “Otherwise, the time given for the tasks was sufficient.” These reflections highlight the adequate amount of SDL tasks but also underscore the need for participants to develop effective time management strategies to maximize learning opportunities in self-directed contexts.

The language barrier, another challenge to SDL, was addressed by Bianka, stating, “I struggled while preparing our presentations because I have to search in English when doing research online, and since my English isn’t very good, I mostly rely on translation. However, the translation is not always reliable.” Bianka's comment underscores the necessity of searching information in English due to the limited availability of resources in Turkish. This highlights a significant challenge faced by participants in SDL tasks, as language barriers can impede access to essential information for particular research areas. This challenge was considered in the design phase of the PD. While my ultimate goal was for participants to take the

initiative in discovering their own resources for the self-directed learning tasks, I recognized the limited availability of materials in Turkish. Consequently, as a facilitator, I provided a variety of resources during the professional development sessions to support their learning.

Regarding the participants' future intentions for SDL, their expressions during the post-interview reflected an inclination towards continuing the SDL practice beyond the PD. Didem expressed her intention of future collaboration as a self-directed learning practice, stating: “When we encounter difficulties, we’ll reach out to you or Ayşe, as she is more experienced than us. We will continue exchanging ideas to develop ourselves further”. She also expressed her intention to continue self-directed learning after the PD, independently refining her understanding and skills by seeking diverse resources, stating: “I need to figure out what to include in the content and what to include in the process. At this point, I need to enrich myself with different resources.” Ayşe also shared her intention for future SDL, stating: “I need to keep the agenda a bit fresher. In assessment and evaluation, I need to explore different assessment tools a bit more.” Bianca’s statement about her improved ability to independently identify and seek out relevant resources reflects her future intention to engage in self-directed learning:

Bianca: For example, when I wanted to look up something related to teaching—like a strategy or something to learn—I didn’t know exactly what or how to phrase it. Now, these lessons have helped support that a bit. For instance, I can search for 'differentiation' or look up something specific.

The findings from the post-interview data support that the design of the PD program promoted SDL in accordance with the first PBL design principle. In addition, this design seems to have empowered the participants through the process, by allowing them to take ownership of their learning via structured steps that included problem analysis and identification of learning needs, as well as researching

information, and applying knowledge to address an ill structured real-world problem. During the program, the participants engaged in SDL tasks that were designed to meet their learning needs. Their reflections on the SDL tasks revealed not only the learning but also the challenges they faced, such as time management and language barriers which can be considered in the design of future PD initiatives.

6.3.2.2 Design principle 2: Use ill structured real-world problems

A diagnosis-solution type of PBL problem was designed and used in this PD program. As the PD started with problem analysis, and proceeded through its solution, the PBL problem's relevance to participants' actual teaching contexts was crucial. Two sub-themes emerged from the post-interview data for this design principle: Relevance of the PBL problem to the participants' own situations, and helpfulness for solving future real classroom problems.

The analysis of the post-interview data revealed that the participants found the PBL problem closely resembling the challenges they faced in their teaching. Canan noted, "These are issues we genuinely face in classroom settings. Having students of varying levels—this is something we encounter constantly throughout our teaching careers." Similarly, Didem remarked, "This is a situation we might come across in real life." Bianka elaborated, "Everything that happened in that fictional classroom also happens in my own class. One student doesn't recognize letters, while another reads fluently, reads quickly, comprehends, and progresses rapidly." This feedback underscores the alignment between the PBL problem and authentic classroom dynamics, enhancing the problem's relevance and practical applicability.

When asked about the likely effects of the process of finding solutions to the PBL problem, which culminated in developing a DLP for the fictional classroom, the

participants pointed out the applicability of what they have done in the PD to their teaching practice. Canan commented: “Finding solutions to this [problem] will significantly alleviate the issues we will face in practice later on. We consciously addressed these issues, after all.” Didem also agreed: “We now know what to do in a situation like this, and in everyday life, classrooms already parallel this.”

These comments illustrate how the PBL problem solution process served as a meaningful and reflective experience, enabling participants to draw connections between theoretical concepts and their practical applications in real classroom settings. The insights gained from this experience have the potential to empower teachers in their ongoing professional journeys, equipping them with the tools and perspectives necessary to navigate the diverse challenges they encounter in their educational environments.

6.3.2.3 Design principle 3: Promote collaboration

The sub themes that emerged from the data included balance of collaborative tasks, collaborative group dynamics, benefits of collaboration, challenges of collaboration, and intention of future collaboration. These sub themes collectively represent the key aspects of the participants' experiences of collaboration during the PD program, offering insights into the interplay of structure, dynamics, and outcomes within the collaborative process.

Balance of collaborative tasks:

The PD process incorporated collaborative SDL activities, conducted both asynchronously and synchronously, as well as direct instruction methods, such as expert lectures and facilitator presentations. When asked about the balance between the sessions based on collaborative tasks vs direct instruction, the majority of the

participants indicated that the balance was appropriate. Canan and Bianka stated that these two were well balanced. Ayşe also found the PD balanced, noting the advantage of being in a small group: “Honestly, since we weren't a very large group, I think it was very advantageous. I believe the balance was good.” However, Didem expressed a preference for more active, collaborative sessions and offered a suggestion:

Didem: Of course, the interactive format was better. The presentation itself becomes a waste of time. Yes, it was well-prepared, but if we could have read it ourselves and then discussed how we could enhance it or what changes might contribute, that would have been more effective. For instance, we wouldn't lose time on the presentation itself, and we could communicate our ideas more quickly.

While this is a reasonable suggestion, its practicality is questionable.

Implementing such an approach would require participants to engage in additional SDL tasks, which, given the challenges they already faced in managing these tasks, could place an additional burden on them. The success of this approach would depend on the participants' readiness and ability to independently analyze the material beforehand and actively contribute to the collaborative discussions. Nonetheless, this feedback highlights an opportunity for improvement, suggesting that future PD designs could focus on creating more opportunities for active engagement and peer collaboration.

Collaborative group dynamics:

The participants generally expressed feeling comfortable working within the group, pointing out their fellow participants' openness to learning, active engagement in collaboration, and open communication which led them to share their ideas without fear of judgment. They also noted the heterogeneous composition and the small size of the group as positive aspects.

Didem's observation of openness to learning captures the active engagement of the teachers: "Now, I don't know if you selected these five teachers deliberately, but they were all educators who put effort into innovation, change, and education." Ayşe noted, "I think they were very open to learning. Everyone was ready to learn, open to sharing, and receptive to feedback. In that sense, we were an advantageous group."

The following is an excerpt from session 3, showcasing a moment where participants voluntarily shared and requested resources for DI. This interaction highlights their self-directed learning and genuine enthusiasm for developing their knowledge and skills in DI.

Ayşe: By the way, I have differentiated instruction presentations from the PD that I attended two years ago. Most of the resources are in English. It includes many strategies, products, tools, and everything. I will share this with my friends.

Facilitator: Okay. Thank you so much.

Ayşe: It's in English, but you can also make use of visuals a lot and use Google Translate for some things. I will also try to upload the sources to the shared folder.

Bianka: Could you also send the names of those books? Or the authors?

Ayşe: Of course. (Session 3)

Active participation was also noted as a characteristic of the PD group. Ayşe stated, "It was a group where everyone was actively involved and responsibilities were shared." Canan described the group's active collaboration as a richness:

Canan: There was interaction not only between the group and the program facilitator but also among the group members themselves during the activities. For this reason, I found it very productive and felt that I was in a rich learning environment.

The following excerpts from Session 5, where the participants collaborated while preparing the 'Reading Evaluation Checklist, and Session 6, after watching a video of a differentiated classroom, depicts active participation.

Didem: Groups similar objects, groups, or objects that are named or shown.

Ayşe: Did you say "named"? You said it, right, Didem teacher?

Didem: Yes, does the student group the objects that are named, according to their common features?

Ayşe: She groups the objects. Yes. Then she recognizes everyday objects and answers questions related to stories.

(Session 5/Collaborative preparation of the “Reading Evaluation Checklist”)

This exchange demonstrates active collaboration, as participants engage in dynamic dialogue to clarify and refine their understanding of the task at hand. This back-and-forth interaction reflects a collaborative effort to co-construct meaning and ensure alignment in their understanding of the “Reading Evaluation Checklist.”

Canan: Yes, the children were very focused on completing the task. I really liked that. They also knew exactly what they needed to do. I noticed a systematic plan in place there. In my own work, I don't always have such a systematic environment. Sometimes, we face issues like, "Teacher, what are we supposed to do?" That's the biggest challenge. Being this well-organized is great, but it seems to be tied to prior preparation. I think I might be neglecting the preparatory work a bit. This is a shortcoming for me. There was such a wonderful working atmosphere among the children. They knew exactly what to do.

...

Didem: There's a strategy related to grouping, isn't there? That could be seamlessly integrated into something like a station activity. The child chooses the group that feels closest to them or suits their level. A natural group forms that way.

Facilitator: If the child has self-awareness about what they know and don't know, that's amazing. Let them choose their own group. Wonderful... It's not always necessary to group students based on readiness. Sometimes, there will be mixed groups where they can learn from one another. That flexibility, as we call it, is one of the fundamental principles.

Canan: I was going to ask about that. For instance, if a student in a lower group doesn't want to be there, it might cause issues. They may want to work with other groups too.

Facilitator: We won't have such issues because they won't always be in the same group. Otherwise, what happens? It becomes entirely about separating the children, which goes against the philosophy. Ayşe, would you like to add?

Ayşe: Of course, when carrying out activities like these, what Canan mentioned earlier—the introduction to the activity—is very important. It's crucial to first present the task to the children properly

(Session 6/After watching a video of small group activity)

This conversation showcases active collaboration as participants share observations, reflect on their practices, and seek clarification on implementing

strategies. This collaborative atmosphere fosters deeper understanding and allows for diverse perspectives to inform practice.

Open communication was another point collectively highlighted by the participants as they described their collaboration experiences in the PD sessions. Each participant referred to the open exchange of ideas which contributed to a productive and trusting environment. Didem emphasized the importance of listening and expressing thoughts openly, fostering a positive environment even with unfamiliar group members.

Didem: We were a very positive group. It is important to listen to each other, and clearly express any positive or negative thoughts we have. It's essential to be open rather than holding back for fear of hurting someone's feelings.

Canan noted that the enjoyable interactions facilitated deeper connections and curiosity among participants:

Canan: The positive aspects included that we established good communication among the group members. We were interactive, and that was enjoyable. Even though I hadn't known any of these people beforehand, the collaborative work led us to get to know each other better and sparked our curiosity about one another.

Bianka highlighted the supportive nature of their exchanges, allowing for honest feedback without fear of offense.

Bianka: Each teacher expressed themselves clearly and engaged in a supportive manner with one another. We didn't hold back out of concern that a teacher might be hurt or upset; rather, we progressed openly, sharing our appreciation and feedback honestly.

Ayşe also reflected on her comfort in sharing ideas about her prior experiences with differentiated lessons, which greatly contributed to the group's rapid progress.

Ayşe: Having participated in the development of various differentiated lesson plan templates and applied them before, I identified some headings that I had used previously but which we didn't utilize here. I was able to express these freely and comfortably. Overall, we adopted a successful approach that facilitated quick progress and collaborative work.

Together, these insights illustrate that open communication among the participants made them feel comfortable during the collaborative learning process.

The heterogeneous structure of the group was also noted as a positive aspect of the participants' collaboration. Bianka highlighted that the diversity within the group brought together different experiences and perspectives, which enriched everyone's learning process.

Bianka: Ayşe's willingness to share her knowledge was invaluable to me. Didem was a teacher who had taken on an administrative role, which made it challenging for her to observe the classroom effectively. However, this situation prompted me to reflect on how I would conduct that lesson. It encouraged me to think about my planning process. I felt that everyone supported each other throughout this experience.

Ayşe's reflection underscores the value of having a group with varied levels of readiness for DI and different teaching experiences. Despite the differences, Ayşe felt the group was both heterogeneous and harmonious, as everyone was open to learning and committed to contributing.

Ayşe: Having a group with members at different levels—those who had heard of differentiation but never implemented it, those hearing about it for the first time, and those like me who have been practicing it for a long time—was very beneficial. This diversity naturally necessitates differentiation from time to time, but I believe we were a harmonious group; we were heterogeneous but well-aligned. Everyone was open to learning and did their best. It wasn't just about our readiness but also our varied experiences. For example, we had a novice teacher, one working in early childhood, and another participant who currently didn't have a classroom.

Ayşe also expressed satisfaction in contributing to the group as a knowledgeable participant of DI. She valued the opportunity to support other participants by sharing both her understanding and practical applications of differentiation: "Sharing my experiences and knowledge about differentiated instruction was very rewarding for me." She also emphasized that she benefited from working with this group:

Ayşe: Joining this group and participating in this team has helped me feel more up to date. As I shared my insights, I found myself thinking, 'We can do this here too.' Observing different applications and seeing how others understood these concepts made me realize, 'Oh, it shouldn't be approached this way,' or 'Yes, this is a valid perspective.' This experience has refreshed my viewpoint on this teaching method.

In the following excerpt from session 4 where Bianka advises on managing classroom presentations in a large class. Ayşe, drawing on her experience, shares a structured approach that includes peer assessment, active listening activities. Her contribution highlights her role as a knowledgeable and experienced member of the group.

Bianka: Can I ask a question to Ayşe teacher? When conducting a lesson based on student presentation, considering the class is very crowded, how do you manage the process? We want everyone to express themselves, but since all 20 students want to participate, even if we divide it over days, it can take a long time. How do you balance that? ... I'm not sure what approach should be taken, based on your experience?

Ayşe: Thank you Bianka. Here's what we do. The student giving the presentation selects a peer to evaluate them. We provide a peer evaluation form. Additionally, the presenter also evaluates how well their classmates listened to them. I provide that for every book presentation. And I also give them small A5-sized sticky notes, not A4 sheets, so they can note down books that catch their interest. We plan the schedule at the beginning of the year. We give the whole calendar to the students and tell them, for example, "Your book presentation is on March 27th. Prepare accordingly for March." (Session 4)

Overall, it can be concluded that diverse participant profiles, variety of teaching experience and varied degrees of knowledge in DI seemed to enrich the collaborative learning environment

Benefits of collaboration:

As for the benefits of collaboration, the participants mostly stated benefitting from the other participants' viewpoints and feedback. Bianka and Ayşe particularly highlighted the value of multiple perspectives, which fostered a supportive environment for sharing knowledge and reflecting on DI teaching practices. Bianka

stressed the importance of collaboration among teachers, noting that their mutual support was beneficial because the issues and challenges they face are often similar.

Bianka: I think the teachers were supporting each other there, which was beneficial because the issues and challenges they face are often interconnected. Most of the elementary school teachers are concerned about the behaviors of the children they are working with, and they implement plans accordingly. However, they worry about whether the children will be able to follow through. When teachers share that they are successfully doing something—such as, 'I provide this guideline more clearly, or, I do it this way'—it motivates the other teachers and shows them that it is possible to achieve that as well.

Ayşe also highlighted the value of embracing different perspectives, noting how they enrich discussions and foster a deeper understanding of the topics at hand:

Ayşe: We brainstormed, and it was wonderful to discover perspectives that I hadn't noticed, as well as those recognized by others. While I might envision something in a certain way, another colleague might offer additional insights or highlight a perspective I hadn't considered.

Following is an excerpt where Bianka asks Ayşe's opinion about the difficulty level of an activity, and Ayşe responds, serving as an example of how participants benefit from each other's feedback.

Bianka: Let me get your opinion on this. ... I thought, which is more challenging for a child: sequencing the topic in order or the comparison part? For someone who understands what they read, would the comparison be more difficult, or the sequencing?

Ayşe: In the seminar Dr. Nalan Babür shared with us about reading theory. It seems like it was one of the steps, and from what I know, text comparison is something that activates higher-level thinking skills. For example, this week was our book presentation day. ..., one of the children read a book called *The Mystery in the Forest*. That immediately reminded me of a character from a book we had read before, and I felt the need to ask the children, "Which book does this resemble?" I thought they'd say one, but suddenly three different books came to their minds, and three different characters from three different books. (Session 8, presentations of individual DLPs)

In summary, the collaborative experiences shared by the participants highlighted the significant benefits of diverse viewpoints among teachers. By actively engaging with one another, teachers not only enhanced their own

understanding but also fostered an environment where collaborative efforts lead to effective problem solutions.

Challenges of collaboration:

Regarding the varying levels of participant engagement in collaboration, Bianka referred to the differences in participant contributions during the collaborative process: “Some participants were more active, while others were more passive. This is, of course, influenced by their home situations. Women's responsibilities don't end at the workplace; they often extend into the home.” Ayşe, on the other hand, shared her concern about dominating the sessions: “I didn't want to dominate those discussions. However, there were times when I felt a strong urge to contribute, which made me worry that I might be overwhelming my friends.” Despite this, Ayşe's concern was not echoed by the other participants, who found her contributions helpful.

Ayşe also expressed time restriction, meeting once a week, as a challenge of collaboration during the PD.

We are in different environments and connect once a week, whether through meetings or messages. We can have a meeting once a week in the evening, and of course, maintaining this can be a bit challenging. It's difficult to ensure continuous productivity and sustain the same level of engagement consistently.

While the participants acknowledged challenges in collaboration, these did not overshadow the benefits it offered. These challenges can be addressed in future implementations of the PD by the facilitator, with a focus on session timing, duration, number of sessions, and the facilitation of collaborative tasks to enhance engagement and effectiveness.

Intention of future collaboration

As an indicator of their positive collaborative experiences, all four participants expressed a willingness to continue collaborating with the other participants in the future. Ayşe stated: “I definitely think so [collaborate in the future]. It would be great if we could also have opportunities to meet face-to-face from time to time.” Canan expressed her desire for future collaboration: “I would like to meet or connect with these friends in my future life. A positive communication dynamic has developed, and I would really enjoy continuing with such collaborative work.” Didem also reflected a strong commitment to sustaining collaboration beyond the formal PD process:

Didem: We will definitely stay in contact whenever we need it, and our experienced colleague Ayşe will guide us. When we encounter challenges, we will reach out to you or Ayşe, as she has more experience than us. We will continue exchanging ideas to develop ourselves.

Bianka expressed eagerness to apply her learning, connect with first-cycle participants, and meet with the DI participants in a follow-up program where attendees could share their implementations and reflections from the past year. This enthusiasm underscores her commitment to professional growth.

Bianka: I feel that if another program is organized, most participants would attend. Everyone learned something new and wants to implement the method. As we discussed, some had concerns related to parents, and everyone was focused on their own next steps. It would be beneficial for teachers to gain new perspectives and perhaps connect with those from the first cycle. Next year, it could be great to talk about what everyone has been doing.

In conclusion, the participants' enthusiasm for future collaboration reflects the strong sense of community and support fostered through this PD experience. Their shared eagerness to continue working together—whether through face-to-face opportunities, ongoing communication, or future programs—highlights the positive impact of their collaborative experiences.

6.3.2.4 Design principle 4: Tutor as facilitator

As the facilitator of the PD program who led the nine-week PD process, my facilitation received positive feedback from participants regarding my support in meeting their needs. They emphasized creation of a positive learning environment, accessibility, clear guidance, timely and constructive feedback, the impact of probing questions on learning, and the supply of resources. Additionally, they acknowledged my guidance throughout the PD process and noted the value of probing questions in encouraging deeper engagement and reflection.

Regarding the creation of a positive learning environment, Ayşe emphasized the reassurance provided by the facilitator: "In this program, you gave us the confidence that if we were ever late or missed something, or couldn't do something, it wouldn't disrupt the entire program." Ayşe elaborated on this by sharing a personal example of how this reassurance played out in practice.

Ayşe: For example, I was supposed to prepare a presentation on strategies, but I just couldn't find the time to create the presentation I wanted. However, you reassured me by saying that I could still contribute and share my experiences. Of course, not fulfilling my task was my responsibility, not yours, but at the same time, you gave me the opportunity to share what I wanted. This was important to me, as it allowed me to do so without much anxiety.

Through this example, Ayşe underscored the value of an environment where participants felt safe to participate openly and engage in learning without undue stress, a key factor in fostering collaborative and productive learning experiences.

Didem was the one who emphasized accessibility and responsiveness:

"Whenever we got stuck, we reached out to you without hesitation. You were always available" and "You responded to our questions, and provided positive feedback. You clarified any points we struggled with and offered support."

As for the guidance through the process provided by the facilitator, Canan pointed out the role of guidance in clarifying the path and ensuring focused progress:

Canan: As a program facilitator, you knew exactly what you were doing, and because you communicated this so clearly to us, we were able to understand exactly what we needed to do. I realized that I never got lost along the way. If there was a goal, we were able to move toward it with confident steps. This had a very significant positive impact on me.

Regarding the feedback I provided as a facilitator, Canan highlighted my input on the DLPs prepared by the participants: “The work we did on the lesson plans was very constructive and practical, as it allowed us to identify and address any gaps or issues directly. This immediate feedback enabled us to make adjustments on the spot.”

Bianka also emphasized the effect of the feedback provided to improve and enhance her work:

Bianka: Everything was expressed very clearly. For example, sometimes something could just be labeled as ‘very good,’ but you stepped in and said, ‘It’s good, but should this part be like this?’ and offered suggestions. I think this was helpful in terms of guidance and was very productive.

Ayşe, on the other hand, highlighted the asynchronous feedback I provided on the shared document:

Ayşe: You were very active in providing feedback both on the (shared) document and during the sessions. I think everyone really appreciated it. Additionally, during the presentations, both your feedback and the effort our friends put in, dedicating time to it, were also valuable.

In sum, the feedback I provided as a facilitator was recognized for its positive impact on the participants' learning process, particularly for its immediacy, constructiveness, and helpful suggestions in both asynchronous and synchronous formats.

As for the impact of probing questions, participants highlighted how those encouraged attention to overlooked points, helped maintain focus, and fostered

interaction. Didem specifically noted that the questions served as helpful reminders, particularly for aspects that might have been missed or areas requiring further attention.

Didem: I think the questions were a good reminder for us, especially on points we might have missed or areas we needed to focus on. Sometimes, when everyone shared their opinions, small nuances were overlooked. You used the questions to direct our attention to those points. It was really helpful at that moment. It was beneficial.

Canan emphasized the importance of the questions in maintaining concentration, noting that they helped keep the group's attention focused. She shared that reflecting on these questions enabled participants to better adapt to the process.

Canan: The questions were important for keeping our attention focused. Once we thought about those questions, we were able to adapt better to the process. I believe they were necessary questions. I was positively affected by them.

Ayşe highlighted how the questions fostered interaction by transforming the process into a more dynamic experience. She observed that this question-and-answer format brought the environment to life, particularly in the absence of physical observation, making the sessions feel more connected and participatory.

Ayşe: It made us more interactive. It wasn't just about doing and presenting and then being done. You asked, 'Why did you think of this, or what about this part?' Since you couldn't directly observe us physically, the more we went into detail and engaged in a question-and-answer format, the more the environment came to life for us. (fostering interaction)

Overall, the participants found the probing questions to be a valuable and effective tool, helping them stay focused, address overlooked points, and foster a more interactive and collaborative learning environment. The following are examples of probing questions from two sessions.

Facilitator: For example, if we think of the comprehension at the preschool stage, as understanding a story being read to them, how does the lack of vocabulary affect the children?

Didem: The child doesn't understand the story. I express it using words they know. For example, ... I think, "This child won't know this word." Since it's

a word I haven't taught before, I either remove it or rephrase it in a way they can understand.
(Session 3)

By asking about the impact of vocabulary on comprehension at the preschool stage, I prompted participants to consider how language barriers affect learning, specifically story comprehension. This question challenged participants to think critically about their instructional practices and the potential barriers children face in understanding texts.

Facilitator: What kind of learning environment is it? We say it's a safe learning environment. What do you think a safe learning environment is like? What do we mean when we say a safe learning environment? Let's talk about this a bit.

Didem: The child feeling secure both emotionally and physically. Psychological security is also very important. Being in an environment where there are no feelings of anxiety, fear, worry, or negative emotions, and where the child feels good.

(Session 4)

Here the probing question encouraged participants to reflect on the concept of a safe learning environment, moving beyond surface-level understanding to explore its deeper implications. Didem's response highlights how probing questions can stimulate thoughtful discussion and encourage participants to articulate and expand on their understanding of essential educational concepts.

The sharing of resources was also recognized by the participants as a significant contribution to their learning from me as the facilitator. Ayşe remarked, "The presentations and sharing of resources were very helpful. In this sense, the folder you created for us was beneficial. We could easily share and upload materials there, which was useful for us." Bianka, on the other hand, stressed the multiple modalities of the resources:

By providing the translation of videos, you were able to clearly and concretely demonstrate differentiated practices to us. I believe that in doing so, you also differentiated instruction. You guided us to all the relevant learning sites, played the video, explained through slides, and provided verbal

explanations. It included visual, verbal, and auditory elements—all of which were great. I think you taught effectively because you engaged with our questions and provided answers.

These insights highlight the importance of providing materials and incorporating multiple modalities for facilitators in professional development sessions.

In conclusion, the feedback from participants highlights the effectiveness of my role as a facilitator throughout the nine-week PD program. They appreciated the creation of a positive learning environment, where reassurance and clear guidance played a pivotal role in fostering engagement without stress. Accessibility and responsiveness to their needs, especially through timely feedback and support, were also highlighted as key factors that contributed to the learning experience. The probing questions were recognized as essential for maintaining focus, addressing overlooked points, and promoting a more interactive and collaborative atmosphere. Furthermore, the sharing of resources, both asynchronously and during live sessions, was highly valued by the participants for its contribution to their learning. The variety of resources provided, including videos, slides, and verbal explanations, as well as the use of multiple modalities, helped participants to engage with the content in a meaningful way. These reflections underscore the importance of a supportive, adaptable, and resource-rich approach to professional development, highlighting the positive impact of structured feedback and interaction in enhancing learning outcomes.

6.3.2.5 Design principle 5: Use distributed scaffolding

In the design of the PD program, learning activities, resources, and facilitating tools—weekly reviews, a cloud-based shared folder (Google Drive), an instant messaging platform and the website—were provided to scaffold the learning process within the PBL framework. Participants were asked to reflect on the impact of these scaffolds. When participants reflected on the impact of these scaffolds, the following sub themes arose in their responses: scaffolds fostering structured, condensed learning; scaffolds fostering collaboration; scaffolds fostering concept concretization through practical application; multimodal and accessible resource sharing; and scaffolds guiding the learning process.

Scaffolds fostering structured, condensed learning:

The expert lecture and the presentations were found to be beneficial as structured, condensed learning opportunities. The expert lecture conducted in the second session by Dr. Nalan Babür, whose expertise is in reading acquisition and reading disabilities, was intended to address a learning need identified by the participants during the PBL problem analysis, given the limited availability of resources in Turkish, and also served as a transition to the main DI content. I also delivered presentations focused on reading development, assessment, and differentiated instruction to provide foundational knowledge on these essential topics. Additionally, the participants themselves prepared and presented the DI elements as SDL tasks. The participants generally found the expert lecture and presentations to be beneficial for their learning and highlighted the value of the direct, condensed delivery of relevant content.

Didem found the expert lecture valuable in terms of providing clear and useful information, saying, "It was very valuable; she explained the steps and

provided useful information." Bianka shared, "The expert's participation in the lesson and her presentation opened up a different perspective on reading for me."

Regarding the presentations, Canan emphasized the direct delivery of the required information: "As the program facilitator, the presentations you provided were very helpful because you directly gave us the information we needed at each step. We were able to learn exactly what we needed, and all our questions were answered."

Overall, the participants appreciated the expert lecture and presentations for providing valuable insights, direct guidance that supported their understanding and engagement. Although not fully aligned with the self-directed learning nature of the PBL framework, these presentations were included in the PD to accommodate the teachers' time constraints for SDL practices and to address the challenge of limited Turkish resources.

Scaffolds fostering collaborative learning

Discussion activities prompted by visuals-videos-questions, collaborative work on the development of reading evaluation checklist and the DLP template, and the joint development of a DLP for the fictional classroom stood out as scaffolds fostering collaborative learning

Group discussions based on a visual or short video, and prompting questions, were meant to set an induction to help the participants transition from their home environment to the PD content and share their perspectives. Canan, referred to these activities as engaging and enjoyable attention-gathering elements at the start of the sessions: "They were interesting activities that caught our attention right at the beginning of the lesson. We had fun discussions, and I really enjoyed them."

These group discussions were found to be a valuable means of sharing perspectives through collaborative engagement among participants. Bianka emphasized the importance of understanding different perspectives, noting, “Discussing [the visuals] helps you understand how teachers think in those moments.” Didem echoed this, adding that the discussions positively influenced her learning experience.

Didem: It was highly beneficial for my learning because everyone brought a different perspective, and we were able to generate new ideas from each other's insights. A point I had missed was valuable to a friend, so they raised it, which prompted me to consider the issue from a new angle. This was extremely helpful in sparking new ideas.

The participants collaboratively developed a reading Evaluation checklist to gain a deeper understanding of the stages of reading development, intended for use in assessing their students' reading skills. Didem, the kindergarten teacher, reflected on her initial challenges in the task due to her lack of familiarity with specific outcomes and standards. She shared how the collaborative process supported her learning:

Didem: In this task, I wasn't very effective because I wasn't familiar with daily learning outcomes and other related aspects. However, the work my colleagues prepared served as an excellent guide for me, helping me improve in this area. I struggled due to my lack of familiarity with the outcomes, but with the support from both my friends and you, I was able to make progress and develop.

Didem's reflection emphasizes the role of collaboration in overcoming individual knowledge gaps and enhancing professional growth. The peer support she received not only helped her engage with the task more effectively but also fostered a sense of shared learning within the group. In the following extract from the collaborative development of reading evaluation checklist an item is being discussed to collaboratively overcome a knowledge gap.

Ayşe: Actually, this is part of the Turkish lesson curriculum. When does it appear? For example, it's included in the first grade. By the second grade, it moves on to activities like writing and explaining short sentences or

expressions based on visuals, in a more detailed manner, focusing less on the meaning of individual words and more on sentences and topics. But in the first grade, it's about predicting the meanings of words. Visuals are given, and the meanings of the words represented by the visuals are matched.

Facilitator: So where and how will the meanings be matched? I didn't quite understand this.

Canan: Actually, this needs to be done on the worksheet. Let's say there are four visuals, for example, a glass. Below, it says "a tool used for drinking water."

Facilitator: Okay, got it. So we're still in reading, then. Great, I misunderstood this.

Ayşe: This is already the stage that comes after learning to read... We're evaluating comprehension. (Session 5)

Another collaborative work by the participants, the joint development of a DLP template aimed at deepening their understanding of differentiated instruction elements and supporting them in designing their own DLPs, also seemed to have functioned as intended, as was evident from both the data from the sessions and the post-interviews. The following is a sample extract where Ayşe suggests an alternative organization for the development of the template.

Ayşe: What if we did it like this? Product slash, process slash—organizing it that way. Because otherwise, it'll get too lengthy... It feels like the plan will turn into an enormous document if we detail everything. It's impossible to fill in everything. Since we can't fill in everything. ... For example, if it's the product, the teacher could mark it, highlight it, or put a check next to it.

Facilitator: Could there be a lesson where we differentiate both? Content and something else?

Ayşe: Then they'd mark both, like product and process. Instead of creating a separate section for each, they could choose or mark it—highlighting it somehow, leaving a little clue for themselves. That way, they can flag what they'll focus on without adding an extra section to the table, just under that heading.

Canan: But in cases with multiple factors, it might become unclear. For instance, was the differentiation based on the product? Was it differentiated with small groups during the process? Or was it content-based? It could get a bit confusing.

Ayşe: Maybe we could add a small notes section next to it where they can jot things down. For example, "Here I'm differentiating both the product and the content." They could write a quick note to themselves. We'll go into more detail during implementation anyway. We're already inputting a lot of data above. I feel like if someone else looked at it, they'd immediately understand what I did.

...

Facilitator: What do you think?

Canan: I'm wondering if it might get confusing later on. When we delete the sections we didn't fill in afterward, it probably won't feel too lengthy. I mean, we're not obligated to fill in everything. We can complete the parts that are useful to us and remove the empty ones later. (Session 6)

This conversation highlights collaborative problem-solving as participants actively share ideas and work together to refine the template. Later, when Ayşe was reflecting on the development of the DLP template during the post-interview, she highlighted the efficiency of the collaboration:

Ayşe: Since I've previously been involved in the development of various differentiated lesson plan templates or applied them myself, I could see that there were some sections I'd used before but didn't include here. I was able to point these out and comfortably express them. In terms of moving forward quickly and working collaboratively, I think we followed a successful path. I also believe we made good progress quickly.

Ayşe's comment demonstrates the benefits of collaborative work in enhancing the quality and speed of decision-making. Her ability to recognize gaps in the template based on her past experiences and her comfort in expressing these observations contributed to the group's success in developing a more comprehensive and effective DLP template. The collaboration allowed for the integration of diverse perspectives and expertise, which also accelerated the learning process.

As for the development of a DLP for the fictional classroom, this activity was perceived as beneficial in the learning of the DI elements. Bianka pointed out during the post-interview that the collaborative development of the DLP helped her concretize the new DI concepts:

Bianka: As I mentioned, the content part always felt very abstract to me. I would even forget it conceptually at the beginning of the lessons. The other teachers had already figured it out, but I struggled. However, working through it concretely together once, then writing a similar plan individually and discussing it, made me feel good. That anxiety I had went away.

Bianka's reflection highlights a key advantage of collaboration: it provides an opportunity for individuals to work through challenges collectively, leading to

greater clarity and confidence. By collaborating with others, Bianka was able to make sense of the abstract content, which helped her overcome her initial struggles and anxiety. The shared experience of working through the material together allowed her to better understand the concepts and feel more capable in applying them independently. The following is an extract of collaborative development of the DLP for the fictional classroom, focusing on identifying the learning outcomes for the three readiness groups.

Canan: So, group one would do visual reading. Would it be appropriate to write it as a learning outcome for group 1?

Ayşe: Yes, yes, I think so.

Bianka: Should I write it here?

Canan: Yes, the learning objective. These are Didem's students. Now, group 2.

Bianka: Can it be something like "combines what they heard or read with an appropriate visual."

Facilitator: At this point, reading is involved with your students. Think accordingly. Do you have students who are still struggling with reading?

Bianka: No.

Facilitator: Then we're focusing on reading now.

Ayşe: Yes.

Bianka: It could be about matching what they read with a visual. For example, they might read slowly and not fully understand, so we could give them short sentences and have them match those with the pictures. Should I write that down?

...

Bianka: For group three, could it be something like: "Retelling the text in the order it occurred"

Ayşe: Will they first arrange the sentences, or will they work with visuals? Our main goal is visual reading, or is it understanding what they've read?

Bianka: Understanding what they've read.

Ayşe: Right, we've written "understanding what they read." Okay. So, they'll rearrange the mixed-up sentences in order... or number them, or rewrite them in order. (Session7)

This exchange illustrates how participants worked together to adapt and refine learning objectives tailored to the needs of different student groups. Through their collaboration, the group ensures that the learning objectives are well-defined and tailored to the varying levels of readiness within the classroom.

Scaffolds fostering sense-making through practical application

The collaborative development of the reading evaluation checklist, the DLP template and the DLP itself discussed above were also cited by the participants as activities that fostered making sense of the concepts and were found effective in applying their newly acquired concepts and knowledge.

Referring to the development of reading development checklist, Bianka, shared her previous classroom experiences of focusing on grade-level expectations rather than individual student needs:

Bianka: I always tried to make reading more fun for the kids or tried to adapt it to second-grade outcomes. Going back to the beginning and assessing from there has been beneficial for me. I believe I will follow those stages from now on.

This reflection underscores the shift from a one-size-fits-all approach to a more individualized focus, aligning with the principles of differentiated instruction. Ayşe, on the other hand, mentioned that the checklist development sparked ideas for expanding the process to other areas:

Ayşe: For example, we created one for literacy, and maybe we could do something similar for math, like counting and the four basic operations. Later on, there could be another one focused on problem-solving, or perhaps a subscale related to reading comprehension. Honestly, it gave me ideas for other things as well.

This demonstrates how the activity not only clarified the process of creating a reading checklist but also encouraged participants to think creatively and expansively about how the concept could be adapted across subjects. Both reflections emphasize how the activity clarified key concepts and knowledge, importantly, inspired participants to extend their thinking and teaching practices beyond the immediate task. This shift in mindset represents a crucial step in applying differentiated instruction in diverse contexts.

The DLP template-building process was also described by participants as making abstract DI concepts more tangible, structured, and applicable to their lesson planning. Didem appreciated the structure the template provided, saying: “It's nice to have a template because it provided us with good guidance on where to write what. Improving it was a good activity. It made our work easier and added practicality.”

Canan described her initial challenges and later sense of clarity:

Canan: While creating the template, everything felt very unclear for me. I didn't fully understand it—I couldn't quite grasp how it would differ from a regular lesson plan or to what extent. So, I really struggled with the template preparation phase. But now, looking at the current version, everything has actually fallen into place clearly.

Bianka highlighted the template's role in solidifying her understanding:

Bianka: It helped me understand it in a more concrete way. For example, if you had just suddenly asked me to create a differentiated plan, I probably wouldn't have been able to do it. We discussed all these concepts, but it only fully clicked for me when we applied them within the template. For me, process and content were separate ideas; interest, learning profile, and readiness were also separate concepts. Bringing all of these together in one lesson plan made everything clear.

These participant comments highlight how the template-building process helped them make abstract DI concepts more concrete, organized, and relevant to their lesson planning.

Similarly, the participants also expressed that jointly developing a DLP for the fictional classroom based on the template they created allowed them to deepen their understanding of DLPs and their components, despite the absence of immediate classroom implementation. The shift to applying these plans to their real teaching contexts further solidified their learning and provided them with the tools to create more effective and tailored lesson plans for their own students.

Bianka highlighted how the collaborative DLP preparation activity helped make previously abstract concepts more tangible for her: “As I mentioned, the

content part always felt very abstract to me. I would even forget it conceptually at the beginning of the lessons.” She also added how she used the DLP for the fictional classroom as a reference to guide her own planning and build her confidence: "It was good to have a ready draft, as it relieved me. I revisited it to make sure if it was in the content or the process phase. In that sense, it was guiding for me."

Didem mentioned that the collaborative DLP provided helpful support for her learning: “Preparing the plan was instructive for us. It served as a guide.” She also added that not being able to implement it was a negative side of it:

Didem: Since it was a hypothetical situation, we couldn’t fully assess its pros and cons. If we had the chance to implement it, we might have realized some shortcomings or observed that the children developed in ways we hadn’t anticipated. The classroom and the plan were hypothetical, so we couldn’t see the advantages and disadvantages through actual application.

This reflection highlights the limitations of working with a hypothetical scenario, where the participants could not fully assess the practical implications of their plans. However, the participants' experience of developing a DLP for the hypothetical classroom provided an opportunity to collaboratively engage in the development process during the PD session. This exercise allowed them to familiarize themselves with the structure and components of a DLP, without the immediate pressure of real-world implementation. While the hypothetical scenario provided a useful framework for discussion and collaboration, the shift to creating DLPs for their own classrooms allowed the participants to ground their learning in their actual teaching contexts.

Supply of multimodal and accessible resources

The resources shared with the participants in the PD website and the shared folder (reading materials, checklists, a model DLP, presentations, and videos of DI classroom practices) were found sufficient and accessible by all four participants.

During the post-interview, Canan pointed out the variety of resources: “A rich set of resources was provided to us, including videos, activities, articles, and book recommendations on the website.” Ayşe also referred to the diversity of the resources, and added her own contribution: “I shared some materials as well, and they reached my colleagues. I’m not sure how much they benefited from them, but it was nice to share them in case they were helpful.” Ayşe's contribution of resources as a participant was especially valuable, as this PD aimed to create a collaborative group of teachers who would support each other within the PBL framework.

Bianka emphasized the value of the provided resources, particularly the articles, noting that while there is an abundance of materials online, many are either of low quality or, due to her limited English proficiency, she faces a language barrier. She said, “There is a vast amount of material available online, but not many high-quality resources, and there is a language barrier [since she doesn’t know English]. Instead of spending time on those, I used the articles you provided, printed them, reviewed them, and then based my presentation on that.” Bianka’s reflection highlights two important considerations for PD design: time constraints and access to quality resources. The time available for teachers to engage with resources is often limited, and ensuring that resources are easily accessible and appropriate for participants' language abilities is crucial.

The videos of DI in practice were particularly valued by the participants for envisioning the DI elements in practice, and offering clear examples that helped them better understand and apply the concepts in real classroom settings. Canan’s feedback highlights the value of visual learning resources in enhancing understanding and making the learning experience more tangible and relatable: “Canan: Watching the videos was more effective. It helped me become more aware

of the process and showed us more concretely what we were involved in. I found it to be a very useful learning tool.” Bianka also pointed out that the videos provided an experience that reading alone couldn't offer: When you showed us videos, we could see it concretely. It made it possible to understand the potential applications, something you can't fully grasp just by reading.” Didem suggested that incorporating more video examples could enhance the program's effectiveness by providing concrete, relatable illustrations of practices. This reflects a desire for more practical resources to support learning and implementation.

Didem: The application videos, like the one you shared most recently, should be included in almost every session. We should examine them and definitely exchange ideas about them during our meetings. This is a program that is rarely implemented. It is more common abroad, and there are only a few examples within the country. It would be better if there were more application examples in the form of videos.

These videos were incorporated into the PD as a design improvement following the first cycle implementation based on participant feedback. The second cycle participants' comments clearly underscored their necessity and highlighted their value as a significant improvement to the program. The pilot website created as a repository for the resources provided during the PD program, and participant-created artifacts, was intended to make these materials easily accessible to all participants. It was intended to grow and become more comprehensive through the contributions made during successive PD cycles. However, this component remained quite limited in practice. Due to the website's technical constraints and the participants' varying levels of technology skills, a cloud-based shared folder ultimately proved to be more convenient as the main repository, where articles were stored, and video links were shared directly. Nonetheless, the participants were encouraged to explore the website and access particularly the videos. The participants found the website functional.

Bianka commented:

Bianka: You had organized everything into sections, with videos, articles, and plenty of content. A teacher could go there and find whatever they needed. I think having that kind of resource available is valuable because I might forget some of this by the start of next term, and going back to the site to review and refresh the information would be very helpful."

Bianka's comment emphasizes the practical value of the website as a resource repository, noting its organizational structure and diverse content. She also highlighted the long-term utility of the site, particularly as a reference tool that teachers could revisit to refresh their knowledge and maintain continuity in their learning.

However, the participants mentioned that they had not visited the website frequently enough. Canan highlighted time limitations as the reason: "I wasn't able to make the most of the website. Since I didn't allocate enough time to it, I personally didn't benefit from it as much as I could have." Ayşe emphasized both the difficulties in accessing the website and the constraints posed by time limitations: "Accessing the website was not very easy, and uploading something there was also not very straightforward. Later on, due to our busy schedules and working in different areas, I couldn't visit it much." Didem mentioned not visiting the website at all: "I never got a chance to visit it. When I tried once, it gave an error, and after that, I didn't have another opportunity."

Overall, the website was designed as a central hub for resources, with the intention of growing and evolving through participant contributions over successive cycles. Although the website offered valuable content, including videos, articles, and other resources, its practical use was limited due to its interface as well as technical accessibility issues for the participants. These coupled with time constraints and limited technology skills led to alternative solutions.

The participants appreciated the ability to revisit the expert lecture and the presentations later via the shared recordings. They also highlighted the multimodal approach, which added variety and enhanced engagement. Canan mentioned that although she was absent, she found the expert lecture helpful after listening to it at a later time: “I was absent, but I listened to it afterwards, and it was very helpful. I'm glad I was curious and decided to check it out even though I wasn't there.” Bianka, on the other hand, highlighted the effectiveness of combining modalities in the presentations:

Bianka: I don't think just having text is very effective. Because after a certain point, attention can wander. But I think the presentations you made were good; you showed the text, asked questions, and even showed videos, which supported learning from the teacher's perspective. Even though we are teachers, we are actually students here.

Scaffolds for procedural guidance

The weekly reviews shared after each session summarizing the session and the upcoming SDL tasks, along with resources and guidelines was a design improvement already started in the first cycle, aiming to enhance clarity and provide participants with structured support for their own learning. The second cycle participants also valued the weekly reviews, stressing the importance of these letters as a tool for reflection, clarification, and guidance, supporting their ongoing learning and helping them feel more confident in their tasks. Didem stated that by revisiting the tasks and reflecting on the activities upon the receipt of the weekly review, she was able to identify areas she had overlooked and fill in the gaps:

Didem: It had a positive outcome because sometimes there were points I missed. With that letter, I had the opportunity to review again. For example, I realized, "Oh, we did this too, but I think I missed it at this point," and then I completed it myself using the resources. The tasks I had to do were sometimes forgotten due to the daily routine. Going back and reviewing was valuable for reminding me and recalling the past. These types of letters should definitely be part of these kinds of activities.

Similarly, Canan's comment also highlights the effectiveness of the review letters in both clarifying and reinforcing her understanding, as well as helping her gain a clearer sense of the expectations for the next class.

Canan: I was taking notes about what I needed to do, but having it directly specified in the letter was more helpful for me. It allowed me to identify things I had misunderstood or hadn't fully grasped through the tasks and summaries provided. The letters reinforced my learning and helped make what I learned in class more permanent. They also clarified the expectations for the next class, giving me a clearer sense of what was required. In this way, the letters were truly enriching.

Ayşe and Bianka emphasized the value of the review letters as a guiding tool throughout the process. Ayşe: "Receiving these letters was actually nice. We knew where we should focus on the work." Bianka highlighted the pivotal role of the letters in providing structure and clarity throughout the PD process.

Bianka: It provides valuable guidance. We refer to it to understand how we were supposed to approach tasks and what actions to take. The clear assignments of who would give feedback to whom were particularly helpful. Given how busy everyone is during the process, it's easy to forget specific tasks. Revisiting the daily logs and reviewing them helped me feel more confident and made everything much clearer.

Overall, the participants pointed out the value of the review letters as a means of reflection, clarification, and direction, which enhanced their continuous learning and boosted their confidence in completing tasks.

In addition, the use of a cloud-based service for a shared folder (Google Drive) and an instant messaging platform were also intended to ensure the smooth flow of the procedures during the PD program and were actively utilized throughout.

6.3.2.6 Design principle 6: Make use of reflection

The session analysis revealed that the learning activities prompted reflections in two primary areas: the participants' own practices and experiences, and their views and

understandings. The findings regarding this principle will be given under these two themes using excerpts of participant reflections from the sessions.

Reflection on own practices and experiences:

The participants' reflections on their own practices and experiences were particularly observed in two types of activities: group discussions prompted by visuals, videos, and questions, and expert lecture and presentations. The PBL problem analysis, the development of the DLP template, the collaborative creation of the hypothetical DLP, and the design of individual DLPs that followed also prompted the participants to reflect on their own practices, though to a lesser extent. These activities provided opportunities for the participants to examine their teaching methods, drawing connections between their prior experiences and the new concepts they were exploring, thus deepening their understanding of differentiated instruction. Here are some examples of participant reflections on their own practices and experiences as prompted by the activities. Canan's comment, following a video of differentiated learning stations based on readiness, highlights her reflection on the challenges of implementing level-based group work in her classroom.

Canan: I was having students work collaboratively in the classroom, but it definitely wasn't this kind of work. There were no level groups. Here, having level groups is different. I think this method is more effective for children. The differentiation based on level groups. I can't currently imagine doing this in my own classroom. It feels very difficult for me. I don't know if the class size is a factor, or if I'm just overestimating it in my mind. (Session 6, discussion activity prompted by a video)

Canan's reflection highlights the powerful role of videos in prompting participants to critically examine their practices and consider alternative approaches.

Bianka's comment reveals her critical reflection on the systemic and logistical considerations of implementing differentiated learning stations.

Bianka: I've never tried group work like this, with stations. However, what concerns me is that after setting up the stations, each student will be working

in a different group, and I might need to assist them or provide support when necessary. But for this system to be effective, the school as a whole needs to adopt it beforehand, and the entire structure should be established. (Session 6, discussion activity prompted by a video)

Ayşe's comment, during a discussion prompted by a visual, about her practice of accommodating both academically successful students and those who are struggling is a powerful example of how the discussion activities encourage reflection on participants' own experiences.

Ayşe: I often approach teaching with this perspective in the classroom: For example, there may be a student who is academically very successful—excelling in subjects like math, science, Turkish, social studies, and so on. They might meet or even exceed the learning outcomes for their grade level. However, they may want to engage with math through music, or by dancing, or perhaps through drawing. They could prefer learning in a different way altogether. On the other hand, there may be a student who is academically struggling, possibly below the expected outcomes. Yet, by recognizing and valuing their unique strengths, we can help them transform into a success story. (Session 3, discussion activity prompted by a visual)

The expert lecture and the presentations were also effective in prompting the participants to reflect on their own practices and experiences. Didem's account during a presentation by the facilitator is an example of an interactive presentation's role in helping participants relate to their past experiences and make sense of the content—DI in this case.

Didem: I went to a combined classroom. We had first, second, and third graders in one class, and fourth and fifth graders in another class in primary school.

Facilitator: Can you share a bit about your experience?

Didem: Yes, back then, we were using a sentence-based approach. The teacher never taught me the second-grade material. Once I learned to read, I continued with the third-grade curriculum together with the others. (Session 4, facilitator's presentation)

The facilitator's presentation prompted Canan to reflect on the competitive atmosphere in her classroom and consider how fostering a more collaborative environment could enhance her students' learning experiences.

Canan: In the classes I've worked with so far, there has been more of a competitive atmosphere than a collaborative one. Children come in with this mindset, as if they always have to surpass something or someone, and that 'something' is never themselves but always another student they've singled out. (Session 4, facilitator's presentation)

Again, Didem reflected on her teaching experience with her son, sharing examples of reading comprehension strategies she used, such as having him paraphrase the text in his own words and re-reading it for better understanding.

Didem: I used this technique a lot while working with my son. When he reads a paragraph, I stop him and ask, 'Did you understand what it's trying to say here? Now, try to express it in your own words.' If he's just guessing, I suggest we read it again, saying, 'We must have missed something; let's read more carefully. Close your eyes, take a deep breath, and read it again.' For something he's newly encountering, I'd have him read it two or three times, then explain it in his own words. That's how I make sure he understands. ... Or I use an acting-out method, where I guide him to connect the content with past experiences. (Session 3, facilitator's presentation)

During the expert presentation, Bianka reflected on her own reading acquisition, sharing insights drawn from her childhood struggles with reading.

Bianka: I learn best through practical, real-life experiences—that's my learning style. For example, when I struggled with reading, it reminded me of my own childhood. I didn't enjoy school, and I would always mix up the letters *b* and *d*. (Session 2, expert lecture)

All the PD learning activities referenced above seemed to have provided opportunities for the participants to examine their prior teaching methods and reflect on their own learning experiences. By drawing connections between these past experiences and the new concepts they were exploring, the participants seemed to deepen their understanding of differentiated instruction.

Reflection on own views and understanding:

As an embodiment of the sixth design principle—Make use of reflection—the reflective journal questions were sent to the participants after each session to guide them in reflecting on that week's content. When asked about the role of these questions in their learning during the post-interview, the participants pointed out how

the questions facilitated their reflection on their own understanding. Canan said "It provided a good opportunity to review the process again," while Bianka pointed out that "It helped clarify things in my mind. It was useful to revisit, reorganize, and recall what we did." Didem also underscored the utility of reflective activities in solidifying learning and creating lasting insights:

Didem: This type of activity should be included because it helps process the week through a mental filter. We revisit the key points, which in turn reinforces the essence of the work in our minds. It helps solidify the week's activities with clearer and more lasting insights, ensuring they stay with us. It serves as a summary, and I find it valuable for that reason.

Reflection on the participants' own views and understanding was a common theme across almost all the learning activities, including PBL problem analysis; group discussions prompted by the visuals, videos, and questions; expert lectures and presentations; development of the DLP template; development of personal DLPs; and reflective journaling.

The PBL problem analysis in the first session encouraged the participants to reflect on their views related to DIs. Bianka's reflection, drawn out by the PBL problem analysis, underscores her view of the complexities of managing a differentiated classroom, and lesson flow: "Classroom management will also be challenging. If we respond to each student's individual needs, it can disrupt the flow of the lesson plan. Teachers may find it difficult to plan in advance or provide support on the spot." Didem's reflection highlights her view about the demands that differentiated instruction places on teachers, especially in terms of preparation and energy.

Didem: The teacher has to provide individual instruction, and for this, they really need to put in effort, preparation, and time. It will be exhausting. Because in group settings, you can say, "Come on, read," or "Come on, write," and it can be grasped in a short amount of time with children who are at a similar level. But when each student is at a different level, this will require serious effort. (Session 1, problem analysis)

The group discussions prompted by visuals, videos, and questions, integrated throughout the entire PD program, played a significant role in encouraging participants to reflect on their views and understandings. In the first session, a discussion based on a video about collaboration led Ayşe to reflect on the roles of both students and teachers in fostering a collaborative learning environment. Her reflection demonstrates her understanding of the core values in collaborative learning—particularly the importance of a non-hierarchical structure where individuals can contribute according to their strengths.

Ayşe: Honestly, collaborative learning is really more of an environment without hierarchy, a space with a collective structure. Everyone contributes with their strengths, while getting support for areas where they need it from peers and collaborators. Here, whether we're talking about teachers or students, adults or children—regardless of the age or group within the learning community—each member should, in my opinion, have a good understanding of their strengths and areas where they need support. (Session 1, discussion activity prompted by a video)

Another video that was highly effective in promoting reflection on one's own views was about a DI strategy, learning stations. Bianka's reflection on the video highlights her awareness of the complexities involved in implementing differentiated instruction, particularly when it comes to organizing tasks according to varying levels of difficulty.

Bianka: For example, when we're setting up questions or tasks, we can categorize them as easy, medium, or difficult. But each group needs to be very carefully organized. I'm not sure if this is a stage that should come after some preliminary preparation. Since we're new to this, I think we'll gain more experience in applying it, and probably establish a more solid system in the coming years. (Session 6, discussion activity prompted by a video)

One of the questions designed to prompt reflection was about how students might react to differentiated instruction. This question prompted Didem to reflect on the social and emotional challenges children may encounter when adapting to new classroom structures, especially differentiated activities.

Didem: I don't think children immediately accept things warmly. They often question why someone else is doing something or if they are receiving more or less attention. They might start to feel jealous. I think we can overcome this through open discussion and explanation. It might take us a month or so to establish this and get the children adapted to the system. I think we'll have these kinds of dynamics in the classroom. (Session 7, discussion activity prompted by a question)

The expert lecture and the presentations conducted by both the participants and myself as the facilitator also prompted reflection on the principles and practices of DI. During my presentation on creating a safe learning environment, Ayşe reflected on the importance of fostering a classroom where mistakes are viewed as learning opportunities rather than irreversible errors.

Ayşe: a classroom environment where a teacher leads by conveying that when students make mistakes, it's not a real, irreversible wrong. You can make mistakes, but don't be afraid of them. I want you to see mistakes as an opportunity to learn. This understanding is not just communicated through words, but also through the way my students are able to understand. (Session 4, facilitator's presentation)

During Canan's presentation about self-assessment as a DI assessment tool, Didem reflected on the potential benefits and challenges of incorporating self-assessment in the classroom, particularly in terms of helping students develop self-reflection skills:

Didem: Where was I? Where have I come? How can I do this differently? This process of self-assessment might be beneficial in terms of enlightening the child and guiding them through the process. Also, there could be another aspect. The child is assessing themselves, and the teacher is assessing the child. Is there a difference between the two? For example, through this process, the teacher can observe and assess the child's self-assessment skills. (Session 5, participant presentation)

The expert lecture was also highly effective in prompting participants to reflect on their own practices. Ayşe's comment reflects the effectiveness of the expert presentation in prompting reflection and deeper questioning about the alignment between theoretical concepts and practical implementation.

Ayşe: Honestly, even just questioning—like, "Oh, is this really how it works?" or "Did this really happen here?"—was really valuable. It helped me reflect on the connection between what you've explained and what we've been implementing in practice. (Session 2, End of the expert lecture)

The development of the DLP template, also encouraged reflection on the planning of DI practices. The following reflection from Bianka highlights the advantages of a structured lesson plan template, which helps teachers observe instructional phases more clearly and refine differentiation strategies based on prior experiences.

Bianka: I believe that when writing the plan, we can sometimes see the stages more clearly, which can be beneficial. For instance, in the initial lesson plan we created, if something didn't quite work in a particular lesson, the teacher could add a feedback note, such as, "I tried this, but it didn't work." The following year, they could adjust the content accordingly, making slight modifications to better differentiate it. (Session 6, development of the DLP template)

Ayşe's reflection reveals her awareness of using the template not only to plan group tasks but also to document additional individualized support, emphasizing her attention to varied student needs within group work.

Ayşe: Here we could also specify additional tasks for each student to complete individually. For example, we could say, "You'll be part of this group, but you'll also complete this task on your own." We could actually detail these aspects here in the template. (Session 6, development of the DLP template)

The sharing of the personal DLPs the participants individually prepared for their own classrooms also promoted discussions, encouraging participants to reflect on their understanding. Ayşe reflected on the reading comprehension skills, referencing the reading theory shared in the expert lecture: "I think that comparison was one of the steps in the reading theory Dr. Nalan Babür shared with us. And, as far as I know, text comparison is something that activates higher-level thinking skills." Bianka reflected on the distinction between interest and learning profile, expressing her difficulty in differentiating between the two: "Well, in my opinion,

the concept of interest here is connected to the child's learning profile, but it also involves capturing their attention. However, as I sometimes mention, there are times when I struggle to fully grasp those concepts.” Her reflection sparked further discussion of these concepts among the group members. Upon a question about how she differentiated an activity in her DLP, Ayşe reflected on her approach: "Yes, they are all doing the same activity. The only difference is that they choose the content themselves. They don't select the words I've set for them. Instead, they form sentences using words they've chosen themselves."

After Canan's DLP presentation Bianka reflected on the role of the 'product' component in a DLP.

Bianka: I'm not sure if it's necessary or whether it should be done this way. I'll ask you about this now. When writing the product, I always considered this. For example, if our chosen topic is reading comprehension, I planned that the product for the children in these three groups should reflect their understanding of reading. Does it need to be like that here, or not? (Session 8, presentation of personal DLPs)

Her need for this clarification led to the discussion and deeper understanding of the 'product' as an assessment phase, both for her and the whole group.

In conclusion, the reflective activities integrated into the PD program played a crucial role in enabling participants to critically examine and refine their own teaching practices and views. The participants seemed to deepen their understanding of DI by revisiting past experiences, questioning existing methods, and considering newly acquired concepts.

CHAPTER 7

DISCUSSION AND CONCLUSION

7.1 Overview of the study

This DBR study was intended as a contribution to the limited and scattered implementation of differentiated instruction in Turkey. The need for such content has emerged from both my personal experiences in special education and general education settings, as well as a review of the literature. When I began this study, DI was not prominently featured in the instructional programs of the Ministry of National Education in Turkey (MEB, 2018). However, throughout the course of this study, it has made its way into the 2024 Turkish Education Model (Milli Eğitim Bakanlığı [MEB], 2024). Although differentiation has been recently included in the official curricula documents at all levels as 'enrichment' and 'support', the actual classroom implementation remains a fuzzy area for teachers.

A needs analysis was conducted during the initial phase of the study to identify teachers' perceptions, classroom practices, and learning needs related to differentiated instruction in the context of early literacy instruction. The analysis revealed the need for a PD program focused on differentiating early literacy learning.

The PD designed based on this needs analysis was intended to empower teachers to address learning challenges in their classrooms through differentiated instruction, helping them develop effective solutions tailored to the diverse needs of their students. To support this goal, PBL design principles were selected to guide the design and development of the PD program, as PBL has been proven to foster learning in context, enabling learners to find solutions to real-world problems (Ling, A., & Loy, K., 2007; Baden, M. S., 2003).

The PD program was delivered remotely via video conferencing to two separate groups of participants over the course of a school year, comprising two cycles. The first cycle was primarily analyzed in relation to the six design principles to identify necessary design improvements. Various data sources were used, including the researcher's field notes, the video recordings of the sessions, the participant post-interview responses, DI-Quest, and PD evaluation questionnaire.

The analysis of the second cycle focused on two main aspects: the participants' acquisition of content of the PD program, particularly the changes in their DI knowledge at the end of the program, their own perceptions of this change as evident in their self-reflection comments during the interview data, and how this learning experience was shaped by the PBL design principles.

In this section, the findings from the two PD implementation cycles are discussed in relation to the research questions, followed by suggestions for future practice, and the limitations of the study.

7.2 Changes in the participants' DI knowledge

The data collected during the second cycle of the study were analyzed to address the first research question, which focused on the changes in the participants' knowledge of DI at the end of the PD program. This analysis involved examining changes in the participants' description and application of DI concepts and principles over time. Evidence from session discussions, the lesson plans prepared by the participants, and their reflections in response to the interview questions showed how the participants' comprehension of DI evolved.

While all four participants demonstrated a foundational awareness of the purpose of DI at the beginning of the PD program, this understanding seemed

primarily anchored in a general approach to teaching rather than the specific DI framework, with the exception of Ayşe, who had prior exposure to DI through an online PD program she had participated earlier. The participants' references to student readiness, interest, and learning profiles, even though they did not use this terminology, suggested that they recognized the diversity of student needs. Yet their implicit references to DI elements such as content and process, and limited mention of product indicated an absence of a sound knowledge of DI elements and proactive application of DI in their practice. Additionally, the emphasis on creating an inclusive learning environment and building individual relationships reflected their awareness of the necessity of fostering supportive classroom dynamics, though concrete DI strategies and systematic use of assessment were only briefly noted.

The two lesson plans submitted at the time of the pre-interview demonstrated no incorporation of DI elements, even if the participants believed they did so. This discrepancy might have stemmed from an alternative understanding of a differentiated lesson—perceived as simply encompassing diverse, student-centered practice. Such alternative conception has also been noted in other studies (Çam & Acat, 2023; Kiley, 2011).

One of the two participants, who had shared their lesson plans, shared in a later session that she had held an alternative conception of DI before participating in the PD. Initially, she believed DI involved tailoring instruction individually for each student, which she found overwhelming and unmanageable. This alternative conception reflects one of the most common misunderstandings about DI identified by Dack (2019) that DI requires fully individualized instruction, with different learning goals for each student. However, after gaining a clearer understanding of DI, Bianka realized that DI was not about providing individual lesson plans for each

student but about creating flexible learning opportunities that cater to varying readiness levels, interests, and learning profiles within a group (Tomlinson, 2001). Therefore, after the PD, Bianka's understanding of DI shifted to a more scalable approach to support diverse learners without the impracticality she initially perceived.

This initial understanding provided a baseline for exploring the participants' growth in DI knowledge and application throughout the PD experience. Initially, the participants focused on remembering and understanding DI principles. They applied these concepts in collaborative tasks to deepen their comprehension, and ultimately develop their own DLPs and implement in their own classrooms.

During the PD sessions, readiness was the first and most frequently mentioned aspect of student diversity to be addressed. It was also the most differentiated aspect in the individual DLPs developed by the teachers. In the PBL problem analysis, which took place in the first session, the assessment of readiness was identified as the initial step in addressing students' needs and became the participants' first area of learning. The teachers' need for assessment tools was also emphasized in other PD sessions. Literature highlights that a deeper understanding and use of literacy assessment enables teachers to make more informed instructional decisions, ultimately supporting student progress (Munger, 2016; Putra, 2023; Webb, 2002). Assessing student readiness entails a strong indicator of teachers' intent to differentiate instruction, as highlighted by Coubergs et al. (2017). Another indicator of this commitment was Bianka's emphasis on the limitations of grade-level assessments, particularly their strict alignment with curriculum objectives, especially when students were performing below the expected grade-level benchmarks. This

emphasis reflected the teachers' genuine need to tailor instruction based on student needs rather than adhering strictly to the curriculum.

Interest, referred as student diversity in the earlier sessions was another DI element that was conceptualized in an alternative way by the participants. First, interest was regarded as attention-grabbing lesson content rather than addressing students' genuine interests. Second, the participants often interpreted learning preferences based on multiple intelligences as student interests. Actually, these learning preferences are categorized under the broader learning profile in the DI framework (Tomlinson, 2001).

Learning profile, the third area of student diversity discussed during the sessions was primarily employed in differentiating the product component in the participants' lesson plans. During the discussions on learning profile, the participants suggested that enriching students' learning profile repertoire was an important objective in itself, rather than catering to a specific learning profile. While this can be a valuable goal, research underscores that providing students with options for demonstrating their learning will foster greater engagement and autonomy—key elements in creating a supportive and effective learning environment (Tomlinson, 2001; Sullivan, 1993; Subban, 2006).

Regarding the lesson components, the most prominent issue was the participants' difficulty in distinguishing between content and process during the development of their DLPs. While they were able to differentiate content and process in practice—such as adjusting learning outcomes for readiness groups and incorporating active student learning activities—they found it challenging to correctly categorize these elements in the DLP template. Specifically, they struggled to identify content as the individualized learning outcomes (what) and the instruction

provided by the teacher (how), while recognizing process as active student engagement with the newly acquired content (Tomlinson, 2001).

During the discussions on the learning environment, several significant sub themes emerged. One prominent sub theme was the necessity for deliberate planning to establish and maintain a safe and supportive learning environment. Additionally, the participants noted the influence of peer reactions to differentiated instruction, highlighting how students' responses to varied tasks and group dynamics could either support or hinder the classroom climate. This teacher concern was also evident in the socioemotional challenges discussed by Dack (2019). Similar to the concerns described by Dack (2019), the participants in this study expressed uncertainty about how to structure classroom activities so that the students would not recognize which readiness group they belonged to, and how to create an environment in which the students would feel comfortable with the idea of differentiation. This teacher concern, which may hinder teachers from effectively implementing differentiation, was given significant attention and addressed thoroughly during this study. Classroom management was also highlighted as a crucial factor, with the participants emphasizing their need for strategies to effectively conduct small group activities, a challenge often associated with implementing differentiated instruction (Tomlinson et al., 1994). Another critical issue centered around the challenges posed by parents' competitive attitudes, which often prioritized individual academic success over fostering collaboration among students. These participant preoccupations and prior experiences were actively addressed during the PD sessions. These also stand out as critical considerations for the future design of professional development programs aimed at supporting differentiated instruction.

DI strategies and assessment emerged as perceived areas of growth for the participants at the end of the PD program. The participants expressed a need for more effective assessment tools, as well as a desire to expand their use of DI strategies to better accommodate diverse student needs. This aligns with the types of needs teachers most frequently report regarding integration of DI in their teaching (Melesse, 2015). This emphasis on assessment aligns with research on the importance of assessing and addressing readiness levels, learning profiles, and student interests in fostering an inclusive and supportive learning environment (Tomlinson, 2001; Subban, 2006). In terms of DI strategies, research highlights that preservice teachers recognize the significance of responding to learning differences but often lack the necessary strategies to implement these beliefs effectively in practice (McCray & McHatton, 2011; Wertheim & Leyser, 2002). The inservice teachers who participated in this study also expressed the need for effective DI strategies to address diverse learning differences. The other areas of growth identified by the participants included enhancing the clarity and structure of lesson planning, particularly, distinguishing between the content and process phases of a lesson. The participants also pointed out the need for more refined classroom management strategies, particularly in small group activities, to support collaboration and ensure that all students were engaged in the learning process.

For differentiation to be effectively and consistently applied during future practice, educators must believe in its value, feasibility, and significance, as well as have a clear understanding of how the approach operates (Dack, 2019). The participants' focus on DI strategies and practices as future areas of growth highlights their dedication to improving their instructional approaches and addressing the

diverse needs of their students, underscoring their commitment to ongoing professional development and adaptability in teaching.

7.3 PBL design and learning

This study was guided by sociocultural theory, which aligns with the learning sciences approach. By emphasizing the importance of social interaction and cultural context in the learning process, this research sought to explore how the collaborative learning environment established through PBL enhanced the participants' understanding and application of differentiated instruction. In the sociocultural framework, learning occurs in a cultural context and authentic learning environments (Danish & Gresalfi, 2018). In this study, the evolution of the participants' DI knowledge was made possible through collaborative tasks and discussions while finding solutions to a PBL problem that resembled their actual classroom setting. Each participant contributed their unique teaching experience and background, fostering a rich community of learners working toward a common goal. As they engaged in these collaborative efforts, the learning trajectory transitioned from a more scaffolded environment—where guidance and support were readily available—to the participants' individual implementations of DI practices. This progression allowed them to internalize the concepts and strategies discussed, ultimately becoming more confident and capable in applying differentiated instruction in their own classrooms. Below I will discuss the findings based on the program design, based on the PBL design principles which guided the design of the PD program.

The findings based on an analysis of the second cycle revealed that the principles of PBL were essentially instrumental in achieving the desired outcomes for teacher PD in DI.

Although self-directed learning (SDL), a key principle of PBL (Savery, 2015), guided the design of the PD program by closely following the PBL structure, scaffolding was provided to the participants, despite the SDL's requirement that learners search independently for learning resources (Bergamin et al., 2019; Thornton, 2013).

The rationale for this divergence lies in getting to know about the context and the circumstances of the participants. For these in-service teachers to participate in any kind of PD depended on much sacrifice on their part, particularly one that demanded much work on their part. When these and varying levels of SDL skills among the teachers were taken into account scaffolds were provided, as an effective SDL design should be adaptable to the learners' individual circumstances (Garrison, 1997). Resources, including translations from original sources, were provided due to the limited availability of DI resources in Turkish, as well as the teachers' limited time to research relevant sources (Bümen et al, 2012; Lohman, 2006; Hoekstra and Korthagen, 2011). The findings supported this design decision, as the participants indicated that having curated resources helped them engage more effectively with the content, reducing the challenges associated with time constraints and language barriers while still promoting their growth in SDL competencies.

Nonetheless, the participants continued to experience time management challenges in completing the SDL tasks, though they described the tasks as generally manageable. Being women—three of whom were mothers—was an important factor that affected the amount of time they were able to dedicate to the SDL tasks (Gündüz, 2010). This is a very important issue to consider in teacher PD programs, as female teachers make up the majority of the teaching population (Milli Eğitim Bakanlığı, 2023) Additionally, the language barrier in conducting a web search was

expressed as a challenge in SDL, which is a reality for many Turkish teachers. In a recent study of in-service teacher training, English was identified as one of the three areas in which classroom teachers required professional development (Okçu et al., 2023).

Making sure that the PBL problem used in the study was an ill-structured, real-world problem seems to have made it possible for the participants to design and implement a DLP tailored to the needs of their own classroom by the end of the PD program. The participants also indicated that this problem-solving process provided a valuable framework for addressing future challenges. This finding aligns closely with PBL theory, as Jonassen and Hung (2008) emphasized that authentic problems resembling real-life challenges faced by learners were critical for effective PBL. Moreover, research indicates that PD closely connected to actual classroom challenges is more likely to foster meaningful, sustained changes in teaching practice (Wei et al., 2009).

Collaborative group dynamics were mostly found supportive by the participants, who highlighted the group's positive characteristics as heterogeneity, openness to learning, active collaboration, and open communication. Studies highlight that diverse group composition brings varied perspectives, enriching the learning experience and encouraging deeper reflection and problem-solving (Wichmann et al., 2016, Cohen, 1994; Palincsar & Herrenkohl, 2002). Openness to learning, active participation, and open communication are crucial for creating a positive and supportive environment, where participants feel comfortable sharing ideas and receiving feedback, which leads to better outcomes in collaborative settings (Hmelo-Silver and Barrows, 2008; Vygotsky, 1978).

The participants highlighted that learning from each other's viewpoints and receiving constructive feedback were key benefits of collaboration. This aligns with research emphasizing that collaborative settings in PBL enhance learning by incorporating diverse perspectives and facilitating peer feedback, which together foster a supportive and reflective learning environment (Hmelo-Silver, 2004).

Complementary lectures and presentations were intended to balance the collaborative learning environments with structured instruction to ensure that the teachers can both learn new concepts and apply them effectively in their classrooms, as recommended in the literature (Hmelo-Silver, 2004; Darling-Hammond et al., 2017). The participants generally expressed satisfaction with the balance between these elements to support their development.

The challenges of collaboration expressed by the participants included varying levels of engagement and the limitation of meeting only once a week, and meeting exclusively online. Regarding varying levels of engagement, Bianka attributed the limited participation of some group members to their household responsibilities, particularly as women. This gender-based challenge in the PD became noticeable at times during the sessions, as participants faced time restrictions in completing self-directed learning tasks and in actively engaging in collaborative online activities, due to family obligations. This challenge was addressed through various scaffolds, such as establishing a common meeting time, providing extra time for task completion, sharing lecture and presentation recordings for later access.

Regarding the issue of equitable collaboration among the participants, Ayşe shared her concern about dominating the group discussions as a knowledgeable participant, especially during the initial sessions. Her efforts to balance her active contributions without overwhelming her peers was impressive. It was encouraging to

find that Ayşe's concerns were not shared by the other participants, as the other members mostly appreciated her insights. They often turned to her with their questions, highlighting her expertise and fostering a collaborative environment where she felt comfortable offering guidance. This dynamic reflected the positive aspect of having a group with diverse levels of knowledge and experience, where the more experienced members can support their peers without overshadowing the group's collective effort (Hmelo-Silver, 2004).

The participants' intention to sustain collaborative relationships can be interpreted as an indicator of the effectiveness of the program's collaborative structure. Research suggests that the continued desire for collaboration after a PD experience is a key outcome of a well-designed learning environment that fosters trust, mutual respect, and shared goals (Darling-Hammond et al., 2017).

The participants' positive views regarding the role of the facilitator in creating a supportive learning environment included my accessibility, the clarity and structure of my guidance, the probing questions, and timely, constructive feedback, as well as provision of resources to support their learning. This was crucial for the success of the study, as the facilitators in PBL play a key role in guiding and supporting collaborative knowledge construction (Hmelo-Silver & Barrows, 2006, Dolmans et al., 2005). My facilitation role was integrated into the design, however, when I examined the sessions, I realized that, as a novice facilitator in a PBL setting, I might have been overly controlling the process. The design also incorporated facilitator presentations to support learning, a practice supported in the literature (Hmelo-Silver, 2004). However, the reliance on these presentations could be reduced with a more experienced facilitator, a longer program duration, or a participant group more experienced with PBL (Hmelo-Silver & Barrows, 2006).

Another key aspect of PBL, distributed scaffolding, seems to have also positively affected the PD process. In this study, the participants were scaffolded in their transition from tutor-directed activities to more independent, self-directed learning. These supports included structured learning activities, access to resources, continuous feedback, and the facilitation of collaborative discussions.

While reflecting on the distributed scaffolds, the participants identified key aspects, including structured learning, collaborative engagement, concept reinforcement through practical application, multimodal and accessible resource sharing, and effective guidance throughout the learning process. These themes closely align with the core principles of PBL. Structured learning experiences act as scaffolds for SDL, by providing resources and support to help students engage in learning effectively, especially when they have not yet fully developed self-directed learning skills (Hmelo-Silver et al., 2007). Practical application, inherent in problem-solving activities, mirrors the essence of PBL where learners apply theoretical knowledge to real-world scenarios (Schmidt, Rotgans, & Yew, 2011). Additionally, resource sharing and the facilitator's guidance throughout the learning process further exemplify the role of scaffolding in PBL to support the participants' development and critical thinking (Dolmans et al., 2005). Regarding the professional development resources, the participants highlighted the need for more videos demonstrating practice of DI strategies. This request underscored the importance of providing visual and contextual examples of differentiated practices, which can offer clearer guidance for implementation. Videos showcasing real-world classroom scenarios would help bridge the gap between theoretical knowledge and practice, providing teachers with concrete examples to model, which is recognized as a key feature of effective teacher professional development programs (Darling-Hammond et al., 2017). Incorporating

such resources into future PD designs could enhance teachers' understanding and ability to apply DI effectively in diverse classroom settings.

Dolmans et al. (2005) stated that effective PBL curricula should be structured to evolve over time, beginning with more tutor-directed guidance and gradually transitioning to student-led learning as learners gain independence. The design of this PD program began with more tutor-directed learning activities, such as lectures and presentations. This transitioned to activities where the participants were more actively involved in SDL tasks, such as preparing presentations and collaborative development of reading development checklist, a DLP template, and a DLP for the fictional PBL classroom, all with the facilitator's guidance. Finally, the participants applied the newly acquired knowledge independently by developing individual DLPs for their own classroom environments. This progression from tutor-led to learner-driven activities aligns with the gradual transition from tutor regulation to student autonomy in PBL (Barrows, 1996; Dolmans et al., 2005).

Barrows (1986) highlights that active problem exploration activates prior knowledge, which not only aids understanding and retention of new information but also serves as a diagnostic tool for identifying misconceptions. This aligns with the PBL design principle of promoting reflection. By encouraging students to actively engage with the problem and reflect on their existing knowledge, PBL helps learners critically assess and correct their misconceptions, thus fostering deeper understanding and more accurate learning foundations.

In line with PBL's emphasis on reflection, the PD program incorporated specific activities designed to provoke the participants' reflective thinking, regarding their prior practices and experiences and their views and understandings, which deepened their engagement with the content. The group discussions conducted in

almost every session were particularly effective in encouraging reflection on the participants' own practice and experience. The key learning activities, such as discussions prompted by visuals, videos, and questions; PBL problem analysis; the expert lecture; the development of the DLP template; the creation of a DLP for a fictional classroom; the development of personal DLPs; and reflective journaling, provided opportunities for the participants to reflect on their views and understandings.

7.4 First cycle design improvements

The data from the first cycle was analyzed to address the third research question, which focused on identifying the design changes needed after the first cycle of the PD program. The analysis of participant feedback and observed challenges revealed areas for improvement in the PD design.

7.4.1 Refinements regarding the PD content

In the first cycle, the participants' alternative conceptions of DI, and areas of struggle included difficulties in differentiating between content and process, as well as between the concepts of interest and learning profile, with some participants equating students' learning preferences with interest. Additionally, the participants often neglected "learning profile" as a category of personal differences among students, focusing instead on readiness and interest. Finally, there was a tendency to oversimplify content when differentiating reading instruction for students in struggling readiness groups.

Design modifications were made so that these alternative conceptions and areas of struggle were specifically addressed and clarified in the second cycle. After

the related design improvements, the omission of learning profiles as personal difference and oversimplification of learning outcomes for students in struggling readiness groups were no longer observed among the participants in the second cycle. However, difficulties in differentiating between content and process, as well as confusion between the concepts of interest and learning profile persisted in the second cycle. Teachers may have the tendency to confuse content and process due to the absence of these components in their prior experience, particularly the inclusion of active student learning experiences (process), which are essential in a student-centered lesson plan, even if the lesson is not differentiated (Arseven et al., 2016). The use of the term "interest" instead of "learning profile" for describing student preferences in learning and learning products can be attributed to simplification of concepts. Teachers may be simplifying the language and categories of DI, often using "interest" as a catch-all term for all student preferences. This tendency can lead to an incomplete application of DI principles, where the key aspects of student diversity are overlooked.

7.4.2 Refinements regarding the design principles

The incorporation of weekly reviews right after the first session of the first cycle also seemed to meet an urgent need, as the participants seemed to understand the SDL tasks more fully, and access available sources with less difficulty. The reduction in the number of SDL tasks in the second cycle provided the participants more room for completing these tasks adequately. Although this design improvement proved to be effective in the second cycle, the participants still had time restriction challenges which should be addressed in future implementations.

No design improvements were deemed necessary regarding the second principle, use of ill structured problems, as the problem situation presented in the first cycle closely reflected the challenges the participants encountered in their own classrooms. The participants in the second cycle continued to recognize the relevance of the PBL problem for the challenges they faced in teaching and felt capable of solving similar problems in their own classrooms.

Regarding the promotion of collaboration in PBL, the participants in the first cycle had reported a need for more facilitation in resolving deadlocks. The use of targeted questions in the second cycle to guide discussions and prevent prolonged focus on a single issue seemed to have worked, as no participant reported concern over such issues during collaborative activities, which had been the case in the first cycle.

To address the first-cycle participants' concerns about varying levels of contribution among group members, specific roles and responsibilities were assigned to the participants in the second cycle, such as feedback peers to review individual DLPs. Additionally, the participants were periodically prompted to re-engage in collaboration if they had been disengaged for an extended period. Although these adjustments aimed to improve both the efficiency and equity of collaborative efforts, some second-cycle participants still reported uneven collaboration. In future implementations, a clearer division of roles and responsibilities for collaborative activities could be planned, and active collaboration could be encouraged further by providing more explicit guidelines and setting specific expectations to ensure more balanced participation from all group members. (Hussein, 2021). Establishing an instant messaging group also helped collaboration outside the sessions, and reduced one-on-one messaging with the facilitator.

As for the use of distributed scaffolding, although the first cycle participants had found the scaffolds useful, they nonetheless expressed a need for more practical resources, such as videos of DI in practice, and sample lesson plans, which were increased in the second cycle, and translated videos of DI practice were included. This was a valuable addition, as pointed out by the second cycle participants, who requested even further addition of other resources in Turkish.

Finally, a design improvement was made regarding the use of reflection. The reflective journal component was not frequently used by the participants in the first cycle. To encourage its use in the second cycle, reflective journal questions were included at the end of nearly every session. Additionally, peer feedback for individual DLPs was incorporated into the design to encourage reflection on the DI elements. Both of these refinements supported participant reflection, as was evidenced in the data collected in the second cycle.

7.5 Conclusion and implications for future studies

When I applied for the Learning Sciences PhD program, my goal was to focus on differentiated instruction, recognizing its importance in general classrooms. Under the guidance of my advisor at that time, I directed my research toward early literacy development, an area that was equally meaningful to me. The COVID-19 pandemic disrupted my plans for working directly with students on reading development, prompting a shift to online work. This change led me to design an online PD program for teachers that integrates both areas: design of an online teacher PD for the differentiation of early literacy instruction.

Teacher education, in-service and pre-service alike, holds a vital role in enhancing educational outcomes and fostering student success. Problem-based

learning, guided the design principles of the PD program, aligning it with established criteria for effective teacher PD programs. PBL's focus on collaboration within small teacher groups solving real-world problems supported the goal of driving practice change beyond mere content delivery. The facilitator's role in fostering self-directed learning through distributed scaffolds was equally critical. Furthermore, the inclusion of reflection as a core principle was indispensable for promoting deeper, more meaningful learning among participants.

During my PhD study, I found design-based research to be a pivotal method for my dissertation. DBR, which bridges theory and practice by developing and refining learning products in authentic settings, supports iterative improvements. This methodology ensures a meaningful impact on both teaching practices and learning outcomes, aligning perfectly with my focus on teacher professional development for differentiated instruction.

This DBR study addressed the limited implementation of DI in Turkey, identified through personal teaching experiences and literature review. While DI has recently been included in the 2024 revisions to the national curricula as "enrichment" and "support" its implementation remains unclear for teachers. It is hoped that this study will help bridge the gap between policy and practice.

The findings from the second cycle suggested that participation in the online PD, based on the PBL principles, supported the participants' knowledge of differentiating early literacy instruction. While the participants' defined DI mainly as addressing individual student needs prior to the PD program, they showed a striking progress in their definition and implementation of DI principles upon completion of the PD. They evolved from a broad and quite vague definition of DI to a more DI-specific understanding and practical application evidenced in their DLPs.

The participants' alternative conceptions, challenges, and key areas for growth identified during the second cycle can be addressed more specifically in future implementations of this PD and in other PD designs for DI. One notable alternative conception was viewing DI as simply employing diverse, student-centered practices, rather than tailoring instruction to meet individual student needs. The limitations of grade-level assessments were also expressed, as well as the need for more comprehensive tools to better support students performing below grade-level benchmarks. As for the components of DI, two alternative conceptions of differentiation for interest emerged. The first was making lessons attention-grabbing for the entire class without genuine differentiation. The second involved equating student learning preferences, such as those associated with multiple intelligences, with student interest. Another challenge was distinguishing between the content and process components of a differentiated lesson. Addressing socioemotional challenges were also noted, such as peer reactions to readiness groups and minimizing stigmatization, while emphasizing the need for effective classroom management strategies for small group activities. Parental competitive pressures for individual academic success were reported to further complicate efforts to foster a differentiated learning environment.

I hope the findings from this study can inform the future PD programs that align with PBL design principles to effectively support teachers in differentiating instruction. While the participants' experiences were largely positive, the areas still identified for improvement highlight the need for ongoing adaptation and refinements following the second cycle. By incorporating the suggested enhancements, future PD programs can better meet the diverse needs of teachers, and contribute to sustained professional growth.

7.6 Limitations

In this study, the implementation of the PD program was restricted to teachers who choose to participate voluntarily. This voluntary nature of participation provides insights into the experiences of teachers who actively choose to participate. In future implementations, teachers from specific schools or districts could be selected as participants to explore the program's influence on a more diverse group of educators.

The PBL approach is conducted with learners collaborating in small groups. In this study, the two cycles were conducted each with one small group of teachers. To facilitate broader implementation, another cycle can be conducted with a larger number of participants collaborating in multiple small groups. Expanding the number of participants and groups can promote broader dissemination and integration into practice. Additionally, involving a larger cohort of participants can help to create a more diverse and inclusive learning environment, where different perspectives and experiences can enrich the learning process.

Due to time limitations, I had to condense the PD program content, prioritizing differentiated instruction topics while minimizing the focus on literacy development and instruction. In the future, the PD program can be conducted in two consecutive modules. One intended for literacy acquisition, while the other for differentiated instruction.

A prototype PD website, created as a repository for PD resources, was used in a very limited capacity during the two cycles. For future cycles, this prototype can be further developed and its use can be prioritized to establish a permanent and evolving resource depository for both previous and new cycle participants.

The researcher also served as the facilitator of this program, which may have affected the feasibility of its implementation. For future applications, having an

independent facilitator with training in facilitation skills could enhance the program's overall effectiveness and ensure smoother execution. Additionally, involving a larger group of researchers could further refine the design of this online teacher PD program, incorporating diverse expertise.

Lastly, the development and implementation of the PD program is limited by my limitations as a novice researcher and PD facilitator. My knowledge of PBL and DI is primarily based on my readings for this dissertation, supplemented by my prior experiences as a special education teacher and my observations in mainstream classrooms and teacher rooms. The never-ending phases of learning and implementation throughout this DBR process were both a curious and rewarding experience for me.

APPENDIX A

ETHICAL APPROVAL FROM BOĞAZİÇİ UNIVERSITY

(Needs Analysis Phase)

Evrak Tarih ve Sayısı: 13.01.2022-47878

T.C.
BOĞAZİÇİ ÜNİVERSİTESİ
SOSYAL VE BEŞERİ BİLİMLER YÜKSEK LİSANS VE DOKTORA TEZLERİ ETİK İNCELEME
KOMİSYONU
TOPLANTI KARAR TUTANAĞI

Toplantı Sayısı : 27
Toplantı Tarihi : 13.01.2022
Toplantı Saati : 10:00
Toplantı Yeri : Zoom Sanal Toplantı
Bulunanlar : Prof. Dr. Ebru Kaya, Prof. Dr. Fatma Nevra Seggie, Dr. Öğr. Üyesi Yasemin Sohtorik İlkmen
Bulunmayanlar :

Nivart Karin Ataoğlu
Öğrenme Bilimleri

Sayın Araştırmacı,
"Designing an online problem-based professional development program for differentiation of early literacy instruction" başlıklı projenizin ilk adımı ile ilgili olarak yaptığımız SBB-EAK 2022/02 sayılı başvuru komisyonumuz tarafından 13 Ocak 2022 tarihli toplantıda incelenmiş ve uygun bulunmuştur.

Bu karar tüm üyelerin toplantıya çevrimiçi olarak katılımı ve oybirliği ile alınmıştır. COVID-19 önlemleri kapsamında kurul üyelerinden ıslak imza alınamadığı için bu onay mektubu üye ve raportör olarak Fatma Nevra Seggie tarafından bütün üyeler adına e-imzalanmıştır.

Prof. Dr. Fatma Nevra SEGGIE
ÜYE

e-imzalıdır
Prof. Dr. Fatma Nevra SEGGIE
Raportör

SOBETİK 27 13.01.2022

Bu belge 5070 sayılı Elektronik İmza Kanununun 5. Maddesi gereğince güvenli elektronik imza ile imzalanmıştır.

APPENDIX B

ETHICAL APPROVAL FROM BOĞAZİÇİ UNIVERSITY

(PD Implementation Phase)

Evrak Tarih ve Sayısı: 09.11.2022-96802

T.C.
BOĞAZİÇİ ÜNİVERSİTESİ
SOSYAL VE BEŞERİ BİLİMLER YÜKSEK LİSANS VE DOKTORA TEZLERİ ETİK İNCELEME
KOMİSYONU
TOPLANTI KARAR TUTANAĞI

Toplantı Sayısı : 35
Toplantı Tarihi : 19.10.2022
Toplantı Saati : 10:00
Toplantı Yeri : Zoom Sanal Toplantı
Bulunanlar : Prof. Dr. Feyza Çorapçı, Doç. Dr. Arhan S. Ertan, Doç. Dr. Senem Yıldız, Dr. Öğr. Üyesi
Yasemin Sohtorik İlkmen, Dr. Öğr. Üyesi Ayşegül Metindoğan, Dr. Öğr. Üyesi Harun
Muratoğulları
Bulunmayanlar :

Nıvart Karin Ataoğlu
Öğrenme Bilimleri

Sayın Araştırmacı,

"Designing an online problem-based professional development program for differentiation of early literacy instruction" başlıklı projenizin ikinci kısmı ile ilgili olarak yaptığımız SBB-EAK 2022/02 sayılı başvuru komisyonumuz tarafından 19 Ekim 2022 tarihli toplantıda incelenmiş ve uygun bulunmuştur.

Bu karar üyelerin toplantıya çevrimiçi olarak katılımı ve oy birliği ile alınmıştır. Onay mektubu üye ve raportör olarak

Dr. Öğr. Üyesi Yasemin
SOHTORİK İLKMEN
ÜYE

e-imzalıdır
Dr. Öğr. Üyesi Yasemin Sohtorik
İlkmen
Öğretim Üyesi
Raportör

SOBETİK 35 19.10.2022

Bu belge, güvenli elektronik imza ile imzalanmıştır.

APPENDIX C

PARTICIPANT INFORMATION AND CONSENT FORM

KATILIMCI BİLGİ VE ONAM FORMU

(İHTİYAÇ ANALİZİ AŞAMASI KATILIMCILARI İÇİN)

Araştırmayı destekleyen kurum: Boğaziçi Üniversitesi Öğrenme Bilimleri Doktora Programı

Araştırmanın adı: Okuma-yazma öğretiminde farklılaştırmaya yönelik problem tabanlı çevrimiçi öğretmen eğitimi programının tasarlanması

Proje Yürütücüsü: Doç. Dr. Günizi Kartal

E-mail adresi:

Telefonu:

Araştırmacının adı: Nivart Karin Ataoğlu

E-mail adresi:

Telefonu:

Sayın Öğretmenler,

Boğaziçi Üniversitesi Öğrenme Bilimleri doktora programında çevrimiçi öğretmen eğitimi ve araştırma temelli tasarım alanlarında doktora tez çalışması yürütüyorum. Anasınıfı ve ilkokul öğretmenlerinin hizmetiçi eğitimine önemli bir katkı olacağını ümit ettiğimiz bu çevrimiçi ankete sizleri davet etmek istiyorum.

Projenin konusu: Bu çalışmanın amacı, okuma-yazma öğretiminde farklılaştırma üzerine çevrimiçi bir öğretmen eğitimi programı tasarlamak ve yürütmektir. Araştırmanın en önemli hedefi, eğitim programının tamamen öğretmenlerin ihtiyaçlarına yönelik planlanması ve eğitim boyunca katılımcılardan gelen dönüt ve taleplerle ihtiyaca en uygun biçimde iyileştirilerek sunulmasıdır. Araştırmanın ilk evresinde öğretmen eğitimi ihtiyaçlarını tespit etmek amacıyla bir anket çalışması yapılacaktır.

Onam: Bu araştırmaya katılmayı kabul ettiğiniz takdirde, “okuma yazma öğretiminde farklılaştırma konusunda bilgi ihtiyacı” ve “farklılaştırılmış öğretime ilişkin öğretmen görüşleri” başlıklı formları doldurmanız istenecektir. Araştırmanın ikinci aşaması olan ihtiyaca yönelik öğretmen eğitime katılmak isterseniz, anketin ilgili bölümüne iletişim bilgilerinizi girmenizi ve devamındaki soruları cevaplamanızı rica ediyoruz. İkinci aşamaya katılmak istemediğiniz takdirde, ilk iki formu doldurup gönderdiğinizde, araştırmaya katılımınız sona ermiş olacaktır. Bu formları doldurmanız toplam 15 - 20 dakikanızı alacaktır.

İhtiyaç analizi aşamasında sizden elde edilen verilerden hareketle hazırlanacak öğretmen eğitim programı, katılımcı öğretmenlere farklılaştırılmış okuma-yazma öğretim planları geliştirmeyi öğrenme ortamı sunacaktır. Bu bakımdan, çalışmaya katılımınızın toplumsal ve bilimsel faydası olacağı düşünülmektedir.

Bu araştırma bilimsel bir amaçla yapılmaktadır ve katılımcı bilgilerinin gizliliği esas tutulmaktadır. Toplanan verilerde hiçbir zaman kimliğiniz belli olmayacaktır. Eğitim programına katılmak için kimlik bilgilerini verenlerin isimleri de saklı tutularak, kesinlikle hiçbir parti ile paylaşılmayacaktır.

Bu araştırmaya katılmak tamamen isteğe bağlıdır. Katıldığınız takdirde çalışmanın herhangi bir aşamasında herhangi bir sebep göstermeden onayınızı çekebilirsiniz. Araştırmadan çekilmeye karar verdiğiniz takdirde sizden toplanan veriler tamamen silinecektir. Araştırmaya katılmanız halinde herhangi bir ücret ya da ödül verilmeyecektir.

Araştırma projesi hakkında ek bilgi almak isterseniz Boğaziçi Üniversitesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü öğretim üyesi olan tez danışmanım Doç. Dr. Günizi Kartal ile temasa geçiniz. Araştırmayla ilgili haklarınız konusunda Boğaziçi Üniversitesi Sosyal ve Beşeri Bilimler Yüksek Lisans ve Doktora Tezleri Etik İnceleme Komisyonu'na (SOBETİK) danışabilirsiniz.

Yukarıdaki açıklamaları okudum ve anladım. Anket çalışmasına katılmayı kabul ediyorum.

Katılımcı Adı-Soyadı:.....

İmzası:.....

Tarih:...../...../.....

APPENDIX D

PARTICIPANT INFORMATION AND CONSENT FORM

KATILIMCI BİLGİ VE ONAM FORMU

Araştırmayı destekleyen kurum: Boğaziçi Üniversitesi Öğrenme Bilimleri Doktora Programı

Araştırmacının adı: Okuma-yazma öğretiminde farklılaştırmaya yönelik problem tabanlı çevrimiçi öğretmen eğitimi programının tasarlanması

Proje Yürütücüsü: Doç. Dr. Günizi Kartal

E-mail adresi:

Telefonu:

Araştırmacının adı: Nivart Karin Ataoğlu

E-mail adresi:

Telefonu:

Değerli Meslektaşım,

Boğaziçi Üniversitesi Öğrenme Bilimleri doktora programında çevrimiçi öğretmen eğitimi ve araştırma temelli tasarım alanlarında doktora tez çalışması yürütüyorum. Anasınıfı ve ilkokul öğretmenlerinin hizmetiçi eğitimine önemli bir katkı olacağını ümit ettiğim bu çevrimiçi çalışmaya sizleri davet etmek istiyorum.

Projenin konusu: Bu çalışmanın amacı; okuma-yazma öğretiminde farklılaştırma üzerine çevrimiçi bir öğretmen eğitimi programı tasarlamak ve yürütmektir. Araştırmanın en önemli hedefi, eğitim programının tamamen öğretmenlerin ihtiyaçlarına yönelik planlanması ve eğitim boyunca katılımcılardan gelen dönüt ve taleplerle ihtiyaca en uygun biçimde iyileştirilerek sunulmasıdır.

Programa katılan öğretmenler bir öğrenme topluluğu içinde, problem tabanlı öğrenme ilkeleri doğrultusunda işbirliği içinde çevrimiçi çalışacak, okuma-yazma öğretimini farklılaştırma, farklılaştırılmış ders planları geliştirme ve problem çözme becerilerini geliştireceklerdir.

Onam: Bu araştırmaya katılmayı kabul ettiğiniz takdirde yaklaşık 8 hafta sürecek bir çevrimiçi öğretmen eğitimi programına katılacaksınız. Eğitim takvimi, görevler, modül içerikleri, materyalleri ve ortaklaşa çalışma araçları, bir online platform aracılığı ile sizlere ulaştırılacaktır. Eğitim süreci, size verilen problem durumla grup çalışması içinde çözümler bulmanız ve bunları raporlayıp sunmanız şeklinde ilerleyecektir. Verilen problem, öğretmenlik hayatınızda karşılaştığınız türden gerçek öğretmenlik deneyimlerinden kaynaklanan içerikte olacaktır. Amaç, siz katılımcı öğretmenlerin ekip çalışması yoluyla, verilen problem durumları analiz etmesi, çözüm bulmak için edinilmesi gereken bilgileri tespit edip, bu bilgilere erişerek problem durumlara çözüm üretebilmesidir. Böylece yaşam boyu bağımsız problem

özme ve öğrenme becerilerinizi geliřtirmeniz de mümkün olacaktır. Eđitim boyunca yapılacak grup alıřmaları ve diđer süreçler arařtırmacı tarafından kolaylařtırılacak ve desteklenecektir. Öğretmen ihtiyalarına göre tasarlanacak bu eğitim programı sizden gelen dönüt ve önerilerle iyileřtirilecektir.

evrimii oturumlar daha sonra analiz edilmek üzere kayıt edilecektir. Eğitim öncesinde, sırasında ve sonrasında verilen kısa anketleri doldurmanız istenecek ve öğretim sürecindeki deneyimleriniz üzerine bir günlük tutmanız istenecektir. Görüşme için seildiđiniz takdirde 20 dakikayı geçmeyecek bir görüşme yapılacaktır.

Bu arařtırma bilimsel bir amaçla yapılmaktadır ve katılımcı bilgilerinin gizliliđi esas tutulmaktadır. Video ve ses kayıtları arařtırma projemiz süresince arařtırmacının kiřisel bilgisayarında ve sadece bu arařtırma için kullanacađı řifreli harici bir bellekte muhafaza edilip arařtırma sona erdiđinde silinecektir. Verilere arařtırmacı ve tez danıřmanı dıřında kimsenin erişimi olmayacak, kimseyle paylařılmayacaktır. Veri analizi ve raporlama süreçlerinde katılımcı isimleri silinerek birer kod adı atanacaktır.

Bu arařtırmaya katılmak tamamen isteđe bađlıdır. Katıldıđınız takdirde, alıřmanın herhangi bir aşamasında herhangi bir sebep göstermeden onayınızı ekebilirsiniz. Arařtırmadan ekilmeye karar verdiđiniz takdirde sizden toplanan veriler silinecektir. Arařtırmaya katılımınız için herhangi bir ücret ya da ödöl verilmeyecektir. alıřma sonunda hizmetii öğretmen eğitimi materyallerine erişiminiz devam edecek, arzu ettiđiniz takdirde alıřmanın sonuçları sizinle paylařılacaktır.

Arařtırma projesi hakkında ek bilgi almak isterseniz Bođazii Üniversitesi Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümü öğretim üyesi olan tez danıřmanım Do. Dr. Günizi Kartal ile temasa geçiniz. Arařtırmayla ilgili haklarınız konusunda, Bođazii Üniversitesi Sosyal ve Beřeri Bilimler Yüksek Lisans ve Doktora Tezleri Etik İnceleme Komisyonu'na (SOBETİK) danıřabilirsiniz.

Yukarıdaki açıklamaları okudum ve anladım. alıřmaya katılmayı kabul ediyorum.

Ses kaydı yapılmasını onaylıyorum. ☐ Evet ☐ Hayır

Video kaydı yapılmasını onaylıyorum. ☐ Evet ☐ Hayır

Katılımcı Adı-Soyadı:.....

İmzası:.....

Tarih:...../...../.....

APPENDIX E

TEACHER NEEDS SURVEY- FIRST PHASE

1. Personal Information

Your Gender:

Your Age: 20-25 / 26-29 / 30-39 / 40-49 / 50 and above

Name of the department you graduated from:

How many years have you been teaching?

1-2 years / 3-5 years / 6-10 years / 11-15 years / 16-20 years / More than 20 years

At which grade levels have you taught so far? Please mark in the table below.

	Never done it	1-2 years	3-5 years	More than 6 years
Preschool				
1. Grade				
2. Grade				

Type of the last school you worked at: State school / Private school / Other

In which city are you currently teaching?

2. Teacher Learning Needs Questionnaire

To what extent would you like to learn about the topics listed below?

Please rate your need for information on each topic from 1 to 5.

1 = very little, 5 = very much

Items	1	2	3	4	5
I would like to learn children's developmental stages of reading skills					
I would like to learn about the relationship between the structural features of the Turkish language and literacy education.					
I would like to learn teaching methods and strategies for students experiencing reading difficulties.					

I would like to learn different strategies to support students with advanced literacy levels.					
I would like to learn how to assess student readiness levels to differentiate literacy instruction.					
I would like to learn how to identify student interests.					
I would like to learn how to identify student learning profiles.					
I would like to learn how to differentiate literacy instruction based on individual student characteristics.					
I would like to learn how to prepare differentiated literacy instruction plans in content, process, and product areas.					
I would like to learn how to differentiate activities that support language skills according to student needs.					
I would like to learn how to differentiate activities for feeling, recognizing, and distinguishing sounds based on student needs.					
I would like to learn how to differentiate syllable reading activities by combining sounds according to student needs.					
I would like to learn how to conduct word reading activities by combining syllables.					
I would like to learn how to differentiate fluent text reading activities according to student needs.					
I would like to learn how to differentiate reading comprehension activities according to student needs.					
I would like to learn how to create a positive classroom environment that makes students feel safe.					
I would like to learn how to flexibly design homogeneous and heterogeneous groups and pair work according to needs.					

I would like to learn methods to facilitate transitions between activities during lessons.					
I would like to learn how to use different teaching strategies.					
I would like to learn how to differentiate assessment					
I would like to learn how to benefit from peer teaching.					
I would like to learn how to actively utilize interest and learning corners in lessons.					

3. Teacher Perceptions on Differentiated Instruction (DI-QUEST)

For each item in the list, please rate your level of agreement from 1 to 7.

- 1 - Strongly disagree
- 2 - Disagree
- 3 - Somewhat disagree
- 4 - Neither agree nor disagree
- 5 - Somewhat agree
- 6 - Agree
- 7 - Strongly agree

PART 1							
The way a teacher teaches is of influence on the intellectual capabilities of students.	1	2	3	4	5	6	7
Classroom experiences of success can influence the intellectual capacities of students.	1	2	3	4	5	6	7
A teacher's belief in the competences of a student can influence their intellectual capacities.	1	2	3	4	5	6	7
The curriculum does not provide any flexibility to cope with an individual student.	1	2	3	4	5	6	7

The curriculum is overloaded on content and goals.	1	2	3	4	5	6	7
The curriculum does not provide any room to foresee in differentiated instruction.	1	2	3	4	5	6	7
Governmental inspection on the implementation of the curriculum is limiting my professional freedom as a teacher.	1	2	3	4	5	6	7
Following the criteria of governmental inspection makes me a less qualitative teacher.	1	2	3	4	5	6	7
I regularly change between working with homogeneous and heterogeneous groups.	1	2	3	4	5	6	7
I teach my students to help each other.	1	2	3	4	5	6	7
I explicitly make sure I have a good relationship with all of my students.	1	2	3	4	5	6	7
During my lessons, students need to work together in order to progress in their learning process.	1	2	3	4	5	6	7
I make sure that every student has a specific function in my classroom.	1	2	3	4	5	6	7
Working in heterogeneous groups gives my students the opportunity to learn from each other.	1	2	3	4	5	6	7
I make sure that every student who needs extra guidance will get this.	1	2	3	4	5	6	7
I differentiate by switching between working with heterogeneous and homogeneous groups.	1	2	3	4	5	6	7

Please rate each item in the list from 1 to 7.

1 - Never

2 - Rarely

3 - Sometimes

4 - Regularly

5 - Often

6 - Very often

7 – Always

PART 2							
I use assessment to gain insight into the learning processes of my students.	1	2	3	4	5	6	7
I use assessment to assess in what way I can adjust my lessons to the learning processes of my students.	1	2	3	4	5	6	7
I teach my students how to cope with feedback.	1	2	3	4	5	6	7
I choose the learning content and teaching methods based on my students.	1	2	3	4	5	6	7
I adjust my assessment based on my students (or groups of students).	1	2	3	4	5	6	7
During my lessons, my students can decide with me on which assignment they need to work.	1	2	3	4	5	6	7
Knowing my students, I select the learning content, materials and teaching methods.	1	2	3	4	5	6	7
Based on their learning profile, I let my students choose between learning content and teaching methods.	1	2	3	4	5	6	7
During my lessons, I choose the learning content and teaching methods for my students based on the learning profile of my students.	1	2	3	4	5	6	7

Based on your responses above, we have an invitation that may interest you!

Call for Participation in an Online Teacher Professional Development Program

In the 2022-2023 academic year, I will conduct an online teacher training program aimed at differentiating literacy instruction based on student readiness, learning styles, and interests. During this professional development program, teachers will work in small groups, collaboratively seeking solutions to given educational problem situations. In addition to the content on differentiating literacy instruction, participating teachers will also have the opportunity to experience and develop collaborative working and problem-solving skills in an online environment.

Would you like to voluntarily participate in this online teacher training program, which will be planned according to the needs of the participants?

Yes:

No:

If your answer is yes, please provide your email address and/or phone number so I can contact you.

Name Surname:	
Email:	
Phone:	



APPENDIX F

TEACHER NEEDS SURVEY- SECOND PHASE

Dear Teachers,

First of all, thank you for your interest in and support for my study.

This second survey of my research will be filled out only by those of you who have expressed a desire to participate in the online teacher professional development program scheduled for next year. Your sincere responses to the open-ended questions below will help us understand the real needs of potential participants and shape the professional development program content accordingly.

Thank you,

N. Karin Ataoğlu

Name and Surname:

Email Address:

1. Have you participated in an online professional development program before?
No / 1-3 times / More than 3 times
2. Do you use instructional technologies in your lessons?
Never / Sometimes / Often / Always
3. What instructional technology tools do you use most frequently? (You can specify if you don't use any.)
4. What do you think are the essential elements for an effective teacher professional development program? (Please list at least 3 characteristics.)
5. Would you like to collaborate with your colleagues?
6. What positive experiences have you had in your team/group work so far?
7. What negative experiences have you had in your team/group work so far?
8. Have you heard of the problem-based learning approach before?
Yes / No
9. What are your thoughts on this approach?
10. What do you think differentiated instruction is?
11. What are your expectations from this training you expressed to be interested in?
12. Please describe in as much detail as possible a student you have struggled with while teaching literacy skills this year or in previous years.

13. In what ways does teaching in a classroom with students of different academic levels and characteristics challenge you the most? Please express it in three points.

14. Is there anything else you would like to ask or mention?

The online teacher training information and introductory meeting for differentiated literacy instruction will be held online in September. The meeting date will be communicated to you later. Thank you for your willingness to participate in the PD program.



APPENDIX G

PBL PROBLEM SCENARIO



Problem Durum

Farklılaştırma Eğitimi - 2. Dönem
Nisan-Mayıs 2023
N. Karın Ataoğlu - Günizi Kartal

Derslerimizi sınıfa girmeden önce planlıyoruz.
Bu planı yaparken ortalama öğrenci özelliklerini dikkate alıyoruz.

Peki, bu ORTALAMA öğrenci gerçekte var mı?
Yoksa tüm hazırlıklarımız aslında OLMAYAN bir öğrenci için mi?



Problem Durum

Hepimiz farklı deneyim sürelerine sahip okul öncesi ve sınıf öğretmenleriyiz. Farklı akademik ve sosyo-ekonomik düzeylere sahip öğrencilerin devam ettiği okullarda öğretmenlik yaptık ve yapıyoruz.

Problemimiz ise ortak:

Sınıflarımızdaki heterojen yapıdaki öğrencilerin tümüne aynı sınıf içinde ve zaman dilimi içinde ulaşabilmek.

Aşağıdaki kurgusal sınıfın tüm öğrencileri sizin sınıflarında yer alan gerçek öğrenciler. Bu öğrenciler farklı okuma yazma düzey ve özelliklerine sahip. Öğrenciler farklı sınıf düzeylerinden olduklarından bu kurgusal sınıfı birleştirilmiş sınıf olarak kabul edebilirsiniz.

Çözüm bekleyen sorun

Sınıftaki tüm bu farklı okuma yazma profillerine sahip öğrencilerin hepsini nasıl kapsayabiliriz?

Süre

Problem durumu çözmek için toplam beş haftalık bir süreniz var.

Problem Çözme Aşamaları

- 1. Problemi tanımlama**

Okuduğunuz problemi önceki deneyim ve bilgilerinizden de yola çıkarak bireysel olarak kendi sözcüklerinizle ifade ediniz. Daha sonra grup olarak bir problem tanımı yazacaksınız.

Problemi iyice anlamlandırmak ve tanımlamak için şu sorulardan yararlanabilirsiniz.

Çözülmesi gereken sorun nedir?
Elimizdeki veriler neler?
- 2. Problem analizi**

Grup olarak problemi analiz edeceksiniz.

Bunu, önemli bulduğunuz noktaları, sorularınızı ve çözüm önerilerinizi listeleterek yapabilirsiniz.

Bu aşamada önceki bilgi ve deneyimlerinize olası açıklamalar ve teoriler ileri süreceksiniz.

Öncelikle fikirlerinizi serbest bir şekilde filtrelemeyi ortaya koyun. Daha sonra bu fikirleri düzenleyebilir ve da aralarından seçimler yapabilirsiniz.
- 3. Çözüm aşamaları**

Problemin olası çözüm adımlarını beş haftalık süreci göz önünde bulundurarak belirleyiniz.
- 4. Öğrenme konuları ve hedefler**

Problemi inceleme ve analiz sonrasında bazı bilgi açıkları ortaya çıkacak.

Bu aşamada grup olarak öğrenme ihtiyaçlarınızı listeleyeceksiniz.

Bundan sonra öz-yönelimli öğrenme için öğrenme konularını aranızda paylaşıp paylaşmayacağınız.

Lütfen beş haftalık süreci göz önünde bulundurunuz.



İyi Çalışmalar

Problem Scenario:

We plan our lessons before entering the classroom. While making this plan, we consider the average student characteristics. Does this average student actually exist? Or are all our preparations actually for a non-existent student?

Today, schools and classrooms are increasingly composed of heterogeneous groups of students. This diversity makes it challenging for teachers to design and implement an instruction that encompasses and facilitates learning for all students. As a result, many students are unable to keep up with the lesson content, preventing them from fully realizing their potential, which can also lead to problematic behaviors.

This situation is especially critical for the first stage of primary education because students who do not fully acquire literacy skills are unable to effectively utilize these skills in their other learning experiences. Additionally, they experience feelings of academic failure.

We are all preschool and classroom teachers with different lengths of experience. We have taught and continue to teach in schools with students from various academic and socio-economic backgrounds.

Our problem is common:

Reaching all the heterogeneous students in our classrooms within the same class and time frame. The students in the fictional classroom below represent the real students in your classrooms. These students have different levels and characteristics of literacy skills. Since the students are from different grade levels, you can consider this fictional class as a combined classroom.

Fictional classroom students:

Ayşe/1: She started first grade with some deficiencies in her preschool achievements, and it took her a long time to remember sounds and form syllables. She can read fluently now, but she struggles with comprehension. She confuses the letters b and d. In mathematics, she did not have difficulty learning addition and subtraction, but she needed some support when moving on to multi-digit addition. She loves drawing, writes neatly and legibly, and is a child with artistic talent.

Ayşe/2: When we started school, she recognized most of the letters. She was a confident student with good expressive skills. Although she was not very eager for line, letter, and other writing activities, she made an effort to complete her tasks on time. With positive feedback, she began to write more legibly.

Ayşe/3: Before starting school, she received support from her family regarding mathematics and literacy processes. She was able to perform the four basic operations at the level of three-digit numbers. Although she needed support with spelling errors and organization, she was a student who read and wrote quickly and understood what she read. While her peers were learning to read and working on letters and syllables, I felt the need to differentiate our plans for her with comprehension texts.

Bianka/1: The student's reading speed is slow. When given less reading homework, she reads more fluently. Her participation in class increases as she finds it easier to work with shorter texts. Her handwriting is neat, but she confuses some letters between printed and handwritten forms. She focuses better and makes progress during individual work.

Bianka/2: The student reads a bit slower during unprepared readings. In prepared readings, she repeats until she reads fluently. She works with a system she has established for her own reading practice. She mentions that she reads each paragraph three times and highlights the words she struggles with to revisit them. She learns better with auditory and visual materials. Her handwriting is very neat. Although she occasionally confuses letters, she does not mix them up when they are coded in a way that helps her remember.

Bianka/3: The student reads fluently in reading activities, paying attention to emphasis, intonation, and punctuation marks. When she encounters an unfamiliar word during her individual readings, she questions its meaning. However, she needs a bit more support in her writing activities. Since she writes letters in uppercase and quickly, it does not look very good. She is a student who regularly reads books. Reminding her of the notebook organization rules during class helps her pay attention to the layout of her pages.

Didem/1: He is a boy who is developmentally aligned with his peers and has been receiving preschool education since the age of 2.5. His fine motor skills are weak, and he only prefers dough activities. He is reluctant to engage in pencil activities and requires verbal prompts during activities.

Didem/2: He enjoys doing line work and copies letters and numbers by looking. However, when writing without looking, he writes the directions incorrectly. He has articulation and sound awareness.

Didem/3: He enjoys line activities, copies the names of people around him, writes his own name, and writes numbers. His number awareness is quite good. He asks about unfamiliar sounds and recognizes four sounds. His pencil grip skills are good.

APPENDIX H

PD PROGRAM FOR THE FIRST CYCLE

Session 1: - Ice breaker acquaintance activity - Criteria of effective collaboration - Presentation of the overview of the 8-week PD program - Collaborative activity: “A letter to Teacher Sedat” - Presentation of the PBL problem (Problem definition)
Session 2: - Discussion activity: inclusive education - PBL problem analysis and identification of learning areas - First learning area: reading development, its components and evaluation
Session 3: - Expert presentation: reading development, including its components and evaluation <i>SDL Task: Asynchronous collaborative preparation of a “reading evaluation checklist”</i>
Session 4: - Presentation of the prototype repository website - Facilitator’s presentation: reading assessment/Reading profiles - Refinement of the “reading evaluation checklist” - Introduction to differentiation instruction <i>SDL Task 1: The evaluation of the students using “reading evaluation checklist” and determining the students’ reading profile accordingly</i> <i>SDL Task 2: Researching and preparing a presentation about a DI element</i>
Session 5: - Participant presentations of the student evaluations using “reading evaluation checklist” - Facilitator’s presentation: philosophy and principles of differentiation - Participant presentations: DI elements (readiness, interest, learning profile, content, process, product) <i>SDL Task: Guided reading of a sample differentiated lesson plan DLP provided by the facilitator.</i>
Session 6: - Reflection on SDL activities - Participant presentations: DI strategies - Development of a DLP template <i>SDL Task: Refinement of the DLP template on the shared document</i>
Session 7: - Reflections on the sample DLP

- Collaborative development of a DLP for the fictional PBL problem classroom.

SDL Task 1: Developing DLPs for participants' respective classrooms, refining them based on feedback from both colleagues and the facilitator on the shared document.

SDL Task 2: Implementation of the DLPs for those who had the opportunity to do so.

Session 8:

- Presentations of the DLPs and DLP implementations



APPENDIX I

PD PROGRAM FOR THE SECOND CYCLE

Session 1: - Ice breaker acquaintance activity - Criteria of effective collaboration - Presentation of the overview of the 8-week PD program - PBL problem presentation, analysis, and identification of learning areas - First learning area: reading development, its components and evaluation <i>SDL Task 1: Refinement of the PBL problem analysis on the shared document</i> <i>SDL Task 2: Answering the reflective journal questions</i>
Session 2: - Expert presentation: reading development, including its components and evaluation <i>SDL Task 1: Asynchronous collaborative preparation of a “reading evaluation checklist”</i> <i>SDL Task 2: Answering the reflective journal questions</i>
Session 3: - Reflection on SDL activities - Discussion activity: inclusive education - Presentation of the prototype repository website - Facilitator’s presentation: reading assessment/Reading profiles - Introduction to differentiation instruction <i>SDL Task 1: Researching and preparing a presentation about a DI element</i>
Session 4: - Facilitator’s presentation: philosophy and principles of differentiation - Participant presentations: DI elements (readiness, interest, learning profile, content, process, product) <i>SDL Task 1: Finalizing the “reading evaluation checklist”</i> <i>SDL Task 2: Preparing the presentation of three DI strategies</i> <i>SDL Task 3: Answering the reflective journal questions</i>
Session 5: - Discussion activity: Addressing small groups - Finalization of the “reading evaluation checklist” <i>SDL Task 1: The evaluation of the students using “reading evaluation checklist” and determining the students’ reading profile accordingly</i> <i>SDL Task 2: Guided reading of a sample differentiated lesson plan DLP provided by the facilitator.</i>
Session 6: - Development of a DLP template <i>SDL Task 1: Refinement of the DLP template on the shared document</i> <i>SDL Task 2: Answering the reflective journal questions</i>

Session 7:

- Collaborative development of a DLP for the fictional PBL problem classroom.

SDL Task 1: Developing DLPs for participants' respective classrooms, refining them based on feedback from both colleagues and the facilitator on the shared document.

Session 8:

- Presentations of the DLPs

SDL Task 1: Answering the reflective journal questions

Session 9:

- Presentations of the DLP implementations

SDL Task1: Answering the reflective journal questions



APPENDIX J

INTERVIEW QUESTIONS

Pre-interview questions

Title of the study: Designing an online problem-based professional development program for differentiation of early literacy instruction

Name of the researcher conducting the interview: N. Karin Ataoğlu

First of all, thank you for taking the time to participate. This interview aims to gather detailed information about your perspectives and experiences regarding literacy instruction and differentiation before participating in the online teacher training program.

Before we begin, I would like to remind you that participation in this training program is entirely voluntary. I will ask for your consent and signature shortly to proceed with the interview and audio recording. However, please note that you may choose to terminate the interview at any time.

Do you have any questions before we start?

Participant Name and Surname:

Signature:

Date:/...../.....

1. If you were tasked with dividing a group of students into 2 separate classes, what characteristics of the students would you consider for this grouping? Why?
2. What do you think the responsibilities of a teacher might be in a classroom composed of students with diverse characteristics?
3. What do you think are the essentials for achieving success in teaching literacy skills?
4. In the literacy learning process, what specific areas do students struggle with the most?
5. What are the most necessary teacher competencies for teaching literacy skills?
6. In the field of teaching literacy skills, in what aspects do you feel strong? What areas do you think you need to develop?
 - Can you identify three areas or points in teaching literacy where you face the most challenges. What methods do you use to overcome these challenges?
7. What do you think differentiated instruction is?
8. What are the advantages and disadvantages of differentiated instruction?
9. Can you describe a lesson where you implemented differentiation? What aspects did you differentiate in that lesson?
10. In the process of differentiating and implementing your lesson plan, which areas do you feel most confident in?

11. In the process of differentiating and implementing your lesson plan, what areas do you feel you need support with?
12. Would you like to use differentiation more frequently?
 - If yes, what factors have led you to use differentiation less often?
 - If no, why not?
13. What are your expectations from this training?
14. Is there anything else you would like to add? Thank you.

Post-interview questions

1. If you had to briefly describe the training process we went through to a friend, how would you explain it?
2. If you were tasked with dividing a group of students into 2 separate classes, what characteristics of the students would you consider for this grouping? Why?
3. What do you think the responsibilities of a teacher might be in a classroom composed of students with diverse characteristics?
4. What do you think are the essentials for achieving success in teaching literacy skills?
5. What are the most necessary teacher competencies for teaching literacy skills?
6. After the training you received, how would you define differentiated instruction? What do you see as its advantages and disadvantages?
7. In the process of differentiating your lesson plan and its implementation, what areas do you feel confident in, and where do you see a need for improvement?
8. How frequently do you think you will use differentiation in your future teaching career? Why?
9. How do you believe the PD you attended has impacted your problem-solving skills?
10. How do you think the PD you attended has influenced your teamwork skills?
11. Based on your experiences, what do you consider the three most important criteria for successful online group work?
12. Can you share some of the most positive aspects of the PD you attended?
13. Are there any areas of the PD you believe need improvement?
14. Is there anything else you would like to add? Thank you.

APPENDIX K

PD PROGRAM EVALUATION QUESTIONNAIRE

Teacher PD Evaluation Questionnaire (During PD) Name Surname:					
Please rate your level of agreement with the following statements on a scale of 1 to 5. 1 = Not at All 5 = Very Much	1	2	3	4	5
I am learning a lot from this program.					
This program is enjoyable for me.					
The given problem situations align with my real teaching experiences.					
Keeping a reflective journal is beneficial for me.					
The program content is shaped by us participants according to our needs when necessary.					
The program facilitator provides timely and sufficient feedback.					
The program facilitator offers the support we need.					
The program facilitator clearly expresses their expectations from us.					
I find the PD website useful.					
I find the collaborative tools available on the PD website useful.					
I find the resources available on the PD website sufficient.					
What challenges have you experienced while using the PD website?					
What additional support do you need?					
What additional comments would you like to add regarding the program?					

Teacher PD Evaluation Questionnaire (At the End of PD) Name Surname:	1	2	3	4	5
Please rate the extent to which you agree with the following statements on a scale of 1 to 5. 1 = not at all 5 = very much					
I learned a lot from this program.					
This program met my expectations.					
This program was enjoyable for me.					
I would like to participate in other PD programs that use a problem-based learning approach.					
The content of this PD is beneficial for my future teaching experiences.					
I learned to prepare plans for differentiated reading instruction.					
The training duration could have been longer.					
The training duration could have been shorter.					
My problem-solving skills have improved.					
My collaborative working skills have improved within a team.					
As a team, we were able to generate knowledge.					
What are the three most important skills you learned in this program?					
What were the three features you liked the most about the program?					
What features of the program challenged you the most?					
Your suggestions for making the program more effective:					

APPENDIX L

DIFFERENTIATED LESSON PLAN TEMPLATE

School:		Date:	
Content			
Subject:			Sınıf
Unit and key terms:			
Topics:	Prerequisite skills for the unit:	• Readiness • Interest • Learning profile	
	Unit's core objectives:		
Suggested Duration:			
General Objective:			
Whole Group:			
Group 1:	Group 2:	Group 3:	
Individual Support:			
Teaching and Learning Methods and Techniques:			
Teaching Technologies, Tools and Resources:			
Process			
• Readiness • Interest • Learning profile			
Whole Group:			
Group 1:	Group 1:	Group 1:	
Individual Support:			
Teaching and Learning Methods and Techniques:			
Teaching Technologies, Tools and Resources:			

Product		
• Readiness • Interest • Learning profile		
Whole Group:		
Group 1:	Group 1:	Group 1:
Individual Support:		
DI Strategies: Stations, exit cards, thinking points, flexible grouping, learning contracts, RAFT, Think-Pair-Share, self-assessment, mind maps, jigsaw, cubing, balancing, simulation, learning centers, anchor activities, extension activities.		
Assessment:		
Explanations Regarding the Implementation of the Plan:		
Post-Implementation Teacher Opinions:		

APPENDIX M

CODEBOOK FOR KNOWLEDGE OF DI

Codebook for Knowledge of DI	
Themes	Sub themes
Purpose of DI	Consideration of individual differences and learning needs
Alternative conceptions of DI	Individual support inside and outside classroom Student-centered approach with rich teaching strategies
DI Elements	
Readiness	General education readiness awareness Readiness as a component of DI (concept – understanding – application) Reading readiness awareness
Interest	General education interest awareness Interest as a component of DI (concept – understanding – application) Alternative conception As attention grabbing activities for whole classroom Considering learning profile as interest
Learning profile	General education learning profile awareness Learning profile as a component of DI (concept – understanding – application) Implementation challenge: Providing learning profile choices vs exposing to a variety of learning profiles
Content	General education content awareness Content differentiation as a component of DI (concept – understanding – application) Implementation challenge: Differentiation content as “how”
Process	General education process awareness Process differentiation as a component of DI (concept – understanding – application) Alternative conception Discriminating process and content Process the whole lesson
Product	Product differentiation as a component of DI (concept – understanding – application) Implementation challenge: Using as an assessment tool
Learning environment	Planned classroom orientation for DI Safe learning environment Focus on success for all No fear of making mistakes

Codebook for Knowledge of DI	
Themes	Sub themes
	Developing personal relationship with students Acceptance of differences Building a team Challenges: Parents' competitiveness / Peer reactions
Assessment	General education assessment awareness Assessment as a component of DI Provide feedback Tailor instruction Responsibility of own learning Challenges Need for assessment tools and strategies Limited grade-level assessment tools
DI Strategies	Challenges Need for DI strategies Flexible grouping Assigning students to readiness groups Classroom management in small group instruction
DI Practice - DLP development and implementation	
DI elements in DLPs	Content for readiness Content for interest Process for readiness Process for interest Process for learning profile Product for readiness Product for learning profile Strategies
DLP Feedback	To incorporate extension activities Specifying learning outcomes for readiness groups Incorporating content differentiation for HOW Planning activities aligned with the learning outcome Planning product assignments as assessment Distinguishing between content and process Describing DLP activities in detail
Participants need of future revisions in their DLPs	Incorporating appropriately adapted learning materials Diversifying content differentiation Diversifying process differentiation Diversifying product differentiation Diversifying assessment tools
DLP implementation challenges	Need to know students better Classroom management Support needed during group work
Perceived participant strength areas	Differentiation for readiness Grouping students for readiness Creating a differentiated learning environment

Codebook for Knowledge of DI	
Themes	Sub themes
	Differentiation for product
Perceived participant growth areas	Learn more DI strategies Assessment methods for younger students Classroom management strategies Determining appropriate tasks aligned with learning outcomes Differentiating between content and process



APPENDIX N

CODEBOOK FOR DESIGN PRINCIPLES

Codebook for Design Principles	
Themes	Sub themes
1. Promote self-directed learning (SDL)	SDL learning experiences Satisfactory Struggled first but felt more comfortable with time Time spent on the SDL activities - manageable Participants SDL experiences Searched for further resources Motivation for future learning Plans to review workshop content in the future Challenges to SDL Language barrier while conducting research Limited number of ready to use resources Difficulty in understanding self-directed learning tasks Lack of time and energy/Being women
2. Use ill structured real-world problems	Relevance of the PBL problem to the participants' own situations Will help solving future real classroom problems
3. Promote collaboration	Balanced integration of collaborative tasks with lectures and presentations Collaborative group dynamics Being open to learning Active engagement in collaboration Heterogeneous group structure Number of participants for collaboration Importance of responsible group members Supportive group dynamics and synergy Open communication Benefits of collaboration Diverse viewpoints and feedback Collaboration leading to problem-solving Intention of future collaboration Challenges experienced during collaboration Different contribution levels Participant feedback contributing at different levels Time spent in deadlocks Limited time for collaboration
4. Tutors act as facilitators to support the PBL process	Was highly accessible Guided throughout the process Supplied resources Provided support in deadlocks Provided timely and constructive feedback

	Scaffolded with probing questions Created a positive learning environment Need for further support Explanation of tasks in further detail More guidance to dissolve deadlocks
5. Use distributed scaffolding	Scaffolds fostering structured, condensed learning Expert lecture Presentations Scaffolds fostering collaboration Discussion activities prompted by visuals-videos-questions Collaborative “Reading Evaluation Checklist” development DLP template development, DLP development for the fictional classroom Scaffolds fostering concept concretization through practical application Collaborative “Reading Evaluation Checklist” development Development of the DLP template Development of a DLP for the fictional classroom Multimodal and accessible resource sharing PD resources Sufficient Accessible PD website Limited use Need for more scaffold Need more resources-Language barrier Ready-to-use resources Concrete examples Videos of DI practices Differentiated lesson plans Scaffolds guiding the learning process Weekly reviews
6. Make use of reflection	Reflection on own practices and experiences Discussion activities prompted by visuals-videos-questions Expert lecture and presentations Reflection on own views and understanding Reflective journal questions Discussion activities prompted by visuals-videos-questions PBL problem analysis Expert lectures and presentations Development of the DLP template Development of a DLP for a fictional classroom Development personal DLPs

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