

PRE-SERVICE SCIENCE TEACHERS' APPROACHES
TO CLASSROOM ASSESSMENT

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ABSTRACT

PRE-SERVICE SCIENCE TEACHERS' APPROACHES TO CLASSROOM ASSESSMENT

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The main focus of this study to examine Turkish pre-service science teachers' approaches to classroom assessment, their conceptions of assessment, and the link between their approaches to and conception of assessment. For the purpose of the study, a mixed method research design was used. In quantitative part, 676 pre-service science teachers, who enrolled 12 universities in six regions of Turkey, participated. The adapted version of Approaches to Classroom Assessment Inventory was administered to participants to identify their approaches to assessment in four assessment literacy themes: assessment purpose, assessment process, assessment fairness and assessment theory. Descriptive statistics and a series of repeated measures ANOVA were conducted to analyze the data. Results showed that pre-service science teachers prioritize assessment for learning approach in assessment purpose theme, design and communication approaches in assessment process theme, equitable approach in assessment fairness theme, and balanced approach in assessment theory theme. In qualitative part, 15 pre-service science teachers

participated. The semi-structured interviews were conducted to determine their conceptions of assessment and to reveal how pre-service science teachers with different approaches to assessment conceptualize assessment. Results indicated that according to the majority of the participants, the focus of assessment should be student to diagnose learning difficulties and misconceptions, monitor learning, and provide feedback to students. Moreover, they were found to emphasize contemporary assessment methods. The qualitative data revealed the pre-service science teachers' conceptions of assessment were not completely connected to a particular assessment approach. Overall results indicated that pre-service science teachers' approaches to and conception of assessment both reflect contemporary views of assessment.

Keywords: Approaches to Assessment, Conceptions of Assessment, Assessment Literacy, Pre-service Science Teachers

ÖZ

FEN BİLİMLERİ ÖĞRETMEN ADAYLARININ SINIF-İÇİ DEĞERLENDİRMEYE YÖNELİK YAKLAŞIMLARI

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Bu çalışmanın amacı fen bilimleri öğretmen adaylarının sınıf-içi deęerlendirmeye yönelik yaklaşımlarını, deęerlendirmeyi nasıl kavramsallaştırdıklarını ve deęerlendirmeye yönelik yaklaşım ve kavramsallaştırmaları arasındaki bağlantıyı incelemektir. Bu amaçla çalışmada karma araştırma deseni kullanılmıştır. Araştırmanın nicel kısmına, Türkiye'nin 6 farklı bölgesinde bulunan 12 üniversitede öğrenim gören 676 fen bilimleri öğretmen adayı katılmıştır. Fen bilimleri öğretmen adaylarının yaklaşımlarını dört temada -ölçme amacı, ölçme süreci, ölçme adillięi ve ölçme teorisi- belirlemek için Sınıf-içi Deęerlendirmeye Yönelik Yaklaşımlar Envanteri'nin uyarlanmış hali katılımcılara uygulanmıştır. Her bir temadaki yaklaşımların ne kadar desteklendięini incelemek için betimsel analiz ve tekrarlı ölçümler tek yönlü varyans analizleri yapılmıştır. Sonuçlar, fen bilimleri öğretmen adaylarının deęerlendirme amacı temasında öğrenme için deęerlendirme yaklaşımına, deęerlendirme süreci temasında tasarım ve iletişim yaklaşımlarına,

değerlendirme adilliği temasında eşitlikçi yaklaşımına ve değerlendirme teorisi temasında dengeli yaklaşımına öncelik tanıdıkları saptanmıştır. Araştırmanın nitel kısmına 15 fen bilimleri öğretmen adayı katılmıştır. Fen bilimleri öğretmen adaylarının değerlendirmeyi nasıl kavramsallaştırdıklarını belirlemek ve farklı yaklaşımlara sahip öğretmen adaylarının değerlendirmeyi kavramsallaştırmalarını ortaya çıkartmak için yarı-yapılandırılmış görüşmeler aracılığı ile veriler toplanmıştır. Sonuçlar göstermiştir ki, katılımcıların çoğuna göre, değerlendirmenin odağı öğrencinin öğrenme zorluklarını ve kavram yanlışlarını ortaya çıkartmak, öğrenmesini takip etmek ve öğrencilere geri bildirim sağlamak olmalıdır. Ayrıca fen bilimleri öğretmen adaylarının çağdaş değerlendirme yöntemlerini vurguladıkları bulunmuştur. Öte yandan, sonuçlar, fen bilimleri öğretmen adaylarının değerlendirmeyi nasıl kavramsallaştırdıklarının belli bir değerlendirme yaklaşımıyla tam olarak bağlantılı olmadığını göstermiştir. Genel olarak sonuçlar, fen bilimleri öğretmen adaylarının değerlendirmeye yönelik yaklaşım ve kavramsallaştırmalarının gelenekselden ziyade çağdaş değerlendirme görüşlerini yansıttığını göstermiştir.

Anahtar Kelimeler: Değerlendirmeye Yönelik Yaklaşımlar, Değerlendirmenin Kavramsallaştırılması, Değerlendirme Okur Yazarlığı, Fen Bilimleri Öğretmen Adayları

To my beloved family

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TABLE OF CONTENTS

ABSTRACT	v
ÖZ.....	vii
ACKNOWLEDGMENTS	x
TABLE OF CONTENTS.....	xi
LIST OF TABLES.....	xiv
LIST OF FIGURES	xv
LIST OF ABBREVIATIONS	xvi
CHAPTERS	
1 INTRODUCTION	1
1.1 Background of the Study	1
1.2 Purpose of the Study and Research Questions.....	6
1.3 Significance of the Study.....	7
1.4 Definition of Important Terms	8
2 LITERATURE REVIEW.....	11
2.1 Teachers' Assessment Literacy.....	11
2.2 Teachers' Approaches to Classroom Assessment.....	15
2.3 Measuring Teachers' Approaches to Classroom Assessment	18
2.4 Teachers' Conceptions of Assessment	21
3 METHOD.....	27
3.1 Research Design.....	27

3.2	Study Context.....	27
3.3	Population and Sample	28
3.4	Instruments.....	37
3.4.1	Quantitative Data Collection Instrument	37
3.4.2	Qualitative Data Collection Instrument	39
3.5	Data Collection.....	40
3.6	Data Analysis	41
3.7	Trustworthiness	42
3.8	Assumptions.....	43
4	RESULT.....	45
4.1	Pre-service Science Teachers’ Approaches to Assessment	45
4.2	Examination of the Differences in Level Pre-service Science Teachers’ Endorsement of a Particular Approach to Assessment in Each Theme	62
4.3	Pre-service Science Teachers’ Conceptions	65
4.3.1	Pre-service Science Teachers’ Conceptions about Focus of Assessment	67
4.3.2	Pre-service Science Teachers’ Conceptions about Method (mode) of Assessment	71
4.3.3	Pre-service Science Teachers’ Perceptions about their Deficiencies in Assessment	74
5	DISCUSSION.....	77
5.1	Discussion of Results	77
5.2	Implications.....	85
5.3	Limitations	86
	REFERENCES	87

A. Permissions Obtained from METU Human Subjects Ethics Committee	97
B. Adapted Version of Approaches to Classroom Assessment Inventory	98
C. Interview Questions	111
D. Consent Forms	112

LIST OF TABLES

TABLES

Table 1.1 Assessment literacy domains

Table 3.1 Distribution of participants

Table 3.2 Information about participants

Table 3.3 Endorsement of approaches by each participant

Table 3.4 Revised items in the ACAI

Table 4.1 Descriptive statistics for scenario 1

Table 4.2 Descriptive statistics for scenario 2

Table 4.3 Descriptive statistics for scenario 3

Table 4.4 Descriptive statistics for scenario 4

Table 4.5 Descriptive statistics for scenario 5

Table 4.6 Descriptive statistics across five scenarios

Table 4.7 Pairwise comparisons for assessment purpose theme

Table 4.8 Pairwise comparisons for assessment process theme

Table 4.9 Pairwise comparisons for assessment fairness theme

Table 4.10 Pairwise comparisons for assessment theory theme

Table 4.11 Codes identified from the responses of pre-service science teachers

LIST OF FIGURES

FIGURES

Figure 3.1 Methodology in qualitative part

LIST OF ABBREVIATIONS

ABBREVIATIONS

ACAI Approaches to Classroom Assessment Inventory

AfL Assessment for Learning

AoL Assessment of Learning

AaL Assessment as Learning

PST Pre-service Science Teacher

ESE Elementary Science Education

CHAPTER 1

INTRODUCTION

This chapter aims to present the background of the study, purpose of the study, research questions, significance of the study and definition of the important terms.

1.1 Background of the Study

Over the years, teachers have used assessment in classrooms to understand what and how students learn, support and improve students' learning, guide instruction, give feedback to students, parents and other teachers (Phye, 1996). Using assessment, teachers draw inferences about students' status to give appropriate educational decisions, provide evidence to student, teachers and parents about students' progress, and exhibit students' accomplishments (Popham, 2013).

Accordingly, when many different educational systems are examined, it is realized that there is an increased priority and attention on teacher assessment literacy (DeLuca et al., 2016a). Assessment literacy refers to teachers' ability and knowledge in order to construct, administer and score assessment; to measure learning through assessment (Popham, 2013), to initiate, advance, accommodate, and use suitable assessment approaches to improve student learning (DeLuca et al., 2016a). Considering this definition, having the proficiency in assessment practices is essential for teachers to improve the quality of the teaching and learning (Volante & Fazio, 2007) because effectiveness of teachers' classroom assessment practices influence student learning. In fact, effective classroom assessment practices allow to draw conclusions about each student's achievement, to communicate with students and parents depending on the conclusion, and to focus on future practices (Brookhart,

1999). On the contrary, ineffective classroom assessment practices cause decreased reliability and validity, leading to misguided and improper educational decisions for future practices (DeLuca & Klinger, 2010). In addition, according to Popham (2013), there are four traditional and three current reasons about why teachers should know about classroom assessment. The four traditional reasons that teachers should know about assessment are to (1) decide students' status in instructions, (2) monitor students' progress, and (3) give grades to students and (4) decide teachers' their own efficiency in the instructions. Moreover, the three current reasons are (1) assessment results influence and decide public impression of educational efficiency, (2) assessment performances help evaluation of teachers and their teaching, and (3) assessment instruments are prepared to clarify instructional goals to lead efficient instructional decisions by teachers. For these reasons, teachers need to do assessment practices well because they improve instruction and learning environment (Coombs et al., 2018) and affect students' motivation and learning (McMillan, 2000; Timperley, 2009). In general, teachers' approaches to assessment affect students' motivation, engagement and advancement both positively and negatively (DeLuca et al., 2019).

In this study, four-dimensional assessment literacy framework was used to describe teachers' approaches to classroom assessment. The four dimensions of assessment literacy include aspects of (1) assessment purpose (includes choosing appropriate assessment form based on the instructional goals and learning objectives), (2) assessment process (includes constructing, administering and scoring assessments; interpreting assessment results assist the progress of instructional decision making) (3) assessment fairness (includes providing fair assessment conditions for all students considering student diversity), and (4) assessment theory (includes understanding psychometric properties, reliability and validity of assessments) to represent the contemporary aspects of teacher assessment literacy (DeLuca et al., 2016a). Each dimension has associated with three priority approaches. To illustrate, assessment fairness dimension has associated with standard, equitable and

differentiated approaches. The complete list of priority approaches with definitions presented in Table 1.1 below.

Table 1.1 Assessment literacy domains

Assessment Literacy Dimension	Priority Approach	Description of Priority Approach
Assessment Purpose	Assessment of learning	Teachers use summative assessment which includes tests-based results of the questions based on the syllabus of the lesson to evaluate students' learning at the end of the learning process (Vlachou, 2018), and to make a final decision about the instructional activities (Popham, 2013).
	Assessment for learning	Teachers and students use formative assessment to provide feedback during learning process (Wen et al., 2006), to make decisions about following steps of instruction, and to enhance instructions and students' learning (Brookhart, 2011).
	Assessment as learning	Students use assessment to monitor and assess their learning process (Earl, 2003). Includes teachers but emphasize the role of the student (DeLuca et al., 2019).
Assessment Process	Design	Teachers underline the design and development of reliable assessments according to learning goals (DeLuca et al., 2019).
	Use/scoring	Teachers focus adaptation and use of rubrics (DeLuca et al., 2019).
	Communication	Teachers give priority communicating with students and parents to interpret assessment results and give aimful feedback (DeLuca et al., 2019).

Table 1.1 (Cont'd)

Assessment Literacy Dimension	Priority Approach	Description of Priority Approach
Assessment Fairness	Standard	Teachers apply same assessments for all of the students (DeLuca et al., 2019).
	Equitable	Teachers use accommodation and modification on assessments for identified students (DeLuca et al., 2019).
	Differentiated	Teachers apply individualized assessments for each student (DeLuca et al., 2019).
Assessment Theory	Consistent	Teachers try to assure reliability and consistency in assessment results including scoring, design and administration across time intervals and different teachers (DeLuca et al., 2019).
	Contextual	Teachers try to assure assessment adjust with learning objectives, reflect students' learning correctly, and consider student and context while interpreting the assessment results (DeLuca et al., 2019).
	Balanced	Teachers try to assure reliability and consistency in measuring what an assessment aims and demands to measure (DeLuca et al., 2019).

According to Harrison (2005) and Popham (2013), teachers' approaches to assessment are influenced by several factors which are their assessment experiences, practices, values, beliefs and knowledge on assessment, and students' learning needs. Additionally, Tierney (2006) described other six factors that are professional development, educational policy, educational research, large-scale assessments, evaluative inquiry and teachers' beliefs. Analyzing teachers' beliefs helps to understand the relationship between their beliefs and students' outcomes, and teachers' classroom practices (Opre, 2010) because teachers' beliefs affect the way teachers teach and students achieve (Savasci-Acikalin, 2009). According to Opre (2015), teachers' beliefs become essential factor to determine instructional practices and students' learning process.

To address different terminology about beliefs, the researchers who study beliefs about assessment used “conception” that is preferred term and commonly used in the specialized assessment literature (Opre, 2015). The term conception invoked from Thompson (1992) and it can be defined as “general mental structure, encompassing beliefs, meanings, concepts, propositions, rules, mental images, preferences, and the like” (p. 130).

Studying teachers’ conception of assessment is important, because it affects the quality of their performance (Opre, 2015), their instructional decisions and activities (Vandeyar & Killen, 2007), and their contributions into context of the teaching (Skott, 2015). According to Vandeyar and Killen (2007), differing assessment conceptions create differing assessment practices. To illustrate, teachers, who concept assessment can be used to obtain information about student learning, will use assessment to complete teaching and learning process. Teachers, who concept students should be responsible for their own learning, will support summative assessment practices. Moreover, when teachers’ conceptions of assessment change, their classroom assessment practices will change (Opre, 2015). In the present study, pre-service science teachers’ conception of assessment will be examined considering their approaches to assessment based on four-theme assessment literacy framework.

In addition, teachers’ assessment practices affect student learning, learning environment (DeLuca et al., 2019a), and students’ achievement (DeLuca et al., 2018). For instance, when teachers prioritize formative assessment practices and give high quality feedback to their students depend on the assessment practices, their achievement and learning motivation will increase (Hattie, 2016). When teachers prioritize summative assessment practices and give low quality feedback to their students, the students’ anxiety intensify and the achievement gap between the students expand (Von Der Embse et al., 2013). Additionally, teachers’ classroom assessment practices can change depend on some factors. First of all, assessment culture of the schools and educational systems can determine differences in teachers’ assessment practices (DeLuca et al., 2019b). Secondly, the diversity of teaching

contexts can cause to happen differences in assessment practices (Fulmer et al., 2015). Lastly, teachers can alter their assessment practices based on pedagogical knowledge, the priorities of educational systems and policies, and socio-cultural contexts of teaching and learning (Willis et al., 2013).

Overall, this study is interested in exploring pre-service science teachers' approaches to classroom assessment and their conceptions of classroom assessment.

1.2 Purpose of the Study and Research Questions

The current study seeks to examine Turkish pre-service science teachers' approaches to classroom assessment based on four-theme assessment literacy framework, and their conceptions of classroom assessment and the link between their conceptions of assessment and approaches to assessment. Accordingly, the research questions of this study are as follows:

- 1) What is the pre-service science teachers' endorsement of a particular approach to classroom assessment in terms of four themes of assessment (i.e., assessment purpose, assessment process, assessment fairness, assessment theory)?
- 2) Is there a difference in the level pre-service science teachers' endorsement of a particular approach to assessment in each theme (i.e., assessment purpose, assessment process, assessment fairness, assessment theory)?
 - 2.1) Is there a difference in the level of pre-service science teachers' approaches to assessment purpose in terms of assessment of learning, assessment for learning, and assessment as learning?
 - 2.2) Is there a difference in the level of pre-service science teachers' approaches to assessment process in terms of design, use/scoring, and communication?

- 2.3) Is there a difference in the level of pre-service science teachers' approaches to assessment fairness in terms of standard, equitable and differentiated?
- 2.4) Is there a difference in the level of pre-service science teachers' approaches to assessment theory in terms of consistent, contextual and balanced?
- 3) How do pre-service science teachers with different approaches to assessment conceptualize assessment?

1.3 Significance of the Study

Capability for understanding of the principles of assessment and evaluation is a fundamental skill to advance teaching and learning (Volante & Fazio, 2007) because teachers' assessment practices improve instruction and learning environment (Coombs et al., 2018) and affect students' motivation, learning and achievement (McMillan, 2000; Timperley, 2009). For this reason, teacher education programs should attach importance to improve pre-service teachers' assessment literacy to decide and apply suitable assessments well (Siegel & Wissehr, 2011). However, most of the researches on assessment literacy emphasized assessment purposes ignoring other aspects of assessment literacy (DeLuca et al., 2016a). Thus, in the present study, adapted version of the Approaches to Classroom Assessment Inventory (ACAI) focusing on four themes (aspects) of assessment literacy: (1) assessment purpose, (2) assessment process, (3) assessment fairness, (4) assessment theory (DeLuca et al., 2016b) was used. The utilization of this instrument is thought to provide to comprehensive understanding of pre-service science teachers' approach to assessment based on multi-dimensional assessment literacy framework. In fact, majority of the studies about teachers' assessment literacy have been conducted using the 1990 standards (i.e., American Federation of Teachers, National Council on Measurement in Education, Standard for Teacher Competency in Educational Assessment of Students, & National Education Association, 1990). Because there is

no reliable data on teachers' current approaches to classroom assessment due to a lack of assessment literacy measures (DeLuca et al, 2016; Gotch & French, 2014), the research team developed ACAI based on new assessment standards. For these reasons, Approaches to Classroom Assessment Inventory (ACAI) was selected for the present study. ACAI was translated and adapted to Turkish and used in Turkey for the first time. Depending on the study results, some suggestions can be made for teachers, prospective teachers, teacher educators, and educational policy makers to improve teaching and learning process in science classes. For example, according to relevant literature, teachers' approaches to classroom assessment can change depending on their career stage (Coombs et al., 2018). Accordingly, the current study focused on Turkish pre-service science teachers' approaches to classroom assessment to portray their approaches. Depending on the results, some suggestions can be made for teacher education programs and the researchers in the field to improve assessment process. This study can also be replicated with in-service science teachers with different years of teaching experience. In addition, this study has potential to make a contribution to both national and international literature portraying pre-service science teachers' approaches to assessment within four-theme assessment literacy framework including contemporary emphases to assessment. In addition, during literature review, the researcher did not come across with any study examining the link between pre-service teachers' approaches to classroom assessment and their conceptions of assessment. Therefore, the current study is thought to be the first study in the related literature focusing on the link between approaches to and conceptions of assessment.

1.4 Definition of Important Terms

Assessment: "The process of obtaining information that is used to make educational decisions about students, to give feedback to the student about his or her progress, strengths, and weaknesses, to judge instructional effectiveness and curricular adequacy, and to inform policy." (AFT et al., 1990).

Assessment literacy: “A dynamic context dependent social practice that involves teachers articulating and negotiating classroom and cultural knowledges with one another and with learners, in the initiation, development and practice of assessment to achieve the learning goals of students.” (Willis et al., 2013, p.242).

Approaches to assessment: “Comprised of both conceptual understandings and practical knowledge related to student assessment within the situated context of their classroom teaching.” (Coombs et al., 2018, p.134).

Conception of assessment: Teachers’ perception and awareness of assessment (Barnes et al., 2015).

Conception: “The organizing framework by which an individual understands, responds to, and interacts with a phenomenon.” (Brown, 2004, p.303).

CHAPTER 2

LITERATURE REVIEW

Chapter two presents teachers' assessment literacy, teachers' approaches to classroom assessment, measuring teachers' approaches to classroom assessment, teachers' conceptions of assessment titles.

2.1 Teachers' Assessment Literacy

The definition of the assessment literacy developed in the process of time (DeLuca et al., 2019). Assessment literacy can be defined as “the readiness of an educator to design, implement, and discuss assessment strategies” (NCREL, n.d.). The National Council on Measurement in Education, the National Education Association and the American Federation of Teachers (1990) published the *Standards for Teacher Competence in Educational Assessment of Students*. The standards consist of seven principles for teacher competence in assessment illustrated test-based and psychometric approaches to assessment. Teachers should be skilled in (1) selecting suitable assessment methods for teaching choices; (2) advancing suitable assessment methods for teaching decisions; (3) operating, grading and interpreting assessment methods; (4) using assessment results to decide students' status, plan teaching and develop curriculum; (5) creating grading procedures to use the evaluation of students' assessments; (6) sharing assessment results with students, parents and other educators; and (7) identifying inappropriate and illegal assessment methods and uses (AFT et al.,1990). Moreover, assessment literate educators should know what they assess, why they are doing the assessment and how to improve it. These educators also should be aware of possible negative results of poor assessment practices

(Stiggins, 1995). In addition to these, according to Schafer (1993), teachers should improve their assessment skills in eight areas: (1) concepts and terminology of assessment; (2) uses of assessment; (3) planning and development of the assessment; (4) interpreting the assessment results; (5) description of assessment results; (6) evaluation and improvement of assessments; (7) giving feedback and grading of the assessments; and (8) ethics of assessment. In addition, the information that gathered from assessment results have to be valid, reliable, significant and correct (Brookhart, 1999) because assessment practices improve instruction and students' motivation, advance students' achievement (Brookhart, 1999), meet students' needs, evaluate students and instructions (Stiggins, 1999), and prevent students to reach their full potential (Mertler, 2003).

Depending on the contemporary changes in assessment, the view of assessment literacy was changed (DeLuca et al., 2019). Contemporary view of assessment pays more attention to social and theoretical aspects of classroom assessment, and formative assessment (Brookhart, 2011). The Joint Committee for Standards on Educational Evaluation (2015) published Classroom Assessment Standards for PreK-12 Teachers (Klinger et al., 2015). These standards represent contemporary aspects of assessment literacy to prepare pre-service teachers, support in-service teachers with guidelines, principles and strategies for effective use of assessment, and guide teachers, students, parents and other educators to advance assessment results for supporting students' learning and achievement. Also, the standards have three assessment domains: foundation (in relation to assessment purposes, preparation and design), use (in relation to analyzing students' work, giving feedback and reporting), and quality (assessment fairness, diversity and reflection) (DeLuca et al., 2019). Including current views and aspects, the term assessment literacy can be evolved as:

Assessment literacy is a dynamic context-dependent social practice that involves teachers articulating and negotiating classroom and cultural knowledges with one another and with learners, in the initiation, development

and practice of assessment to achieve the learning goals of students (Willis et al., 2013, p.242)

Depending on the contemporary shifts in classroom assessment practices and context, and new assessment standards, multidimensional approaches were identified under four-themes of assessment literacy: (1) assessment purpose, (2) assessment process, (3) assessment fairness, and (4) assessment theory. In the theme of assessment purpose, the priority approaches are assessment of learning (i.e., using summative learning and assigning grades), assessment for learning (i.e., using formative learning and providing feedback related to learning objectives), and assessment as learning (i.e., providing feedback to improve students' abilities and skills). In the theme of assessment process, the priority approaches are design (i.e., developing reliable assessments to measure students' learning), scoring (i.e., adjusting rubrics to answer assessment scenarios), and communication (i.e., interpreting assessment results and giving feedback orally). In the theme of assessment fairness, the priority approaches are standard (applying equal assessment methods for all students), equitable (using accommodations and modifications for identified students), and personalized (individualizing assessment methods for each student). In the theme of assessment theory, the priority approaches are consistent (assuring reliability in assessment results during the whole of assessment process), contextual (assuring that assessment both reflect curriculum expectation and student learning), and balanced (considering reliability in measuring students' learning, and validity of the assessment) (DeLuca et al., 2016b).

Examining in-service or pre-service teachers' approaches to assessment considering contemporary assessment literacy framework is important because one of the most crucial responsibilities of the teachers is assessing their students (Mertler & Campbell, 2005). It can affect everything that teacher does (Mertler, 2003). However, the researches revealed that teachers have weak assessment skills in most cases (Brookhart, 2001; Campbell et al., 2002). Moreover, many in-service teachers claimed that they feel insufficient and unprepared to assess students' learning (Murray, 1991; Plake, 1993) because of the insufficient training about assessment in

their teacher education programs (Plake et al., 1993; Rogers, 1991). In many teacher education programs, classroom assessment courses are not a requisite to graduate (Stiggins, 1999; Brown, 2004). For these reasons, in-service teachers try to improve themselves in assessment practices with experience rather than their pre-service training (Wise et al., 1991). Moreover, most of the early in-service teachers show limited assessment literacy (DeLuca & Klinger, 2011; Volante & Fazio, 2007). For example, the results of the study conducted by Birenbaum and Rosenau (2006) examining pre-service teachers' learning strategies and assessment preferences when compared to in-service teachers showed that in-service teachers show deeper approach to learning and assessment as a result of their experiences. Also, in-service teachers were found to choose assessment strategies requiring higher levels of thinking.

In addition, Coombs et al. (2018) investigated the relationship between teachers' assessment literacy through multidimensional approaches to assessment (including conceptions of assessment purpose, assessment process, assessment fairness and assessment theory) and teachers' career stages (initial pre-service teacher, beginning in-service teacher, early in-service teacher and established in-service teacher). The data collected from 727 participants in Canada and U.S.A. The participant teachers completed the Approaches to Classroom Assessment Inventory (ACAI). The results of the study showed that there is a significant relationship between career stage and approaches to assessment purpose. Partial differences were seen within the first five years of teaching (early in-service teachers). There is a statistically significant rise in supporting assessment of learning, standard and differentiated approaches, and decline in supporting balanced approach in this career stage. After five years of teaching experience, teachers started to prioritize formative and differentiated approaches to classroom assessment. When the career stage increase, teachers became more likely to support approaches to assessment purpose (assessment for learning, assessment as learning, assessment of learning). Also, these results illustrated slightly differenced impacts of career stages on the teachers' approaches

to classroom assessment. However, these results showed that continued investigation needed into the influence of career stage on teachers' approaches to assessment.

Similarly, according to Coombs et al. (2020), more experienced teachers support the assessment for learning, equitable and integrated approaches to a greater extent when compared to less experienced teachers. In addition, they give importance to self-assessment activities (Wen et al., 2006), more complex assessment methods (Birenbaum & Rosenau, 2006), and have higher levels of perceived skill in assessment (Coombs et al., 2018).

As indicated by aforementioned literature, teachers' approaches to classroom assessment can change depending on their career stage. Thus, the current study focused only on Turkish pre-service science teachers' approaches to classroom assessment based on multi-dimensional assessment literacy framework. Accordingly, the results of the present study can have significant implications for teacher education programs and teacher educators in order to improve classroom assessment. The study can be replicated with in-service science teachers with different years of teaching experience to show their approaches to classroom assessment. Depending on the differences between the results of pre-service and in-service teachers, required supports for teachers or arrangements for teacher education program and courses can be made if necessary. In the following subsection, teachers' approaches to assessment their assessment practices are elaborated.

2.2 Teachers' Approaches to Classroom Assessment

Some of the researchers have responded to call of exploring teachers' assessment preferences, knowledge, approaches to assessment (Wolf et al., 1991; Brown, 2004; Coombs et al., 2018) and assessment practices (Scarino, 2013; Cowie & Cooper, 2017) to show contemporary views of assessment literacy. Among these "approaches to assessment" reflects teachers' multiple perspectives related to

classroom assessment (Willis et al., 2013; DeLuca et al., 2016a). The previous traditional views of assessment focused on teachers' knowledge about assessment, and abilities of assessment. On the other hand, the contemporary views of assessment focus on teachers' ability to combine their assessment knowledge with their pedagogy and learning context (DeLuca et al., 2016a). According to Shepard (2000), summative approach to classroom assessment is supported from traditional views of social efficiency curriculum, scientific measurement and behaviorist learning theory. Conversely, formative approach to classroom assessment is supported from contemporary views. Contemporary views of assessment conflict with teachers' previous views that results to resist the progress in the approaches to classroom assessment. The previous traditional approaches affect teachers' classroom assessment actions today. In schools, assessment practices include both traditional test-based and contemporary approaches (Shepard, 2000). In multiple studies, the researchers examined how teachers' approaches to classroom assessment change from traditional to contemporary conceptions. The results showed that pre-service teachers start teacher education programs with summative approaches to assessment depending on their experiences as a student (DeLuca & Klinger, 2010; Mertler, 2004; Volante & Fazio, 2007). As time passes, pre-service teachers start to change their approaches into more contemporary conceptions because their teacher education programs provide opportunities to improve themselves in current assessment conceptions (Volante & Fazio, 2007).

Similar study conducted by Cowan (2009) to show pre-service teachers' development of formative approaches to classroom assessment. The results revealed that the pre-service teachers mainly practicing simple and uncomplicated formative assessment practices (e.g., questioning, sharing learning objectives and criteria) and exceptionally practicing more complicated formative assessment practices (e.g., self-assessment, peer assessment, giving feedback).

In the study of Smith, Hill, Cowie and Gilmore (2014), pre-service teachers' assessment beliefs were examined in first and third year of teacher education

program. The results of the study showed that pre-service teachers' beliefs changed from summative to formative orientations at the end of the teacher education program. Moreover, pre-service teachers realized students' role in assessment process (assessment results give information both teacher and student). On the other hand, in-service teachers should be supported in their professional learning to maintain contemporary classroom assessment conceptions (Mertler, 2004). Moreover, differing models for teacher professional learning have affected teachers' approaches to classroom assessment (DeLuca et al., 2016a). These models include accrediting mentor teacher (Jonson, 2008), getting expert support and collaborative inquiry (Harrison, 2005). In addition to these models, "sustained, collaborative, classroom-embedded professional learning model that engages teachers and administrators in learning about target areas of classroom assessment" (DeLuca et al., 2016a, p.358).

Teachers' assessment practices significantly affect students learning and teaching process (Brookhart, 2011). Teachers' assessment practices are shaped by their beliefs, conceptions (Opre, 2015), background, experience level and professional learning; educational curricula; students' actions, interactions with each other, and diversity (Looney et al., 2017). These factors affect teachers' assessment practices in different assessment themes. These assessment themes may involve teachers' comprehension and conception of assessment purpose (including assessment for learning, assessment as learning, and assessment of learning approaches), assessment process (design, use/scoring, and communication approaches), assessment fairness (standard, equitable, and differentiated approaches), and assessment theory (consistent, contextual and balanced approaches) (Coombs et al., 2018). Various factors impact teachers' agreement of different assessment approaches by developing different assessment practices depend on educational context (DeLuca et al., 2018). Moreover, according to Vandeyar and Killen (2007), divergent assessment conceptions bring on divergent assessment practices. Teachers who believe assessment is a valuable method to collect information about teaching and learning use assessment to complete teaching and learning. Teachers who

believe responsibility should be given to students for their own learning process use formal and summative assessment practices.

In the study of James and Pedder (2006), the connection between teachers' beliefs and practices were examined. The data collected from 558 teachers in England. The results revealed that these teachers who believed that assessment practices used to assist the progress of learning and improve learning process mentioned that they support performance-oriented assessment practices for their students because of the countries' educational policies.

Another study conducted from Alm and Colnerud (2015) to examine teachers' grading practices as a result of their approaches to assessment. The data were collected from 411 teachers in Sweden. The results showed that students' feel the grading is unfair when teachers were unsuccessful to follow contemporary grading systems, used irresponsible and irrelevant information and ambiguous words in communication. Moreover, whether teachers used norm or criterion-referenced grading and included their individual ideas in grading procedure affect the development of the assessments.

In this study, considering above-mentioned literature, pre-service science teachers' approaches to classroom assessment was aimed to be examined.

2.3 Measuring Teachers' Approaches to Classroom Assessment

Over the years, researchers have developed, revised and adapted different instruments to measure teachers' approaches to assessment based on different assessment literacy frameworks, and most of the researchers, used 1990 Standards measures for their instruments and studies (DeLuca et al., 2016b).

Plake et al. (1993) developed Teacher Assessment Literacy Questionnaire (TALQ) to measure in-service teachers' assessment competency in the 1990 Standards for Teacher Competence in Educational Assessment of Students (AFT et al., 1990).

Their item development goal was to arrange realistic and significant application questions related to teachers' assessment practices. The TALQ consists of two parts. First part has 35 items to measure teachers' assessment knowledge on competency areas and second part has questions about teachers' background and perceptions related to assessment. The data collected from 555 in-service teachers. The results of the first part revealed that participants accomplish best in the items related to measuring knowledge in the competency area of administering, scoring and interpreting the results of assessment. On the other hand, the participants accomplish worst in the items related to the competency area of communicating assessment results. The results of the second part revealed that majority of the participants admitted that teacher-developed assessments should be used widely to improve lectures. Also, more than half of the participants stated that in-service delivery is the best way to improve themselves in interpreting assessment scores.

Another study conducted by Zhang and Burry-Stock (1997) who developed Assessment Practices Inventory (API) using 1990 Standards to measure teachers' perceptions of assessment skills. The API consists of 67 items. For each item, the participants were reported their assessment competency on a 5-point scale 1= not at all skilled to 5=highly skilled. The sample was 311 in-service teachers. The participants with measurement training and teaching experience reported that they were more skilled than the others who did not get measurement training in performance assessment, interpreting and using assessment results in decision making.

Similar study conducted from Campbell et al. (2002) with Assessment Literacy Instrument (ALI) that was the renamed version of the TALQ. The sample was 220 pre-service teachers. The results revealed that pre-service teachers showed higher level of reliability when compared to in-service teachers in the study of Plake et al. The participants performed best in the competency area of choosing appropriate assessment methods, and worst in the area of communicating assessment results like the in-service teachers in Plake et al. (1993) study.

In the study of Mertler (2003), Classroom Assessment Literacy Inventory (CALI) was developed. The CALI was adapted from Teacher Assessment Literacy Questionnaire (TALQ) (Plake et al., 1993). The adapted version of the instrument, CALI, has same items which were reworded a little. The sample consisted of 67 pre-service teachers and 197 in-service teachers. The results showed that pre-service teachers performed best in the competency area of choosing appropriate assessment methods, worst in area of developing valid grading procedure. The in-service teachers performed best in the competency area of administering, scoring and interpreting the results of assessment, worst in area of developing valid grading procedure like pre-service teachers. What is more, the in-service teachers accomplished significantly higher scores than pre-service teachers in all items. In other words, the in-service teachers were more assessment literate than pre-service teachers.

In conclusion, the instruments that are TALQ, CALI and ALI have items representing Assessment Processes (57%), Assessment Purposes (14%), Assessment Ethics (14%) and Communicating Assessment Results (14%) themes. The API has items representing items Assessment Fairness and Assessment for Learning themes (DeLuca et al., 2015)

Although these assessment literacy instruments do not reflect current assessment framework and practices (DeLuca et al., 2016b), the standards should be revised and improved into contemporary assessment demands (Brookhart, 2011). Moreover, most of the research on teacher assessment literacy focus to decide teachers' approaches to assessment purposes ignoring other approaches to classroom assessment (DeLuca et al., 2016b). For these reasons, DeLuca, LaPointe-McEwan and Luhanga (2016b) developed the Approaches to Classroom Assessment Inventory (ACAI) based on currently published Classroom Assessment Standards (JCSEE, 2015). The instrument developers identified four themes representing contemporary aspects of teacher assessment literacy: (a) Assessment Purpose (including aspects of assessment for learning), Assessment Process (including

aspects of communicating assessment results), (c) Assessment Fairness (including aspects of assessment ethics), and (d) Assessment Theory. The instrument consists of three parts. Part one of the ACAI has 20 items that contains five scenarios with four items for each scenario to decide teachers' approaches to classroom assessment. Part two of the ACAI has 26 items rated on a five-point scale 1=novice to 5=expert to decide teachers' confidence regarding classroom assessment practices. Part three of the ACAI has two sections to decide teachers' professional learning priorities and preferences in assessment. First section consists of 12 items related to their interest in learning about assessment rated on a five-point scale 1=very low interest to 5=very high interest. Second section consists of 14 items to show their preferences in professional learning rated on a five-point scale 1=not preferred to 5= highly preferred. For all parts, there are no correct responses for the items. The ACAI represents various perspectives and practices related to classroom assessment and the items do not have correct answers. On the other hand, other instruments like TALQ or CALI has the items that represent teachers correct and incorrect classroom assessment knowledge, skills and practices based on 1990 Standards. Moreover, the ACAI represents current assessment contexts and contemporary aspects of teachers' assessment literacy in four themes: assessment purpose, assessment process, assessment fairness and assessment theory. However, the above-mentioned instruments except from the ACAI focuses only assessment purposes. For these reasons, in this study, the ACAI was selected to administer the participants (DeLuca et al., 2016b). It was also used to assess participants' perceived assessment practices.

2.4 Teachers' Conceptions of Assessment

Teachers' conceptions depict various categories of ideas related to their description of how they experienced educational concepts (Pratt, 1992). These conceptions represent teachers' views, interactions and interpretations about teaching environment (Marton, 1981).

The studies related to teachers' conceptions of assessment have importance because teachers' conceptions of learning, teaching, assessment and curriculum affects the way they teach, and their students learn and achieve learning goals (Thompson, 1992), the quality of teachers' performance and methods implementation in educational activities (Opre, 2015), and their perceptions and evaluation of student performance (i.e., assessment) (Brown, 2004). In addition, teachers' conceptions of assessment have impact on their interpretations and contributions in their teaching context (Skott, 2015). Therefore, the studies about teachers' conceptions of assessment have significant contribution to understand how teachers comprehend assessment and how they conceive assessment and how their conceptions affect their teaching (Opre, 2015).

According to various researchers, teachers hold four conceptions of assessment. A first conception of assessment is that assessment advanced student learning process and teaching quality (Black & Wiliam, 1998). To see the advancement in learning and teaching, assessment have to determine students' performance and show valid and reliable information about students' performance (Brown, 2004). Also, assessment contribute information for teachers to advance their teaching and teaching activities (Opre, 2015). A second conception of assessment is that assessment can be utilized to represent teachers', schools' or education system's usage of public resources. Assessment results show teachers' or schools' performance and consequences of their performance to other people (Firestone et al., 1998). In other words, teachers and schools are two main actors that affects students' performance (Opre, 2015). A third conception of assessment is that students independently responsible for their learning through assessment. There are important consequences of assessment results for individual students. They can be placed into learning groups or classes, used for graduation and higher levels of education based on their grades of assignment, performance and exams (Brown, 2004). A fourth conception of assessment is that assessment has no valid role in teaching and learning. Assessment generally considered to cause negative consequences for students, teachers and educational system. Assessment can cause anxiety to students

and ignore their abilities (Opre, 2015). Moreover, assessment can distract actual purpose of teaching and learning, and negatively affect teachers' autonomy and professionalism (Dixon, 1999).

Brown (2004) summarized teachers' four conceptions of assessment:

(a) assessment improves teacher instruction and student learning by providing quality information for decision-making; (b) assessment makes students accountable for their learning; (c) teachers or schools are made accountable through assessment; and (d) assessment is irrelevant to the work of teachers and the life of students (p. 305).

In addition, these four assessment conceptions can interact with each other. In other words, teachers can have multiple conceptions about assessment. To illustrate, teachers who believe assessment is irrelevant could also think that assessment improves instruction and student learning (Brown, 2004).

Teachers' these types of conceptions affect from some factors. According to Brown (2004), the number of years' in their professional experience as a teacher and previous experience as a student, the educational context that they develop, and socio-economic status of their schools does not affect teachers' conceptions of assessment. On the contrary, these conceptions can be changed by educational system, the way of understanding of the content (Vandeyar & Killen, 2007), teachers' perceptions of the societies' expectations, and their beliefs about their students' abilities (Bright & Joyner, 1998).

In the study of Brown and his colleagues (Brown, 2004; Brown & Harris, 2009; Brown et al., 2011) used Teachers' Conceptions of Assessment (COA) instrument to show teachers' agreement and disagreement to 50 items related to these four conceptions of assessment. The results of the study revealed that participant teachers agreed the conceptions which are assessment improves teacher instruction and student learning by providing quality information for decision-making, assessment

makes students accountable for their learning, and teachers or schools are made accountable through assessment. On the other hand, they disagreed the conception which assessment is irrelevant to the work of teachers and the life of students. Also, according to DeLuca et al. (2016a) the results of this study showed that “teachers conceptualize and value assessment purposes differently pointing to potential variability in teachers’ approaches to assessment” (p. 360).

Hargreaves (2005) conducted a study to explore and interpret teachers’ conceptions of assessment for learning approach. The data collected from 83 teachers. She summarized six conceptions based on the participants’ responses: assessment for learning means (1) monitoring students’ performance against learning goals; (2) using assessment results to inform next steps of learning and teaching; (3) giving feedback to improve; (4) learning about students’ learning; (5) taking control of students’ their own learning and assessment; and (6) using assessment as a learning event.

Another study conducted from Wang, Kao and Lin (2010) to describe and analyze pre-service teachers’ initial conceptions about assessment of science learning. The data collected from 215 pre-service teachers through open-ended written questions and interviews. The results of the study showed that more than half of the participants conceived assessment can be used to measure students’ knowledge related to learning objectives; approximately half of the participants conceived that knowledge application should be assessed; roughly 10% of the participant conceived that the aim of the assessment should be fundamental process skills and students’ involvement in learning tasks should be assessed; less than 5% of the participants conceived that higher level of inquiry thinking processes should be assessed.

Based on the above-mentioned literature, this study aimed to investigate pre-service science teachers’ conception of assessment through semi-structured interviews to get an in-depth understanding of their conceptions. More specifically, in the current

study, one of the purposes was to reveal how pre-service science teachers with different approaches to assessment conceptualize assessment.

CHAPTER 3

METHOD

This chapter covers information about the research method of the study under eight subtitles that are research design, study context, population and sample, instruments, data collection, data analysis, trustworthiness, and assumptions.

3.1 Research Design

The current study is based on a mixed method research design. It involves collection and analysis of both qualitative and quantitative forms of data in a single study (Creswell, 2014). The quantitative data were collected with Approaches to Classroom Assessment Inventory (ACAI) to analyze pre-service science teachers' approaches to classroom assessment. Then, qualitative data were collected with semi-structured interviews to see how pre-service science teachers with different approaches to classroom assessment conceptualize assessment.

3.2 Study Context

Before applying Elementary Science Education (ESE) program, candidates must take a national university entrance exam at the end of the high school education in order to be a student of this program in Turkey. The candidates are placed in ESE program at different universities depending on the results of the exam and their preferences.

The general aim of the ESE program is to educate future science teachers for 5th – 8th grades in elementary schools. In Turkey, the ESE program was prepared by Higher Education Council (YÖK) in 1998, 2006 and 2018. The participants of this study followed the program that prepared in 2006. It is a four-year program and

consists of must courses related to scientific field knowledge, professional teaching knowledge, general knowledge and elective courses (Arduc et al., 2020). One of the must courses focuses on educational assessment.

3.3 Population and Sample

The population of the quantitative part of this study was pre-service science teachers (PSTs) from the universities located in different regions of Turkey. The sample entirely consisted of 676 PSTs (283 juniors and 393 seniors) from 12 universities in six regions of Turkey. The distribution of the participants through regions were presented in Table 3.1. The universities selected by convenience sampling. Of the 676 PSTs, 534 (79%) were female and 142 (21%) were male. The PSTs ranged in age from 19 to 35 with a mean age of 21.78 (SD= 1.37).

Table 3.1 Distribution of participants

Geographical Region	Sample Frequency	
	Junior	Senior
Marmara	25	14
Aegean	86	110
Mediterranean	48	42
Black Sea	18	80
Central Anatolia	56	69
Eastern Anatolia	50	78
South Eastern Anatolia	0	0
Total	283	393

Of 676 PSTs, only 7 PSTs (1.0%) reported that they took four assessment courses. Majority of the PSTs (60.4%) took one assessment course. Although all PSTs took at least one assessment course, 3.7% of them thought that they do not have any knowledge about assessment and 3.6% of them stated that assessment was not mentioned during their education. Also, 4.1% of PSTs stated that they are not

interested in assessment topics. More than 90 % of the participants (n=613) reported that they are planning to work as a science teacher when they graduate. Detailed information about characteristics of the participants were presented in Table 3.2.

Table 3.2 Information about participants

Variable	Frequency	Percent
<i>Number of courses taken</i>		
Never	62	9.2
One course	408	60.4
Two courses	159	23.5
Three courses	40	5.9
Four courses	7	1.0
<i>Mention of assessment topic</i>		
Not at all	24	3.6
A little	122	18.0
Moderate	359	53.1
A lot	171	25.3
<i>Knowledge about assessment</i>		
Not at all	25	3.7
A little	217	32.1
Moderate	400	59.2
A lot	34	5.0
<i>Interest in the topics related to assessment</i>		
Not at all	28	4.1
A little	167	24.7
Moderate	372	55.0
A lot	109	16.1

The qualitative part of this study consisted of 15 volunteer PSTs. The instrument used to collect quantitative data included a section that asked the participants whether they would be volunteers to participate in the qualitative part of the study. If so, they were kindly asked to provide their e-mail addresses. In total, 85 volunteer PSTs shared their e-mail addresses to participate in the semi-structured interview. An e-mail was sent to volunteers to explain the aim of the study and details of the qualitative part, and to confirm their volunteer participation. 15 of the 85 PSTs replied to e-mails agreeably. The semi-structured interviews were conducted with them.

The demographic information of the pre-service science teachers involved in the qualitative part and their support for each approach are provided below. The pre-service science teachers were identified as highly supportive of an approach when their mean scores are 4 or above obtained by averaging their endorsement for a particular approach across all five scenarios. This cut-off point was determined considering the strategies recommended by one of the developers of the ACAI. More specifically, it was recommended that one strategy can be to calculate central tendency (mean or median) for each approach and to use this value to group participants into high/low groups. Another strategy can be to select a cut-off value. The consulted ACAI developer suggested that the greater the cut-off value for high levels of endorsement, the better it will function in qualitative part. Accordingly, considering these two suggested strategies together (i.e., considering the mean for each approach and selecting a greater cut-off value for a better identification of high levels of endorsement), a cut-off value of 4 or above was selected in this study, Table 3.3 indicates the highly endorsed approaches by each participant considering abovementioned cut-off point.

Pre-service Science Teacher A

Pre-service Science Teacher A is 23 years old senior student on teacher education program. She reported that she took one assessment course. According to her response to the related question, this course helped her to understand what

assessment is and how she can meet the objectives in science. She thinks that this course contributed to her, but it is not sufficient. PST A was found to be highly supportive of assessment for learning (AfL) approach (M=4.20) in the theme of assessment purpose and equitable approach (M=4.20) in the theme of assessment fairness using the abovementioned cut-off value (see Table 3.3).

Pre-service Science Teacher B

Pre-service Science Teacher B is a 20 years old junior student taking only one assessment course on teacher education program. She stated that she did not learn too much about assessment in this course. As shown in Table 3.3, a standard approach (M=4.00) within the theme of assessment fairness was highly endorsed by the PST B.

Pre-service Science Teacher C

Pre-service Science Teacher C is 21 years old, senior student. He took two assessment courses. He indicated that in these courses, assessment methods, how to use these methods, interpretation of methods were taught. According to him, he cannot know whether these courses were sufficient or insufficient without experience. Except from assessment of learning (AoL) approach within assessment purpose theme and differentiated approach within assessment fairness theme, all remain approaches (AfL (M=4.80), assessment as learning (AaL) (M=4.00), design (M=5.00), use/scoring (M=4.00), communication (M=4.40), standard (M=4.00), equitable (M=4.40), consistent (M=4.00), contextual (M=4.20), and balanced (M=4.00)) were endorsed from PST C (see Table 3.3).

Pre-service Science Teacher D

Pre-service Science Teacher D is 22 years old, senior student. She took one assessment course. This course provided her to assess student knowledge and assessment methods. She thinks that this course contributed her, but it is not sufficient, and she can improve themselves with the help of instructors in her teacher

education program and their articles or books. As shown in Table 3.3, PST D was found to be highly supportive of assessment AoL (M=4.60) and AfL (M=4.20) approaches within the theme of assessment purpose, communication approach (M=4.20) within the theme of assessment process, balanced approach (M=4.60) within the theme of assessment theory, equitable (M=4.00) and differentiated (M=4.40) approaches within the theme of assessment fairness.

Pre-service Science Teacher E

Pre-service Science Teacher E is 22 years old, senior student. She took one assessment course. In this course, she learned sufficient information about traditional assessment methods, and how to use performance assessment and portfolio assessment. PST E was found to prioritize communication (M=4.80) and use/scoring (M=4.20) approaches in assessment process theme, AfL (M=4.40) and AaL (M=4.60) approaches in assessment purpose theme, equitable (M=4.60) and differentiated (M=4.40) approaches in assessment fairness theme, and balanced approach (M=4.20) in assessment theory theme (see Table 3.3).

Pre-service Science Teacher F

Pre-service Science Teacher F is 22 years old, senior student. She took one assessment course. According to her, the instructor gave an emphasis on preparing exam questions. She thinks this course was not sufficient, and she can improve themselves with experience. As shown in Table 3.3, PST F was highly supportive of design approach (M=4.80) within the theme of assessment process, AaL approach (M=4.00) within the theme of assessment purpose, and equitable approach (M=4.00) within the theme of assessment fairness.

Pre-service Science Teacher G

Pre-service Science Teacher G is 22 years old, senior student. She reported that she did not take any assessment courses. PST G was found to highly endorse communication (M=5.00), design (M=4.60), and use/scoring (M=4.00) approaches

in assessment process theme, AfL (M=4.60) and AaL (M=4.60) approaches in assessment purpose theme, differentiated (M=4.80) and standard (M=4.00) approaches in assessment fairness theme, and balanced approach (M=4.40) in assessment theory theme (see Table 3.3).

Pre-service Science Teacher H

Pre-service Science Teacher H is 21 years old, senior student. She took one assessment course. According to her, she learned some current methods of assessment. She stated that this course was not fully sufficient. PST H was found to be highly supportive of equitable approach (M=4.60) in the theme of assessment fairness, and AoL (M=4.40) and AaL (M=4.00) approaches in the theme of assessment purpose (see Table 3.3).

Pre-service Science Teacher I

Pre-service Science Teacher I is 23 years old, senior student. He took one assessment course. He indicated that he learned how to prepare exam questions with the help of this course. According to him just one assessment course is not enough for them. As shown in Table 3.3, PST I was found to highly endorse a standard approach (M=4.20) in the theme of assessment fairness, AoL approach (M=4.00) in assessment purpose theme, and consistent approach (M=4.00) in assessment theory theme.

Pre-service Science Teacher J

Pre-service Science Teacher J is 21 years old, senior student. She took one assessment course. She reported that, in this course, traditional assessment methods, performance assessment, portfolio assessment and structured grid were covered. According to her, this was not sufficient for her teaching profession, and she tries to improve herself by researching and reading related books. Except from standard approach in assessment fairness theme and consistent approach in assessment theory theme, all remain approaches (AoL (M=4.20), AfL (M=4.20), AaL (M=5.00), design

(M=4.20), use/scoring (M=4.40), communication (M=4.80), differentiated (M=5.00), equitable (M=4.40), contextual (M=4.80), and balanced (M=4.60)) were endorsed from PST J (see Table 3.3).

Pre-service Science Teacher K

Pre-service Science Teacher K is 21 years old, senior student. She took one assessment course. She learned assessment methods including laboratory assessment. She thinks the course provide her sufficient information for her teaching profession. As shown in Table 3.3, PST K highly prioritized consistent approach (M=4.80) within the theme of assessment theory and AfL approach (M=4.00) within the theme of assessment purpose.

Pre-service Science Teacher L

Pre-service Science Teacher L is 21 years old, senior student. She took two assessment courses. According to her, these courses provided her with sufficient information about assessment methods. Also, she learned making experiments, preparing lesson plan and classroom management in this course. Across four assessment themes, none of the approaches were highly endorsed by PST L.

Pre-service Science Teacher M

Pre-service Science Teacher M is 22 years old, junior student. He took one assessment course. In this course, he learned sufficient information about preparing open-ended questions, multiple choice questions, homework, and giving feedback to monitor student learning during or at the end of the learning. As shown in Table 3.3, PST M was more likely to prioritize design approach (M=4.40) in assessment process theme, AfL approach (M=4.20) in assessment purpose theme, and equitable approach (M=4.00) in assessment fairness theme.

Pre-service Science Teacher N

Pre-service Science Teacher N is 27 years old, senior student. She took two assessment courses. She learned how to write learning objectives, assessment methods, preparing various types of exam questions with advantages and disadvantages. She thinks these courses contributed them enough knowledge about assessment theoretically, but she needs experience in practice. PST N was highly supportive of communication approach (M=4.60) within the theme of assessment process, contextual (M=4.20) and balanced (M=4.00) approaches within the theme of assessment theory, equitable (M=4.00) and differentiated (M=4.00) approaches within the theme of assessment fairness, and AaL approach (M=4.00) within the theme of assessment purpose (see Table 3.3).

Pre-service Science Teacher O

Pre-service Science Teacher O is 23 years old, senior student. She took one assessment course. In this course, she thinks that she learned sufficient information such as advantages of assessment methods. Also, assessment can provide feedback to us about teaching process. PST O was found to be highly supportive of AfL (M=4.40) and AaL (M=4.20) approaches within the theme of assessment purpose, differentiated (M=4.40) and equitable (M=4.00) approaches within the theme of assessment fairness, design (M=4.20) and communication (M=4.00) approaches within the theme of assessment process, and balanced approach (M=4.20) within the theme of assessment theory (see Table 3.3).

Table 3.3 Endorsement of approaches by each participant

Participants	Assessment Purpose			Assessment Process			Assessment Fairness			Assessment Theory		
	AoL	AfL	AaL	Design	Use/scoring	Communication	Standard	Equitable	Differentiated	Consisted	Contextual	Balanced
A		x				x		x				
B							x					
C		x	x	x	x	x	x	x		x	x	x
D	x	x				x		x	x			x
E		x	x	x	x	x		x	x			x
F			x	x				x				
G		x	x	x	x	x	x		x			x
H	x	x	x			x		x				
I	x						x			x		
J	x	x	x	x	x	x		x	x		x	x
K		x								x		
L												
M		x		x				x				
N			x			x		x	x		x	x
O		x	x	x		x		x	x			x

3.4 Instruments

3.4.1 Quantitative Data Collection Instrument

The Approaches to Classroom Assessment Inventory (ACAI) was developed by a research team at the Queen's Faculty of Education led by Dr. Christopher DeLuca based on the new Classroom Assessment Standards of Joint Committee for Standards on Educational Evaluation (Joint Committee on Standards for Educational Evaluation, 2015). The instrument developers identified four assessment literacy themes and each theme associated with three assessment approaches: (1) assessment purpose (includes assessment of learning, assessment for learning and assessment as learning approaches), (2) assessment process (includes design, use/scoring and communication approaches), (3) assessment fairness (includes standard, equitable and differentiated approaches), and (4) assessment theory (includes consistent, contextual and balanced approaches) to represent the contemporary aspects of teacher assessment literacy (DeLuca et al., 2018).

For the present study, the ACAI was translated and adapted into Turkish. The adapted version of the ACAI was administered to pre-service science teachers to examine their approaches to classroom assessment. In the adapted version of ACAI, there are two parts that target different aspects. Part one consists of questions about demographic information and teaching background like gender, age, university and grade level. This part contains five scenario-based questions with four items designed to analyze and determine the PSTs' approaches to classroom assessment. For each item, there are three actions, and the participants were asked to identify the possibility of enacting each action rated on a five-point scale (1= not at all likely; 5= highly likely). In total, there are twelve actions associated with twelve assessment approaches for each scenario.

The instrument was carefully adapted. Wording of the statements was examined by two psychological counseling and guidance experts, three Turkish language teachers,

two English language teachers, one expert in science education offering an assessment course for 18 years, and one expert in Academic Writing Center to eliminate ambiguities and unfamiliar terms. Depending on the experts' feedback, the related parts were rewritten and checked again until the experts approved all items and questions in the instrument concerning clarity, appropriateness, and validity. In addition, during the adaptation process, the researcher contacted the developers of the instrument and got their approvals for the suggested revisions. Some suggestions were also made by the developers of the instrument. By getting permission and recommendation from instrument developers some items in the ACAI were revised. The revised items presented in Table 3.4. Also, for all questions and the actions in Scenario 5, the “standardized test” term was changed as “high school entrance examination” considering the context of the study. The adapted instrument was presented in Appendix B.

Table 3.4 Revised items in the ACAI

	Item	Revised item
Scenario 1	You give your class a paper-pencil summative unit test with accommodations and modifications for identified learners. Sixteen of the 24 students fail.	You give your class a paper-pencil summative unit test. Sixteen of the 24 students fail.
Scenario 1 Question 3 Action 2	For students with exceptionalities, who failed the test, discuss a new assessment that would appropriately demonstrate his/her learning.	For students who failed the test, discuss a new assessment that would appropriately demonstrate his/her learning.

Table 3.4 (Cont'd)

	Item	Revised item
Scenario 5	A parent of one of your classified/identified students is concerned about an upcoming standardized test.	A parent of one of your classified/identified students is concerned about an upcoming high school entrance examination.
Scenario 5 Question 19 Action 1	Tell the parent that all eligible students in the class must complete the standardized test.	Tell the parent that it is not obligatory to enter high school entrance exam.
Scenario 5 Question 19 Action 3	Tell the parent that standardized tests are required but classroom assessments can be fully accommodated for the student's individual learning needs.	Tell the parent that high school entrance examination is not required but classroom assessments can be fully accommodated for the student's individual learning needs.

3.4.2 Qualitative Data Collection Instrument

As a second phase of the study, qualitative data were collected to investigate how pre-service science teachers with different approaches to assessment conceptualize assessment through semi-structured interviews. In mixed method research design, the semi-structured interviews can be helpful to support, complete and add depth to results (Adams, 2015). ‘‘The semi-structured interview also gives the interviewer the space to seek clarity as to what the interviewee actually means and why they gave a particular answer’’ (Morris, 2015, p.10). Therefore, semi-structured interviews were selected as the study's qualitative data collection instrument. The questions of the semi-structured interviews were formed by the researcher considering the research questions of the present study, the Approaches to Classroom Assessment Inventory (ACAI) questions, and the related literature (Wang et al., 2010). Accordingly, the interview questions were grouped under 3 main aspects namely, focus of assessment, method (mode) of assessment, and perceived deficiencies (in assessment).

After forming the interview questions, two experts in science education and one in Turkish language education analyzed the questions. According to the experts' feedback, necessary parts were written and rechecked. The interview questions were pilot tested with two pre-service science teachers. The semi-structured interviews were conducted by the researcher face to face or via audio conferencing and lasted approximately 15 minutes. After the interviews, the participants gave feedbacks about the interview questions in terms of comprehensibility, clarity and wording. According to participants' feedbacks, some words revised to be more comprehensible. The final version of the semi-structured interviews includes 13 questions that grouped under 3 main aspects as focus of assessment (e.g., in your opinion, what should be the focus of assessment in science classes?), method (mode) of assessment (e.g., in your opinion, which assessment method is more effective in science classes?) and perceived deficiencies in assessment (e.g., is there anything that you feel you are inefficient in assessment in science classes?) and follow-up questions in total (see Appendix C).

3.5 Data Collection

Before starting data collection process, ethical permission was taken from the Middle East Technical University Scientific Research and Publication Ethics Committee. After getting the necessary permissions, the researcher reached the volunteer participants in one of the universities. For the rest of the universities from different cities, the researcher contacted research assistants and faculty members to administer the instrument to their volunteer students. The instruments were sent in the beginning of the spring semester in 2019. Some of the research assistants and faculty members collected data and sent back the instruments to the researcher in 2019, 2020 and 2021. However, some of the research assistants and faculty members could not send back the instruments because of the coronavirus (COVID-19) pandemic outbreak. Then, the qualitative data was collected from volunteer PSTs in the fall semester in

2020 and spring semester in 2021. Depending on the participants' requests, the semi-structured interviews were conducted by the researcher via video or audio conferencing. By getting permission from the participants before the semi-structured interviews, audio recordings of the participants were taken. The semi-structured interviews lasted approximately 15 minutes. Figure 3.1 displays the summary of methodology followed in the qualitative part.

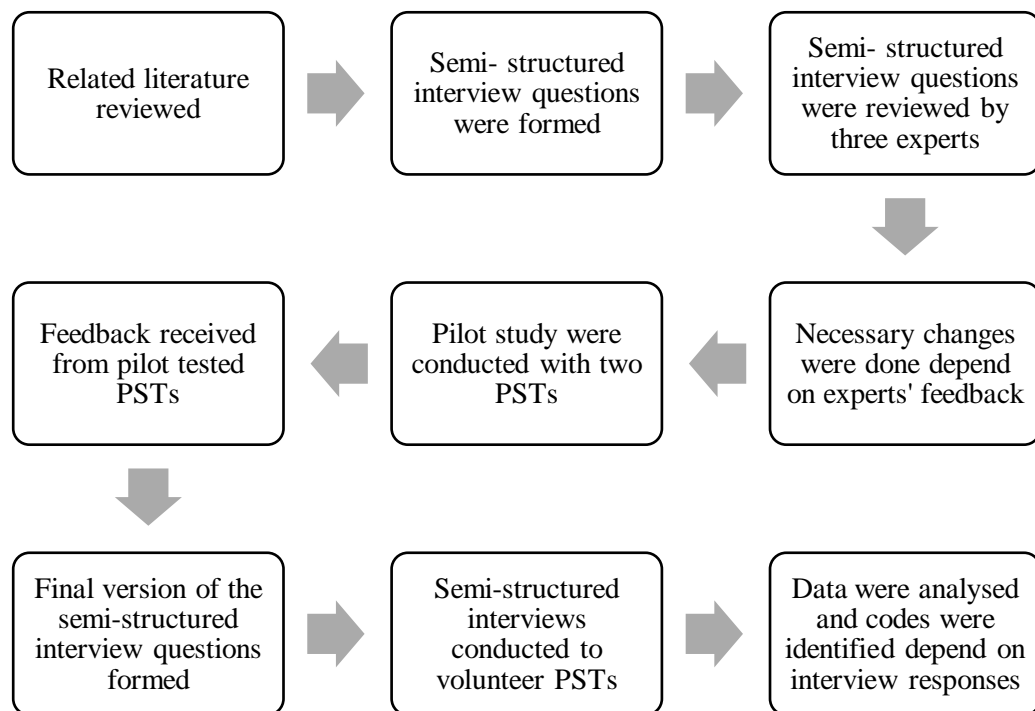


Figure 3.1 Methodology in qualitative part

3.6 Data Analysis

Both quantitative and qualitative data were collected for the study. The first part included analysis of quantitative data attained from the ACAI. Descriptive analysis (i.e., mean, standard deviation and frequency distributions) and inferential statistics

(i.e., repeated measures ANOVA) were conducted through IBM SPSS Statistics 23. The second part included analysis of qualitative data attained from semi-structured interviews. The interview responses were examined with qualitative content analysis. Codes that are mostly short expressions help to organize data and interpret about them (Miles et al., 2014). In the present study, hybrid coding is used. Hybrid coding involves both inductive coding and deductive coding (Saldana, 2013). For the data analysis, three aspects were identified namely focus of assessment, method (mode) of assessment, and perceived deficiencies. For each aspect, parent codes and child-codes were identified both inductively (as emergent codes) and deductively (as predetermined codes). More specifically, in the present study, the interview questions were structured under 3 main aspects namely, focus of assessment, method (mode) of assessment, and perceived deficiencies (in assessment). As part of the data analysis, for each aspect, child-codes and parent-codes were identified either inductively or deductively. For example, concerning method (mode) of assessment aspect, based on the study conducted by Wang, Kao, and Lin (2010), some of the child-codes were pre-determined (e.g., paper-pencil test, oral questioning) but others were identified inductively as emergent codes (e.g., self-assessment, Vee diagrams). The related parent-codes for this aspect were all identified deductively considering Wang, Kao, and Lin's study. On the other hand, regarding perceived deficiencies aspect, all child-codes and related parent codes were identified inductively.

3.7 Trustworthiness

To ensure trustworthiness of the qualitative part of the study, Lincoln and Guba (1985) defined four criteria for trustworthiness, namely, credibility, dependability, transferability, and confirmability. The first criterion is credibility that concerned with correspondence between the participants' responses and obtained data (Korstjens & Moser, 2018). In the present study, investigator triangulation (Lincoln & Gubba, 1985) was used to ensure credibility. As part of investigator triangulation,

an expert in science education offering assessment course during the last 18 years was consulted about the data analysis and identification of the codes. The second criterion for trustworthiness is dependability that deals with replicability of the study by other researchers with consistent results. Due to dynamic nature of experiences in a social environment, in a qualitative research, replicability can be debatable, thus more emphasis is given on the consistency of the results (Merriam, 2009). According to Merriam (2009), triangulation can be used as one of the strategies to provide dependability. Thus, in the current study, investigator triangulation was also used to ensure dependability. In fact, Lincoln and Guba (1985) stated that providing credibility also implies the dependability. The third criterion is transferability which involves generalizability and applicability of the study results to different situations (Korstjens & Moser, 2018). For this study, the detailed information about the PSTs and the excerpts based on their interview responses were presented to provide transferability. The last criterion is confirmability that involves neutrality of the researcher. The results should only reflect participants responses (Stahl & King, 2020). Triangulation methods and audit-trails are recommended to provide credibility (Shenton, 2004). In this study, triangulation method (investigator triangulation) was used, and details of the data collection and data analysis were provided to ensure confirmability.

3.8 Assumptions

1. The participants of the study fulfilled the instrument and responded interview questions honestly.
2. The participants did not communicate with each other while fulfilling the instrument and responding the questions.
3. The characteristics of the participants were assumed to be representative of the population.

CHAPTER 4

RESULT

This chapter gives information about results of the descriptive and inferential statistics about pre-service science teachers' approaches to assessment, their perceptions about classroom assessment, and their conceptions of assessment.

4.1 Pre-service Science Teachers' Approaches to Assessment

In order to address the research question: "What is the pre-service science teachers' endorsement of a particular approach to classroom assessment in terms of four themes of assessment (i.e., assessment purpose, assessment process, assessment fairness, assessment theory)?" descriptive statistics (percentage, mean and standard deviation) were computed. As shown below, descriptive statistics were reported for each scenario to indicate pre-service science teachers' approaches to assessment across each of the four themes.

Scenario 1: *You give your class a paper-pencil summative unit test. 16 of the 24 students fail.*

Question: As a teacher in this situation, how likely are you to do each of the following actions?

Table 4.1 Descriptive statistics for scenario 1

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Purpose	AoL	Record the test grade as each student's summative assessment for the unit but reduce the weight of the test in the final grade.	11.5	19.8	36.1	21.7	10.9	3.01	1.15
	AfL	Based on your analysis of the test, reteach parts of the unit focusing on items students struggled with, give students opportunities to apply their learning, and then re-test the material.	0.6	2.5	9.6	19.8	67.5	4.51	0.82
	AaL	Ask students to reflect on their test preparation, analyze their test responses, and make a personal plan for re-learning the material. Then re-test the material.	1.8	9.6	22.0	31.1	35.5	3.89	1.05
Assessment Process	Design	Recognize that your test design may be flawed and design a revised unit test to give students.	1.9	8.4	24.4	31.1	34.1	3.87	1.04
	Use/Scoring	Remove test questions that most students failed and re-calculate student scores without those questions.	40.1	29.0	17.5	8.7	4.6	2.09	1.56
	Communication	Schedule student conferences (individual or group) to discuss grades, areas of confusion, and next steps.	1.8	4.6	24.1	38.8	30.7	3.92	0.94

Table 4.1 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Fairness	Standard	Allow all students to retake a similar test and average the two grades.	8.1	17.5	33.1	26.8	14.5	3.22	1.14
	Equitable	For students who failed the test, discuss a new assessment that would appropriately demonstrate his/her learning.	2.1	9.1	25.3	37.4	26.0	3.76	1.01
	Differentiated	Discuss with each student who failed the test a new assessment that would appropriately demonstrate his/her learning.	2.2	6.6	22.6	38.0	30.5	3.88	0.99
Assessment Theory	Consistent	Analyze test questions that the majority of students consistently answered incorrectly. Then provide students with new questions to test those concepts.	2.5	7.8	22.9	36.2	30.5	3.84	1.03
	Contextual	Consider student test scores in light of previous, formative assessment information available for each student. Consider this information and adjust grades accordingly.	8.4	15.3	34.3	28.9	13.2	3.23	1.12
	Balanced	Reflect on student performance, considering item wording and student circumstances contributing to failure in relation to previous assessment information. Then adjust grades accordingly.	1.3	6.1	20.7	37.4	34.4	3.97	0.96

The results from this scenario indicated that the vast majority of the pre-service science teachers in this sample emphasized an assessment for learning (AfL) approach ($M= 4.51$, $SD= 0.82$) within the theme of assessment purpose. In practice, the response includes “reteach the parts of the unit that the students have difficulty, and re-testing the students to apply their learning” and 67.5 % of the participants selected “highly likely” option for this response. Across all pre-service science teachers in this sample, the least endorsed responses based on the descriptive statistics involved standardized and summative approach to assessment. Indeed, the response with the lowest mean was to “remove the test questions which most of the students failed and re-calculate the student scores without those questions” ($M= 2.09$, $SD= 1.56$). This item reflects use/scoring approach within the theme of assessment process and only 4.6 % of the sample selected “highly likely” option for this item. The item with the next lowest mean score involves “record the test grade as each student’s summative assessment for the unit but reduce the weight of the test in the final grade” ($M= 3.01$, $SD= 1.15$). This item concerned assessment of learning (AoL) approach within the theme of assessment purpose. The third lowest mean score was on the standard approach within the theme of assessment fairness. The related item involves “allow all students to retake a similar test and average the two grades” ($M= 3.22$, $SD= 1.14$). In the assessment fairness theme, the most endorsed approach was differentiated approach with a mean of 3.88. Concerning assessment theory theme, the least endorsed approach was contextual approach ($M= 3.23$, $SD= 1.12$) based on the mean scores.

Scenario 2: *You discover that one of your students has plagiarized some of his assignment (e.g., an essay, lab report).*

Question: As a teacher in this situation, how likely are you to do each of the following actions?

Table 4.2 Descriptive statistics for scenario 2

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Purpose	AoL	Administer consequences in alignment with school policies on plagiarism.	5.8	17.8	26.5	25.9	24.0	3.44	1.20
	AfL	Have him highlight the plagiarized text and then rewrite the section in his own words. As a teacher, reflect on how this incident might inform your future teaching practice.	2.7	8.1	24.3	34.3	30.7	3.82	1.04
	AaL	Ask him to document how he obtained and used reference materials for the assignment and what he would do differently next time. Have him write a work plan for re-doing the assignment.	2.1	6.7	17.8	34.7	38.6	4.01	1.01
Assessment Process	Design	Reflect on how you as a teacher designed and presented the assignment. In future, ensure that you deliberately design opportunities for students to learn about plagiarism.	0.9	5.2	20.2	37.1	36.5	4.03	0.93
	Use/Scoring	Grade aspects of student work that are original and deduct points for the plagiarized sections.	11.2	16.9	27.5	26.9	17.4	3.22	1.24
	Communication	Talk with him about the severity of plagiarism and negotiate potential next steps for his learning.	1.2	4.3	13.6	31.4	49.4	4.24	0.93

Table 4.2 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Fairness	Standard	Explain to him the policy on plagiarism and how you consistently apply the policy so that it is fair for all students.	1.3	6.7	14.8	33.5	43.6	4.11	0.98
	Equitable	Consider his specific learning needs and exceptionalities before determining whether or not to apply the general plagiarism policy.	2.4	10.2	26.9	32.6	27.8	3.73	1.05
	Differentiated	Conference with him to review the implications of plagiarizing and agree upon an appropriate alternate assignment.	4.2	7.8	24.1	35.0	28.9	3.77	1.08
Assessment Theory	Consistent	Consult school policy on plagiarism and implement consequences consistent with the policy.	4.8	15.0	24.3	28.6	27.4	3.59	1.17
	Contextual	Consider the original aspects of the assignment and the plagiarized text to determine what he knows and does not appear to know about the content expectations.	4.8	11.5	25.3	34.6	23.8	3.61	1.11
	Balanced	Examine extenuating circumstances that led to the plagiarism and then develop an alternative assignment to assess the expectations relevant to the plagiarized sections of the assignment.	3.0	11.1	26.6	32.8	26.5	3.69	1.07

In responding to this scenario, the pre-service science teachers in this sample prioritized communication approach (M= 4.24, SD= 0.93) within the theme of assessment process. In practice, the response includes “talk with the student about

the severity of plagiarism and negotiating the possible next steps for his/her leaning”. The item with next highest mean score involves “reflect on how you as a teacher designed and presented the assignment. In future, ensure that you deliberately design opportunities for students to learn about plagiarism” (M= 4.03, SD= 0.93). This item reflects design approach within the theme of assessment process like the item with the highest mean score, and only 0.9% of the sample selected “not at all likely” option on this item. The third highest mean score was on assessment as learning (AaL) approach within the theme of assessment purpose. In practice, the item involves “ask him to document how he obtained and used reference materials for the assignment and what he would do differently next time. Have him write a work plan for re-doing the assignment” (M= 4.01, SD= 1.0). Across all pre-service science teachers in this sample, for this scenario, the least endorsed response related to was use/scoring approach (M= 3.22, SD= 1.24) within the theme of assessment process. In practice, the response includes “grade aspects of student work that are original and deduct points for the plagiarized sections”. The second lowest mean score was on assessment of learning (AoL) approach within the theme of assessment purpose. The related item involves “administer consequences in alignment with school policies on plagiarism” (M= 3.44, SD= 1.20). In the assessment fairness theme, the most endorsed approach was standard approach (M=4.11, SD= 0.98). Regarding assessment theory theme, the least endorsed approach was consistent approach with a mean of 3.59.

Scenario 3: *Out of 28 students in your class, 4 students are classified/identified with an exceptionality and have an Individual Education Plan (IEP) (i.e., each student requires accommodations but not a modified curriculum) as well as several other unidentified students with differentiated learning needs. You must decide how to accurately measure learning in your class.*

Question: As a teacher in this situation, how likely are you to do each of the following actions?

Table 4.3 Descriptive statistics for scenario 3

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Purpose	AoL	Provide the 4 identified students with accommodations on all summative assessments.	2.2	6.3	20.4	40.7	30.4	3.91	0.98
	AfL	Implement scaffolded formative assessments with all of your students based on their individual learning needs, leading up to the final accommodated unit test.	1.2	2.4	20.7	38.2	37.6	4.09	0.88
	AaL	Allow each student to develop a personal learning plan based on his/her strengths, learning needs, and the learning goals.	0.7	5.1	15.4	33.7	45.1	4.17	0.92
Assessment Process	Design	Design a variety of assessment tasks and allow students to choose how they will demonstrate their achievement of learning expectations.	2.1	3.3	20.1	44.0	30.5	3.98	0.91
	Use/Scoring	Accommodate your rubrics and scoring guides to reflect identified students' IEPs.	1.0	4.3	19.6	33.8	41.2	4.10	0.93
	Communication	Explain to students and parents the purpose of accommodations and how they will be implemented and communicated on students' report cards.	1.6	5.4	20.5	31.4	41.0	4.05	0.99

Table 4.3 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Fairness	Standard	Grade students based on the same assessments including homework, quizzes, and a unit test.	14.5	18.0	25.1	23.5	18.9	3.14	1.32
	Equitable	Ensure students with identified learning exceptionalities are provided with accommodations on all assessment tasks.	1.0	3.6	17.5	45.2	32.6	4.05	0.86
	Differentiated	Provide a variety of assessment options for all students based on their individual learning needs.	1.6	4.6	13.0	35.2	45.5	4.18	0.94
Assessment Theory	Consistent	Use the same scoring rubric for all students.	34.6	20.7	16.3	14.5	13.9	2.53	1.44
	Contextual	Develop different scoring rubrics for identified students.	2.8	6.1	14.5	31.0	45.5	4.10	1.05
	Balanced	Use the same scoring rubric for all students but use professional judgment to apply criteria differently based on individual student ability.	6.3	10.3	25.7	32.0	25.6	3.60	1.16

The most endorsed responses to this scenario were differentiated approach ($M= 4.18$, $SD= 0.94$) within the theme of assessment fairness and assessment as learning (AaL) approach ($M= 4.17$, $SD= 0.92$) within the theme of assessment purpose from the pre-service science teachers in this sample. The response with the highest mean score was to “provide a variety of assessment options for all students based on their individual learning needs”. The next highest mean score was on “allow each student to develop a personal learning plan based on his/her strengths, learning needs, and the learning goals” and only 0.7% of the sample selected “not at all likely” option on this item. Across all pre-service science teachers in this sample, the least supported response for this scenario was consistent approach ($M= 2.53$, $SD= 1.44$)

within the theme of assessment theory. In practice, the related response includes “use the same scoring rubric for all students”. The second least endorsed response depend on the descriptive statistics was to “grade students based on the same assessments including homework, quizzes, and a unit test” (M= 3.14, SD= 1.32). The response related to a standard approach within the assessment fairness theme. Concerning assessment process theme, the most endorsed approach was related to use/scoring approach (M= 4.10, SD= 0.93) and the least endorsed approach reflects design approach (M= 3.98, SD= 0.91).

Scenario 4: *You are planning a unit for your class.*

Question: As a teacher in this situation, how likely are you to do each of the following actions?

Table 4.4 Descriptive statistics for scenario 4

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Purpose	AoL	Start by designing a summative evaluation and use backward planning to create your lesson plans.	3.1	4.5	13.9	34.7	43.7	4.11	1.01
	AfL	Design formative assessments to be used during instruction. Use information from these assessments to guide the design of subsequent lessons, learning activities, and summative assessment tasks.	0.6	2.2	18.0	39.5	39.7	4.15	0.84

Table 4.4 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Purpose	AaL	Start by reviewing the curriculum learning expectations with students and require each student to develop a personal learning and assessment plan for the unit.	3.3	10.5	25.0	34.4	26.8	3.71	1.07
	Design	Design a summative evaluation that covers all relevant curriculum expectations for the unit.	0.7	5.4	15.4	35.2	43.3	4.15	0.92
Assessment Process	Use/Scoring	Consider how grades are determined in your class and the weighting of assignment. Then design assessments for the unit based on weighting decisions.	1.0	4.6	19.5	45.2	29.6	3.98	0.88
	Communication	Co-construct learning goals and discuss assignments and grading criteria for the unit with your students.	1.6	6.7	20.2	36.4	35.0	3.96	0.99
Assessment Fairness	Standard	Plan class lessons and assessments that are the same for all students and encompass the curriculum expectations.	4.2	11.7	25.0	33.4	25.7	3.65	1.11
	Equitable	Give all students a diagnostic assessment at the beginning of the unit to group students for differentiated learning and assessment activities.	1.6	4.2	20.1	40.9	33.2	4.00	0.92

Table 4.4 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Fairness	Differentiated	Give all students a diagnostic assessment at the beginning of the unit and have students use their results to select appropriate learning and assessment activities.	1.6	5.2	18.4	38.6	36.1	4.02	0.95
Assessment Theory	Consistent	Use externally generated quizzes and unit tests (i.e., professionally developed, online resources, peer teacher) to measure student learning.	10.8	12.7	19.9	30.8	25.7	3.48	1.29
	Contextual	Develop assessments based on the content and activities of your enacted lessons.	0.7	2.5	13.2	40.0	43.6	4.23	0.83
	Balanced	Develop assessments based on questions/activities that have worked well with other students like yours but adjust them to take into consideration the content and activities of your enacted lessons.	0.7	3.3	15.0	36.4	44.6	4.21	0.87

The results from this scenario signified that the pre-service science teachers endorsed contextual approach ($M= 4.23$, $SD= 0.83$) and balanced approach ($M= 4.21$, $SD= 0.87$) within the theme of assessment theory. The response with the highest mean score includes “develop assessments based on the content and activities of your enacted lessons”. The second highest mean score includes “develop assessments based on questions/activities that have worked well with other students like yours but adjust them to take into consideration the content and activities of your enacted lessons”. For both of the items, only 0.7% of the sample selected “not at all likely”

options. The third highest mean scores were on assessment for learning (AFL) approach and design approach. The item on assessment for learning approach within the theme of assessment purpose involves “design formative assessments to be used during instruction. Use information from these assessments to guide the design of subsequent lessons, learning activities, and summative assessment tasks” (M=4.15, SD=0.84). The other item on design approach within the theme of assessment process involves “design a summative evaluation that covers all relevant curriculum expectations for the unit” (M=4.15, SD=0.92). Across all pre-service science teachers in this sample, the least endorsed response to this scenario was consistent approach (M= 3.48, SD= 1.29) within the theme of assessment theory. In practice, the response includes “use externally generated quizzes and unit tests (i.e., professionally developed, online resources, peer teacher) to measure student learning”. The second least endorsed response was “plan class lessons and assessments that are the same for all students and encompass the curriculum expectations” (M= 3.65, SD= 1.11). The item reflects standard approach within the theme of assessment fairness.

Scenario 5: *A parent of one of your classified/identified students is concerned about an upcoming High School Entrance Examination (LGS).*

Question: As a teacher in this situation, how likely are you to do each of the following actions?

Table 4.5 Descriptive statistics for scenario 5

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Purpose	AoL	Tell the parent that the exam will provide important information on how the school system is working for all students and the results will allow school districts to invest resources where improvement is needed.	2.2	7.3	18.1	34.4	37.9	3.98	1.03
	AfL	Tell the parent that the exam will provide feedback on her child's learning towards educational standards and help guide teaching and learning.	1.0	4.3	15.9	37.6	41.2	4.13	0.91
	AaL	Tell the parent that the exam will provide students an opportunity to develop learning strategies, test- preparation skills, and goals for their learning.	1.0	4.5	15.3	35.5	43.7	4.16	0.92
Assessment Process	Design	Tell the parent that prior to the exam, all students will complete practice tests to prepare and become familiar with the exam format.	1.2	4.8	14.5	33.1	46.4	4.19	0.94
	Use/Scoring	Tell the parent how the exam will (or will not) be incorporated into her child's report card grade and how it will facilitate instructional decisions.	3.0	8.2	20.4	33.7	34.7	3.89	1.07

Table 4.5 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Process	Communication	Tell the parent that the purpose of the exam will be explained in detail to all students prior to taking the test and their test results will be explained to students and parents.	0.9	2.4	15.6	34.0	47.2	4.24	0.86
	Standard	Tell the parent that it is not obligatory to enter the exam.	33.8	20.7	19.5	12.7	13.3	2.51	1.41
Assessment Fairness	Equitable	Tell the parent that her child's IEP will be consulted prior to testing and appropriate accommodations will be provided.	1.6	4.3	15.3	33.5	45.2	4.16	0.95
	Differentiated	Tell the parent that exam is not required, but classroom assessments can be fully accommodated for the student's individual learning.	13.3	14.5	27.1	24.9	20.2	3.24	1.30
Assessment Theory	Consistent	Tell the parent that the exam is designed to provide a measure of students' achievement across the school district.	16.3	16.8	24.3	23.7	19.0	3.12	1.34
	Contextual	Tell the parent that report card grades allow parents to draw more valid conclusions than the exam about her child's growth and achievement in relation to curriculum expectations.	7.2	14.8	29.8	27.7	20.5	3.40	1.17

Table 4.5 (Cont'd)

Related Theme	Approach	Actions	Percentage (%)					M	SD
			1 Not at all likely	2	3	4	5 Highly likely		
Assessment Theory	Balanced	Tell the parent that the exam, in conjunction with report card grades, allow parents to draw more informed conclusions about their child's growth and achievement than either source alone can provide.	2.2	5.4	17.7	27.1	47.6	4.12	1.03

For this scenario, the primary response for pre-service science teachers in this sample was a communication approach ($M= 4.24$, $SD= 0.86$) within the theme of assessment process. In practice, the response includes “tell the parent that the purpose of the exam will be explained in detail to all students prior to taking the test and their test results will be explained to students and parents”, and only 0.9% of the sample selected “not at all likely” option for the item. Following this primary response, the pre-service science teachers endorsed a design approach ($M= 4.19$, $SD= 0.94$) within the theme of the assessment process. The response includes “tell the parent that prior to the exam, all students will complete practice tests to prepare and become familiar with the exam format”. Across all pre-service science teachers in this sample, the least priority response was standard approach ($M= 2.51$, $SD= 1.41$) within the theme of assessment fairness. In practice, the response includes “tell the parent that it is not obligatory to enter the exam”. The response with the second lowest mean involves “tell the parent that the exam is designed to provide a measure of students’ achievement across the school district” ($M= 3.12$, $SD= 1.34$). The response related to consistent approach within the theme of assessment theory. In the assessment purpose theme, the least endorsed approach is assessment of learning (AoL) approach ($M= 3.98$, $SD= 1.03$), where teachers would “tell the parent that the exam will provide important information on how the school system is working for all

students and the results will allow school districts to invest resources where improvement is needed”.

Overall, in order to determine the pre-service science teachers’ endorsement to a particular approach, the approaches were averaged across five scenarios (see Table 4.6).

Table 4.6 Descriptive statistics across five scenarios

Theme	Approach	M	SD
Assessment Purpose	AoL	3.69	0.65
	AfL	4.14	0.59
	AaL	3.99	0.64
Assessment Process	Design	4.04	0.64
	Use/Scoring	3.45	0.60
	Communication	4.08	0.61
Assessment Fairness	Standard	3.33	0.66
	Equitable	3.94	0.60
	Differentiated	3.82	0.61
Assessment Theory	Consistent	3.31	0.73
	Contextual	3.71	0.60
	Balanced	3.92	0.61

According to the Table 4.6, the most endorsed response was the assessment for learning (AfL) approach (M=4.14, SD= 0.59) within the assessment purpose theme among all pre-service science teachers' responses in this sample. Assessment for learning approach includes that using evidence of learning to provide feedback on learning and involves both teacher-directed and student-centered approaches to formative assessment. The least endorsed responses were consistent approach (M=3.31, SD= 0.73) within the theme of assessment theory, and standard approach (M=3.33, SD= 0.66) within the theme of assessment fairness. Consistent approach

includes ensuring reliability in assessment results throughout the assessment process. Moreover, standard approach includes applying same assessment protocols for all students.

4.2 Examination of the Differences in Level Pre-service Science Teachers' Endorsement of a Particular Approach to Assessment in Each Theme

In order to address the research question “Is there a difference in the level pre-service science teachers' endorsement of a particular approach to assessment in each theme (i.e., assessment purpose, assessment process, assessment fairness, assessment theory)?” and its sub-questions four separate repeated measures ANOVAs were conducted. The analyses were carried out using the mean scores obtained by averaging pre-service science teachers' support for a particular approach across all five scenarios (see Table 4.6). Prior to each analysis, the underlying assumptions were checked, and it was ensured that the assumptions are satisfied.

The first repeated measures ANOVA was conducted for assessment purpose theme to determine whether there is a difference in the level of pre-service science teachers' approaches to assessment purpose in terms of assessment of learning, assessment for learning, and assessment as learning approaches. Findings showed that there is a statistically significant difference in pre-service science teachers' approaches to assessment purpose (Wilks' Lambda= .60, $F(2,666)= 221.65$, $p= .000$). The multivariate value $\eta^2= .40$ showed that the magnitude of the difference in means was large. Pairwise comparisons were conducted using paired sample t test and Holm's sequential Bonferroni procedure to reveal which means vary from each other. According to the results, the PSTs were found to be more likely to support assessment for learning approach ($M=4.14$, $SD= .59$) compared to assessment of learning ($M=3.69$, $SD= .65$) and assessment as learning ($M=3.99$, $SD=.64$) approaches. In addition, the largest difference was found between assessment for learning and assessment of learning approaches, $t(667)=20.60$, $p=.000$, $d=1.6$ (see Table 4.7).

Table 4.7 Pairwise comparisons for assessment purpose theme

	<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen's d</i>
AfL - AoL	20.60	667	.000	1.6
AfL - AaL	8.09	667	.000	.63
AoL - AaL	-11.40	667	.000	-.88

The second repeated measures ANOVA was conducted for assessment process theme to determine whether there is a difference in the level of pre-service science teachers' approaches to assessment process in terms of design, use/scoring, and communication approaches. Results signified that there is a difference in pre-service science teachers' approaches to assessment process (Wilks' Lambda= .43, $F(2,666)=453.17$, $p=.000$). The multivariate value $\eta^2=.58$ showed that the magnitude of the difference in means was large. In order to determine which means differ from each other, Pairwise comparisons were conducted using paired sample t test and Holm's sequential Bonferroni procedure. According to the results, the PSTs were found to be less likely to prioritize use/scoring approach ($M=3.45$, $SD=.60$) compared to design ($M=4.04$, $SD=.64$) and communication ($M=4.08$, $SD=.61$) approaches. Moreover, the largest difference was found between communication and use/scoring approaches, $t(667)=28.24$, $p=.000$, $d=2.19$ (see Table 4.8). Comparably, the difference between design and use/scoring approaches was large, $t(667)=25.85$, $p=.000$, $d=2.01$. Among pairwise comparisons, the comparison between design and communication approaches was found to be nonsignificant, $t(667)=-1.99$, $p=.048$, $d=-.15$. Therefore, paired sample t test results showed that the PSTs have similar levels of design and communication approaches.

Table 4.8 Pairwise comparisons for assessment process theme

	<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen's d</i>
Communication – Use/Scoring	28.24	667	.000	2.19
Design – Use/Scoring	25.85	667	.000	2.01
Design – Communication	-1.99	667	.048	-.15

The third repeated measures ANOVA was conducted for assessment fairness theme to determine whether there is a difference in the level of pre-service science teachers' approaches to assessment fairness in terms of standard, equitable and differentiated approaches. Results demonstrated that there is a significant difference in pre-service science teachers' approaches to assessment process (Wilks' Lambda= .57, $F(2,666)=259.25$, $p=.000$). The multivariate value $\eta^2=.44$ showed that the magnitude of the difference in means was large. In order to decide which means differ from each other, Pairwise comparisons conducted using paired sample t test and Holm's sequential Bonferroni procedure. The PSTs less likely to support standard approach ($M=3.32$, $SD=.66$) compared to differentiated ($M=3.81$, $SD=.61$) and equitable ($M=3.94$, $SD=.60$) approaches. Furthermore, the largest difference was found between equitable and standard approaches, $t(667)=22.26$, $p=.000$, $d=.45$ (see Table 4.9). Similarly, there is a large difference between differentiated and standard approaches, $t(667)=18.96$, $p=.000$, $d=1.47$. Compared to other pairwise comparisons, there is less difference in the pairwise comparison between equitable and differentiated approaches, $t(667)=5.84$, $p=.000$, $d=.45$.

Table 4.9 Pairwise comparisons for assessment fairness theme

	<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen's d</i>
Equitable – Standard	22.26	667	.000	1.72
Differentiated – Standard	18.96	667	.000	1.47
Equitable – Differentiated	5.84	667	.000	.45

The fourth repeated measures ANOVA was conducted assessment theory theme to determine whether there is a difference in the level of pre-service science teachers' approaches to assessment theory in terms of consistent, contextual and balanced approaches. Results demonstrated that there is a difference in pre-service science teachers' approaches to assessment process (Wilks' Lambda= .63, $F(2,666)= 199.12$, $p= .000$). The multivariate value $\eta^2= .37$ showed that the magnitude of the difference in means was large. Pairwise comparisons were conducted using paired sample t test and Holm's sequential Bonferroni procedure to indicate which means differ from each other. The PSTs were found to be more likely to prioritize balanced approach (M=3.92, SD= .61) compared to contextual (M=3.71, SD= .60) and consistent (M= 3.31, SD= .73) approaches. Moreover, the largest difference was found between balanced and consistent approaches, $t(667)=19.96$, $p=.000$, $d=1.55$ (see Table 4.10).

Table 4.10 Pairwise comparisons for assessment theory theme

	<i>t</i>	<i>df</i>	<i>p</i>	<i>Cohen's d</i>
Contextual - Consistent	14.46	667	.000	1.12
Balanced - Consistent	19.96	667	.000	1.55
Contextual - Balanced	-9.16	667	.000	.71

4.3 Pre-service Science Teachers' Conceptions

In order to address the research question: "How do pre-service science teachers with different approaches to assessment conceptualize assessment?" qualitative content analysis was conducted depend on the data collected from semi-structured interviews. For the analysis of the data, interview responses were transcribed, and analyzed using hybrid coding involves deductive and inductive coding. The main questions of the of the interviews related to PSTs' views about focus of assessment, method (mode) of assessment and perceived deficiencies in assessment. According

to these aspects, parent-codes and child-codes were determined. To determine codes for, all responses were analyzed individually. Detailed information about provided table below.

Table 4.11 Codes identified from the responses of pre-service science teachers

Aspect	Parent Code	Child Code
Focus of assessment	Curriculum	Content
		Learning objectives
	Student	Diagnosing learning difficulties
		Diagnosing misconceptions
		Monitoring student learning
		Providing feedback to students
Teacher	Grading	
	Providing feedback to teaching	
Method (mode) of assessment	Measurement mode	Paper-pencil test
		Portfolio assessment
		Performance assessment
	Performance mode	Peer assessment
		Self-assessment
		Vee diagram
		Structured grid
	Informal mode	Predict-Observe-Explain
		Open-ended questions
		Oral questioning
		Informal observation

Table 4.11 (Cont'd)

Aspect	Parent Code	Child Code
		Inadequacy of the offered assessment course
Perceived deficiencies	Teacher education program	Lack of opportunity for applying theoretical knowledge
		Lack of in-class experience

4.3.1 Pre-service Science Teachers' Conceptions about Focus of Assessment

Pre-service science teachers' responses to the interview questions in relation to focus of assessment revealed three parent codes were curriculum, student and teacher. In general, PSTs emphasize that the focus of the assessment should be student.

First of all, *content* and *learning objectives* are the child codes of curriculum parent code. More than a half of the PSTs supported this parent code. For example, in the following excerpts the key terms/statements used to identify the codes were written in italics.

“The focus is observing whether students meet *learning objectives* or not. Assessment should focus lecture *content* and *learning objectives*” (PST A)

“That is to say, it should mostly focus *content*” (PST D)

“ ... assessing whether students meet the *learning objectives* or not” (PSTs G, J, O)

“Totally *learning objectives*” (PST K)

“The main focus is understanding whether students meet the *learning objectives* or not, so it is so critical tool” (PST N)

Secondly, diagnosing learning difficulties, diagnosing misconceptions, monitoring student learning, providing feedback to students and grading were the emergent child-codes arranged into “student” parent code. According to these findings, while PSTs’ views ranged from traditional to contemporary views, contemporary views appeared to be more dominant. Examples given in the following excerpts:

“... it is important to *diagnose learning difficulties* and specify students’ missing points in science lectures” (PSTs A, C, D)

“... because assessing *student’s learning*, in other words assessing *student’s learning* of science is important” (PST B)

“I can say that it is a tool that helps to *follow students’ learning*” (PST C)

“The focus can be change but mostly assessment can be used to *diagnose misconceptions, grading* and understand what student learned at the end of every unit” (PST F)

“We can check and *monitor what student learned* about the lectures” (PSTs H, I, K)

“We can learn how much students understood, *why students did not understand and how students can understand*” (PST L)

“The main focus is to see *how much students understood*. Also, it can be used to *diagnose misconceptions* and *grading* them” (PST M)

“*Diagnosing misconceptions* and *monitoring* student learning are two main focus, I did not choose one of them” (PST N)

“In science lectures, the target and the focus are *determining misconceptions*. Then, we can eliminate the misconceptions. Also, with the help of the assessment, we can specify *learning difficulties*” (PST O)

Lastly, *providing feedback to teaching* was the only child-code which was linked to teacher parent-code. Approximately half of the PTSs emphasized this code. Example quotations can be given below:

“... *provide feedback* about how much I taught to students” (PSTs C, F, M)

“We should focus *how much we I taught and able to teach* to students, not what students understood” (PST E)

“... helps to understand *what I taught to students and what should I done* if I did not teach something” (PST H)

“... *provide information* about what should I done if students fall behind in lecture” (PST K)

“... if there is a problem about our teaching method, we can understand with assessment... teachers can *realize their own deficiency* in teaching, then they can make up the deficiency” (PST L)

“.. I can *change my teaching methods* if there is a problem, or I can *make those methods permanent* if I see they work well with students” (PST N)

In general, PSTs who expressed the focus of the assessment should be curriculum (content and learning objectives) were highly supportive of AfL approach in assessment purpose theme, communication approach in assessment process theme, equitable and differentiated approaches in assessment fairness theme, and balanced approach in assessment theory theme. Grading child-code were supported from two PSTs who highly endorsed design approach in assessment process theme and

equitable approach in assessment fairness theme. Also, diagnosing learning difficulties child-code was supported by the PSTs who highly endorse AfL, communication, equitable and balanced approaches. The PSTs who stated focus of the assessment should be diagnosing misconceptions were highly supportive of AaL, design and equitable approaches. The PSTs who endorsed AoL, AfL, AaL, equitable, communication, consistent approaches expressed the focus of the assessment should monitoring student learning and providing feedback to students. In addition, PSTs who stated the focus of the assessment should be providing feedback to teaching for teacher most commonly endorsed AfL and AaL approaches in assessment purpose theme, design and communication approaches in assessment process theme, and equitable approach in assessment fairness theme. Thus, these results suggest that, in general, pre-service science teachers' conception of assessment concerning the focus of assessment are not distinctively linked to specific approaches to assessment. However, pre-service science teachers' both conceptions of assessment regarding this aspect and their approaches to assessment appear to reflect contemporary views to assessment. Moreover, some findings suggest a link between conception of assessment and approaches to assessment. For example, the PSTs who stated that the focus of the assessment should be grading were found to be highly supportive of design and equitable approach. In other words, the PSTs, emphasizing construction of reliable assessments in line with objectives and utilizing accommodation and modification for the assessment of identified students were found to think that the assessment should focus on grading. On the other hand, the PSTs expressing that the focus should be on monitoring student learning and providing feedback to students appeared to highly endorse all approaches in assessment purpose theme. Thus, these PSTs are highly supportive of the use both summative and formative assessment as well as involvement of students in assessment process. In addition, they prioritize communicating with students and parents, using accommodation and modification for identified students, and assuring consistency of assessment results.

4.3.2 Pre-service Science Teachers' Conceptions about Method (mode) of Assessment

Considering pre-service science teachers' responses to the questions related to the most effective method (mode) of assessment, the child codes were integrated into three parent codes namely, measurement mode, performance mode and informal mode. According to the results, most of the PSTs (B, C, D, E, F, G, H, I, J, L, N, O) focused one method of assessment fitting to one parent code. However, some of the PSTs (A, K, M) mentioned about the use of more than one method fitting more than one parent code. In general, PSTs appear to emphasize performance mode and informal mode. There is only one PST expressing paper-pencil tests as the most effective way for assessment.

Firstly, *paper-pencil test* is only the child-code of measurement mode parent code. Example quotations can be given below:

“At the end of the units, *paper-pencil test* can be conducted to understand what student learn” (PTS A)

Also, *portfolio assessment*, *performance assessment*, *peer assessment*, *self-assessment*, *open-ended questions*, *vee diagram*, *structured grid* and *predict-observe-explain* are the child-codes integrated into performance mode. The followings were sample excerpts:

“Or *vee diagram* can be useful, we used it in our teacher education program” (PST A)

“*Laboratory assessment* are more efficient method” (PST B)

“I cannot say specific method for science lectures, but *self-assessment* and *peer assessment* can be helpful to criticize themselves” (PST C)

“For example, *self-assessment* forms, or *predict-observe-explain* method can be efficient methods while assessing and teaching” (PST D)

“In the future, *portfolio assessment* can be the right technique” (PST E)

“We can involve students by using *self-assessment* methods, so students assess themselves. Or *predict-observe-explain* method can be used to observe them” (PST F)

“*Laboratory assessment* can be useful for learning while having fun (PST F, H)

“*Open-ended questions* can be good choice. Student can put an interpretation on questions” (PST H)

“I think the best method is *performance assessment*. In science lectures, science teachers should use *laboratory assessment* and *portfolio assessment*” (PST G)

“The method can change depend on the subject, but *vee diagram* or *predict-observe-explain method* can be used” (PST J)

“*Open-ended questions* can be one of the best assessment methods” (PST K)

“*Open-ended questions* and *structured grid* can be used but we can choose methods depend on the subject” (PST L)

“... *open-ended* questions are the best because the responses show students ideas and knowledge” (PST M, N)

“I can use *portfolio assessment*. It helps students to allow creative and critical thinking. Students should be active, so I can use *peer-assessment*. To see misconceptions, I can use *structured grid*” (PST O)

Finally, *oral questioning* and *informal observation* are the child codes integrated into informal mode. Quotes from the PSTs are given in the following:

“Or *oral questioning* can be used to assess students” (PST A)

“I think students should be *questioned orally* in person and, teachers can *observe* students’ behaviors and abilities.” (PST I)

“*Oral questioning* and *observing* students are efficient methods. For example, while observing students, we can see how students communicate with others, how they learn and how they apply their knowledge” (PST K)

“*Oral questioning* during lectures is effective, I will use in my teaching profession” (PST M)

Overall, the results showed that the PST who highly endorsed AfL and equitable approaches declared that paper-pencil test is the most effective method of assessment. On the other hand, the PSTs highly endorsing various approaches thought that the most effective mod of assessment was performance assessment. The common endorsed approaches by these PSTs were in assessment purpose theme (AaL and AfL approaches), in assessment process theme (design and communication approaches), and in assessment fairness theme (standard and equitable approaches). The portfolio assessment code was obtained from the PSTs who highly endorsed design and communication approaches in assessment process theme, differentiated approach in assessment fairness theme, and balanced approach in assessment theory theme. Although they highly endorsed AfL and AaL approaches in assessment purpose theme, they did not endorse AoL approach. Furthermore, peer-assessment and structured grid modes of assessment were stated by the PSTs who were highly supportive of AfL, AaL, design, communication, equitable and balanced approaches. PSTs who thought that the most effective mod of assessment was self- assessment were highly supportive of equitable approach in assessment fairness theme. There was no common endorsement of a particular assessment approach for the PSTs

expressing vee diagram as an effective assessment method. On the other hand, PSTs who stated open-ended questions were the best method of assessment had high levels of endorsement for AfL and design approaches. Predict-observe-explain modes of assessment were supported by the PSTs who endorsed mostly equitable approach. In addition, PSTs who expressed the informal modes of assessment (oral questioning and informal observation) was the most efficient way more likely to support AfL, equitable and consistent approaches. These results, in general, revealed that PSTs highly endorsing AfL find various assessment methods as effective. They do not point out particular method. Similarly, PSTs highly supportive of equitable appear to think that a variety of assessment methods involving paper-and pencil tests to informal modes of assessment are effective in assessment. In addition, PSTs who highly endorse AoL approach in assessment purpose theme were found to consider performance assessment, peer assessment and portfolio assessment as effective mode of assessment. The PSTs finding vee diagram as effective mode of assessment did not show any distinctive assessment approaches .

4.3.3 Pre-service Science Teachers' Perceptions about their Deficiencies in Assessment

Analysis of pre-service science teachers' responses to the questions related to their perceived deficiencies in assessment revealed three child codes: *inadequacy of the offered assessment course*, *lack of the opportunity for applying theoretical knowledge*, and *lack of in-class experience*. These codes were integrated into teacher education program parent-code. Accordingly, the participant PSTs mainly emphasized lack of application and in-class experience as their deficiencies and these deficiencies were related to the assessment course offered by the teacher education program. Followings are the sample excerpts:

“I took assessment course, but it is not an applied course. We could not put what we learned into practice” (PST A)

“I cannot know because I have theoretical knowledge, but I did not practice”
(PSTs C, F, I)

“We did not take any assessment course that involves assessment methods for students with exceptionalities. Therefore, I do not know what to do when I meet this challenge” (PST E)

“I did not take any assessment course, so I feel inadequate in assessment”
(PST G)

“Because I did not experience assessment in classes with students, I could not know what is waiting for me” (PSTs K, O)

“I did not have any experience, so I can say that I feel insufficient for all subjects” (PSTs J, L)

Overall, more than half of the PSTs stated that they have deficiencies in assessment resulting from their teacher education program. These PSTs were mostly endorsed AfL and AaL approaches within the theme of assessment purpose, design and communication approaches within the theme of assessment process.

CHAPTER 5

DISCUSSION

This chapter aims to present the information about discussion of results, implications and limitations of the study.

5.1 Discussion of Results

Pre-Service Science Teachers' Approaches to Classroom Assessment

This study aimed to examine the PSTs approaches to classroom assessment, their conceptions of assessment and the link between their conceptions of assessment and approaches to assessment. Accordingly, the first research question in this study was about PSTs' endorsement of a particular approach to classroom assessment in terms of four themes of assessment, namely, assessment purpose, assessment process, assessment fairness and assessment theory. Each theme has three priority approaches. The PSTs' approaches to classroom assessment were identified by examining their responses to five assessment scenarios included in the ACAI. The results showed similarities with Coombs et al. (2018) study concerning three themes of assessment. More specifically, overall results based on descriptive findings showed that participants in both studies are more likely to prioritize AfL approach in assessment purpose, communication approach in assessment process, and balanced approach in assessment theory themes. For example, in the present study, concerning the first scenario *“You give your class a paper-pencil summative unit test. 16 of the 24 students fail.”*, the PSTs were found to prioritize AfL approach and, then balanced approach in their responses based on the descriptive data. Specifically, when 4 and 5 options on 5-point likert scale were combined in order to indicate “highly likely” option, according to 87.3 % of the participants it is highly likely that “based on their analysis of the test, they reteach parts of the unit focusing

on items students struggled with, give students opportunities to apply their learning, and then re-test the material” (assessment for learning approach). The results of the first repeated ANOVA also showed that the PSTs prioritize AfL approach significantly more than AoL and AaL approaches in the assessment purpose theme. In a similar study conducted by DeLuca et al. (2019), it was also found that the most commonly supported approach by the participating teachers were AfL in assessment purpose theme. In AfL approach, the PSTs are likely to support the utilization of formative assessment to offer feedback during teaching and learning process (Wen et. al., 2006) and to improve both students’ learning and instruction (Brookhart, 2011). Furthermore, according to the current results, the PSTs tend to choose student-centered assessment methods that focus on students’ learning process, learning and metacognitive abilities (AaL) significantly more than summative assessment methods (AoL). Thus, the least endorsed approach was AoL reflecting traditional view to assessment.

Additionally, concerning the assessment theory theme, fourth repeated measures ANOVA results revealed the PSTs were significantly more likely to support balanced approach compared to contextual and consistent approaches. The responses of the PSTs to the first scenario were also in line with this finding. For example, about three-quarter of the participants (71.8 %) indicated that it is highly likely that they “reflect on student performance, considering item wording and student circumstances contributing to failure in relation to previous assessment information. Then adjust grades accordingly” (balanced approach). However, related percentages were lower for the statements indicating contextual and consistent approaches. Furthermore, the PSTs were less likely to support consistent approach compared to balanced and contextual approaches in assessment theory theme. For instance, in scenario 3 “*Out of 28 students in your class, 4 students are classified/identified with an exceptionality and have an Individual Education Plan (IEP) (i.e., each student requires accommodations but not a modified curriculum) as well as several other unidentified students with differentiated learning needs. You must decide how to accurately measure learning in your class.*”, the lowest mean score was obtained on

consistent approach ($M = 2.53$) based on descriptive findings. Particularly, when 1 and 2 options on 5-point likert scale were combined to indicate “not at all likely” option, according to 55.3% of the participants it is not at all likely that “use the same scoring rubric for all students.”. However, related percentages were lower for the statements indicating other approaches in assessment theory theme. Similarly, regarding the fourth scenario “*You are planning a unit for your class.*”, the least endorsed approach was consistent approach with a mean of 3.48. According to 56.5% of the participants it is highly likely that “use externally generated quizzes and unit tests (i.e., professionally developed, online resources, peer teacher) to measure student learning.”, but related percentages were higher for other statements indicating contextual and consistent approaches. Assessment theory theme put on emphasis on psychometric properties of assessment such as reliability and validity (DeLuca et al., 2016b). According to the results, the PSTs tend to focus on both the reliability and validity issues instead of focusing just one of them.

Moreover, regarding assessment process theme, according to the second repeated measures ANOVA results, PSTs were found to be significantly less likely to support use/scoring approach compared to design and communication approaches. However, there was no significant difference in their support for design and communication approaches. The participants’ responses to the first scenario were also consistent with these ANOVA results obtained by considering their responses across five scenarios. More specifically, in response to first scenario, while only 13.3 % of the participants reported that it is highly likely that they “remove test questions that most students failed and re-calculate student scores without those questions”(use/scoring approach), 69.5% of them reported that they “schedule student conferences (individual or group) to discuss grades, areas of confusion, and next steps (communication approach). The percentage of the participants supporting design approach was 65.2 % in this scenario. Thus, according to these results, the PSTs tend to prioritize communicating with students and their parents to delineate assessment results and provide deliberate feedback and emphasize the design of reliable assessments in line with learning goals (DeLuca et al., 2019).

The descriptive findings also revealed that equitable approach ($M = 3.94$) was the most endorsed approach by the participants in assessment fairness theme. The lowest mean scores were obtained on the standard approach ($M = 3.33$) in this theme. The results of the repeated measures ANOVA also showed that the PSTs were significantly more likely to support differentiated and equitable approaches compared to standard approach. In addition, according to the results, the PSTs prioritize the equitable approach more than the differentiated approach. These descriptive and inferential findings were the most apparent in the responses to scenario 5. For example, in response to the scenario “*A parent of one of your classified/identified students is concerned about an upcoming High School Entrance Examination (LGS).*”, more than a quarter of the participants (78.7 %) indicated that it is highly likely that they “tell the parent that her child’s IEP will be consulted prior to testing and appropriate accommodations will be provided” (equitable approach) while less than 50 % (45.1) reported that “tell the parent that exam is not required, but classroom assessments can be fully accommodated for the student’s individual learning”. The least endorsed approach was found to be standard (26 %). Thus, the results implied that the PSTs are likely utilize accommodation and modification for the assessment of identified students (DeLuca et. al., 2019). However, in the study of Coombs et al. (2018), both pre-service and in-service teachers were found to prioritize differentiated approach believing that teachers should individualize assessment methods. The reason for why the current finding regarding assessment fairness theme differ from the available literature may be the existence and content of the courses for classified/identified students in teacher education programs, and the differences between countries’ educational policy and curriculum for these students. For example, in Turkey, there are no special education courses that PSTs are obliged to take in science teacher education programs. In addition, in the present study, the data was collected from pre-service teachers. If this study is replicated with in-service teachers, more consistent results can be found because in-class experience can be another reason for the different results. In fact, in Turkey, there are classified/identified students in science classes. Furthermore, according to

Ministry of National Education in Turkey (2017), one of the expected competencies of science teachers is that “When carrying out teaching and learning process, she/he takes into account the students with special needs.”. More specifically, science teachers manage the teaching and learning process taking into account the students with special needs. Thus, although pre-service science teachers involved in the current study had no experience in assessing classified/identified students, in-service teachers are more likely to have such an experience. Moreover, concerning the fifth scenario, the descriptive findings revealed that communication approach ($M = 4.24$) was the most endorsed approach by the participants. According to 81.2% of the participants it is highly likely that “Tell the parent that the purpose of the exam will be explained in detail to all students prior to taking the test and their test results will be explained to students and parents.”. Similarly, regarding scenario 2 “*You discover that one of your students has plagiarized some of his assignment (e.g., an essay, lab report).*”, the most endorsed approach was communication approach with a mean of 4.24. According to 80.8% of the participants it is highly likely that “Talk with him about the severity of plagiarism and negotiate potential next steps for his learning.”. However, related percentages were lower for other statements indicating use/scoring and design approaches in assessment process theme. Also, based on the overall descriptive data communication approach ($M = 4.08$) was the most endorsed approach by the participants in assessment process theme.

Overall, the current findings regarding the PSTs’ approaches to assessment are consistent with related literature by giving emphasis on AfL, communication and balanced approaches (Coombs et al., 2018; DeLuca et al., 2019). The only difference appears to be in the assessment fairness theme. In the present study, the PSTs were found to prioritize equitable approach emphasizing individual assessment.

Pre-Service Science Teachers’ Conceptions of Assessment

The third research question of the present study was about how pre-service science teachers with different approaches to assessment conceptualize assessment. In order to address this research question semi-structured interviews were conducted. For the

analysis of interview data, three aspects were identified namely focus of assessment, method (mode) of assessment, and perceived deficiencies in assessment. For each aspect, parent codes and child-codes were identified both inductively and deductively. Concerning the focus of assessment aspect, the curriculum, student, and teacher were as parent-codes based on the responses of the PSTs. Among these parent codes the most emphasized by the PSTs was found to be “student”. On the other hand, the analysis of the data considering the participant pre-service science teachers’ approaches to assessment revealed that the PSTs conceptions of assessment about the focus of assessment were not completely connected to particular assessment approaches in each theme. For example, one of the PSTs in the qualitative part (PST L) taking two assessment courses stated that the course provided her with sufficient information about assessment methods and learned making laboratory experiments and preparing lessons plans. Consistent with this background in assessment, this PST was found to conceptualize the assessment as monitoring students’ learning and providing feedback to teaching. However, none of the approaches were highly endorsed by the PST. This was an unexpected finding, because according to relevant literature, teachers’ conception of assessment influences their instructional decisions and activities (Vandeyar & Killen, 2007), and their contributions into context of the teaching (Skott, 2015). In addition, Vandeyar and Killen (2007), reported that different assessment conceptions lead to different assessment practices. Based on these studies in the relevant literature, it was reasonable to expect that the PST L prioritized approaches reflecting contemporary view such as AfL approach. The reason for this unexpected result may be that, in this study pre-service science teachers who do not have extensive in-class assessment practices were involved. When they start their career, their conceptions of and approaches to assessment can be more congruent based on their experiences. However, this explanation is speculative and future research can examine the link between teachers’ conceptions of and approaches to assessment at different career stages and make a comparison.

Regarding the method (mode) of assessment, three methods of assessment namely, measurement, performance and informal were identified deductively considering Wang, Kao, and Lin's study (2010). In general, the current findings regarding the PSTs' conceptions about assessment methods were found to be partially consistent with related literature. For instance, in line with the results of the study conducted by Wang et al. (2010), most of the PSTs in the present study stated performance mode of assessment is the best mode to assess students' learning. On the other hand, only one PST indicated measurement mode as the most effective way to assess students' learning whereas about half of the PSTs indicated measurement mode in the study of Wang et al. (2010). In addition, the study conducted by Hargreaves (2005), revealed that most of the teachers held measurement mode of assessment. Another differing result with related literature was related to informal mode of assessment. More specifically, while about half of the PSTs considered informal mode of assessment as effective in the present study, less PSTs expressed informal mode in the study of Wang et al. (2010). The reason for why the current finding regarding measurement and informal mode of assessment differ from the related finding in the literature may be the countries' various educational systems and policies, various cultural priorities, and the cultural and linguistic differences between societies (Brown & Remesal, 2012), the context of the assessment courses because teachers' conceptions are shaped by the societies' conceptions (Bandura, 2001). In fact, majority of the studies used assessment literacy framework based on 1990 standards. Although these standards undoubtedly guided assessment researches for years, they do not reflect contemporary views of assessment and measure teachers' approaches to classroom assessment based on current assessment context. They also do not involve current formative assessment conceptions and social issues that teachers can face with while constructing and administering assessment methods (DeLuca et al., 2016b; Brookhart, 2011). For these reasons, Classroom Assessment Standards (JCSEE, 2015) were published that giving more emphasis on teachers' contemporary views of and to assessment. Furthermore, in Turkey, Ministry of National Education (2017) gave an emphasis on revising teacher competencies

according to current needs and views in educational field. For this reason, there can be differences between the results of the recent studies and the studies conducted before the implementation of Classroom Assessment Standards (JCSEE, 2015) because of different the views of assessment in the past and present.

In fact, a recent study conducted in Turkey resulted in similar findings with the current study (Izci & Caliskan, 2017). More specifically, in the study of Izci and Caliskan (2017), the PSTs were asked to indicate their preference for different assessment methods to use in their teaching profession before and after attending the assessment course. The content of the course involved traditional assessment methods, alternative assessment methods, how to diagnose students' learning difficulties and misconceptions, how to interpret and use assessment results to support students' learning and teaching, how to provide equitable assessment for each student. After attending the course, consistent with current findings, the PSTs were found to have a tendency to use open-ended questions, portfolio assessment, peer assessment, structured grid, and concept maps.

In addition, consistent with results related to focus of assessment, the findings concerning the PSTs' conceptions of assessment about the effective methods of assessment were not completely connected to particular assessment approach in each theme. However, at this point it also important to note that, although in the current study, PSTs' conceptions of assessment were not completely linked to specific approach, in general, they had contemporary conception of and approaches to assessment. Despite this situation, the participant PSTs think that the assessment course offered in their teacher education program was not sufficient for their teaching profession, because of the lack of opportunity for applying theoretical knowledge into practice and lack of in-class experience.

5.2 Implications

The present study highlighted pre-service science teachers' approaches to classroom assessment and their conceptions of classroom assessment. According to the results, not all pre-service science teachers prioritized the same approaches and have the same conceptions of assessment. Their approaches and conceptions of assessment provide information about how teachers understand assessment and develop assessment methods, and how they make their instructional decisions in classrooms based on their approaches and conceptions of assessment (DeLuca et al., 2018). Therefore, the current findings can have important implications for teacher education programs. According to results of the study, the PSTs tend to have contemporary conception of and approaches to assessment. However, there are also PSTs who hold traditional conceptions (e.g., emphasizing grading as a focus of assessment) and prioritize traditional approaches to assessment (e.g., AoL and standard approach). To encourage such PSTs to have more contemporary conception of and approaches to assessment, the importance of assessment on teaching and learning process rather than grading should be emphasized in assessment courses. In addition, there may be more than one assessment courses emphasizing both traditional and contemporary views. In fact, the PST in the qualitative part (PST I) who took only one assessment course stated that the course was not sufficient. He further indicated that, he learned how to construct exam questions in this course. Thus, it appeared that the course was delivered based on traditional views. Consistent with his background in assessment, the assessment approaches that he highly endorsed were found to be AoL and standard. In addition, according to the PSTs responses, the inadequacy of the offered assessment courses, lack of the opportunity for applying theoretical knowledge, and lack of in-class experience are the problems that PSTs face with. For these reasons, it is suggested that the assessment courses offered in teacher education programs are designed so that the PSTs have opportunities to apply their theoretical knowledge into practice. Moreover, the PSTs can be provided with opportunities to gain in-class experiences regarding the implementation of different assessment methods in real

classroom settings to apply what they learned before starting their professional teaching. In fact, the study of Buck, Trauth-Nare and Kaftan (2010) suggested that through extended in-class experiences, the PSTs can advance formative assessment practices. In addition, informal talks with the participants revealed that most of them do not know how to treat identified students and students with exceptionalities. Therefore, it is suggested that special education courses are offered in teacher education programs.

5.3 Limitations

This study has some limitations that should be considered while interpreting the results. To begin with, generalizability of the results can be a limitation. For the present study, the data were collected from pre-service science teachers at 3rd and 4th grades from 12 universities in Turkey. For this reason, the results cannot be generalized to larger populations, different countries and educational contexts. For the future studies, the data can be collected from pre-service science teachers from different domains and in-service science teachers. Moreover, the present study has mixed method research design. For quantitative part of this study, adapted version of Approaches to Classroom Assessment Inventory (ACAI) was used. For the qualitative part of the study, semi-structured interviews were conducted. Both of the parts relied on self-report data. For the future studies, pre-service science teachers' approaches can be analyzed in detail by observing classroom assessment practices and lesson plans.

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APPENDICES

A. Permissions Obtained from METU Human Subjects Ethics Committee

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02 Ocak 2020

Konu: Değerlendirme Sonucu


Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (IAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof.Dr. Semra SUNGUR

Danışmanlığını yaptığımız Ayşenur ÇAYIR'ın "Fen Bilimleri Öğretmenlerinin ve Öğretmen Adaylarının Sınıf-İçi Değerlendirmeye Yönelik Yaklaşımları" başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve 496 ODTU 2019 protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız


Doç.Dr. Mine MISIRLIŞOY

Başkan

Prof. Dr. Tolga CAN

Üye

Doç.Dr. Pınar KAYGAN

Üye

Dr. Öğr. Üyesi Ali Emre TURGUT

Üye

Dr. Öğr. Üyesi Şerife SEVİNÇ

Üye

Dr. Öğr. Üyesi Müge GÜNDÜZ

Üye

Dr. Öğr. Üyesi Süreyya Özcan KABASAKAL

Üye

B. Adapted Version of Approaches to Classroom Assessment Inventory

SINIF-İÇİ DEĞERLENDİRME ENVANTERİ

1. BÖLÜM: KİŞİSEL BİLGİLER

1. Cinsiyetiniz: () Kadın () Erkek
2. Yaşınız: _____
3. Eğitim gördüğünüz üniversitenin adı: _____
4. Üniversite eğitimi gördüğünüz bölümün adı: _____
5. Eğitim gördüğünüz bölümde kaçınıcı sınıf öğrencisisiniz?
() 3 () 4
6. Mezun olduktan sonra fen bilimleri öğretmeni olarak çalışmayı düşünüyorum.
() Evet () Hayır
7. Ölçme değerlendirmeye yönelik ders aldınız mı?
() Evet () Hayır
Yanıtınız 'Evet' ise aldığınız ders sayısı: _____
8. Üniversite eğitiminiz sırasında ölçme değerlendirme konusuna ne kadar değinildi?
() Hiç () Biraz () Orta () Çok

9. Ölçme değerlendirme konusuna ne kadar ilgi duyuyorsunuz?

Hiç Biraz Orta Çok

10. Ölçme değerlendirme konusunda ne kadar bilginiz olduğunu düşünüyorsunuz?

Hiç Biraz Orta Çok

2. BÖLÜM: SENARYO TEMELLİ SORULAR

Bu kısımda 5 senaryo ve her senaryoya ait 4 soru bulunmaktadır. Öğretmenlik yapacağınız alan ve sınıf düzeyini düşünerek soruları yanıtlayınız. Her sorunun seçeneklerinde yer alan eylemleri yapma olasılığınızı ilgili kutucuğu işaretleyerek belirtiniz.

1. Senaryo: Öğrencileriniz için düzey belirleyici (summatif) bir kağıt-kalem ünite testi yaptınız. Testin sonucunda sınıftaki 24 öğrenciden 16 tanesi başarısız oldu.

1. Soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Her öğrencinin ünite testinden aldığı notu kaydetme ama bu testin karne notuna olan etkisini azaltma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Test sonuçlarının analizlerine dayanarak, öğrencilerin ünitelerde zorlandıkları kısımları belirleme, zorlanılan bu kısımları tekrar öğretme, öğrendiklerini uygulamaları için öğrencilere fırsat verme ve testi tekrar uygulama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Eylem: Öğrencilerin teste nasıl hazırlandıklarına dair derinlemesine düşünceleri, sorulara verdikleri cevapları incelemeleri ve konuyu tekrar öğrenmeleri için kişisel plan yapmalarını isteme. Daha sonra testi tekrar uygulama.

2. Soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

Hiç olası
değil

Son derece
olası

1. Eylem: Hazırladığımız testin hatalar içerebileceğini fark etme ve öğrencilere uygulamak için yeni bir test hazırlama.

2. Eylem: Çoğu öğrencinin başarısız olduğu soruları çıkarma ve öğrencilerin puanlarını bu soruları katmadan yeniden hesaplama.

3. Eylem: Öğrencilerle, aldıkları notları, tam olarak anlayamadıkları kısımları ve ileride yapılabilecekleri konuşmak için bireysel veya grup halinde görüşmeler yapma.

3. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

Hiç olası
değil

Son derece
olası

1. Eylem: Tüm öğrencilere benzer bir test daha uygulama ve iki testin not ortalamasını alma.

2. Eylem: Testte başarısız olan öğrencilerin, öğrenme düzeylerini daha doğru bir şekilde ortaya koyabilecek yeni bir değerlendirme yöntemini ele alma.

3. Eylem: Testte başarısız olan her bir öğrenci ile, öğrenme düzeylerini daha doğru bir

şekilde ortaya koyabilecek yeni bir değerlendirme yöntemi hakkında fikir alışverişinde bulunma.

4. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Öğrencilerin çoğunluğunun tutarlı bir şekilde yanlış cevap verdiği test sorularını inceleme. Daha sonra bu soruların içeriğine uygun yeni sorular hazırlayıp, öğrencilere uygulama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Öğrencilerin test sonuçlarını değerlendirirken, her öğrenci için mevcut olan biçimlendirici (formatif) değerlendirme bilgilerini göz önüne alma. Notları bu bilgileri kullanarak belirleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Test sorularının cümle yapısı ve öğrencilerin önceki değerlendirmelerde başarısız olmasına yol açan durumları göz önüne alarak, öğrencilerin testteki performansları hakkında derinlemesine düşünme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Senaryo: Bir öğrencinizin ödevlerinden birinde (örneğin, laboratuvar raporu, yazılı ödev) kopya çektiğini (başka birinden veya kaynaktan gizlice yararlandığını) fark ettiniz.

5. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Kopya çekme durumuyla ilgili okuldaki uygulamalarla uyumlu hareket etme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Öğrencinin, ödevinde kopya çektiği bölümü belirlemesini ve daha sonra bu bölümü kendi sözcükleriyle yeniden yazmasını sağlama. Bir öğretmen olarak, bu kopya olayının ilerideki öğretmenlik uygulamalarımızı nasıl etkileyeceği hakkında derinlemesine düşünme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Öğrenciden, ödev için kaynaklara nasıl ulaştığını, kaynakları nasıl kullandığını ve bir dahaki sefere neyi farklı yapması gerektiğini yazılı olarak belirtmesini isteme. Öğrencinin, ödevi yeniden yapması için bir çalışma planı hazırlamasını sağlama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığımızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Bir öğretmen olarak, ödevi nasıl tasarlayıp sunduğunuz hakkında derinlemesine düşünme. Bir sonraki sefer, öğrencilerinizin kopya çekmenin ne anlama geldiğini öğrenmeleri için üzerinde iyi düşünülmüş fırsatlar sağlama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Öğrencinin çalışmasındaki özgün kısımları notlandırma ve kopya çektiği kısımlar için puan kırma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Öğrenciyle kopya olayının ciddiyeti hakkında konuşma ve öğrenme sürecindeki gelecek adımlarının neler olacağı hakkında görüşme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Öğrenciye kopya çekme durumunda neler yaptığınızı ve böyle bir durumda adil olarak tüm öğrencilere tutarlı bir şekilde nasıl davrandığınızı açıklama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Kopya çekmeye yönelik herhangi bir uygulama yapıp yapmamaya karar vermeden önce öğrencinin özel öğrenme ihtiyaçlarını göz önünde bulundurma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Öğrenciyle kopya çekmenin sonuçlarını değerlendirmek ve onun için uygun ve farklı bir ödev yapması üzerinde anlaşmaya varabilmek için görüşme yapma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Kopya durumu ile ilgili okuldaki uygulamaları göz önüne alma ve bu uygulamalarla tutarlı bir şekilde hareket etme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Öğrencinin içerik beklentileri hakkında neler bildiğine, neler bilmediğine karar vermek için ödevin özgün ve kopya çekilmiş kısımlarını göz önünde bulundurma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Kopya çekmeye sebep olan hafifletici koşulları inceleme ve daha sonra ödevin kopya çekilmiş kısımları ile ilgili beklentileri değerlendirmek için alternatif bir ödev geliştirme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Senaryo: Sınıfınızdaki 28 öğrenciden 4 tanesi tam zamanlı kaynaştırma/bütünleştirme öğrencisidir ve Bireyselleştirilmiş Eğitim Planları vardır. Sınıfınızdaki öğrenmeyi doğru bir şekilde nasıl değerlendireceğinize karar vermelisiniz.

9. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Tam zamanlı kaynaştırma öğrencileri için, tüm düzey belirleyici (summatif) değerlendirmelerde öğretimsel uyarlamalar yapma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Tüm öğrencilerinizin bireysel öğrenme ihtiyaçlarını göz önüne alarak, biçimlendirici değerlendirme yöntemlerini uygulama ve bu uygulamaların uyarlama yapılmış ünite testine zemin hazırlamasını sağlama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Her öğrencinin güçlü yanlarına, öğrenme ihtiyaçlarına ve öğrenme hedeflerine dayanan kişisel öğrenme planı geliştirmesine izin verme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Çeşitli değerlendirme görevleri tasarlama ve öğrencilere kazanımları ne ölçüde gerçekleştirdiklerini göstermeleri için görevler arasında seçim hakkı tanıma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Tam zamanlı kaynaştırma öğrencilerinin Bireyselleştirilmiş Eğitim Planını (BEP) yansıtmak için dereceli puanlama anahtarları (rubrik) ve puanlandırmalarda uyarlama yapma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. Eylem: Öğrencilere ve velilere, uyarlamaların amacını ve öğrencilerin karnelerine nasıl yansıtacağını açıklama.

11. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil				Son derece olası
1. Eylem: Öğrencileri ödevler, mini sınavlar ve ünite testleri gibi aynı değerlendirmelere dayanarak notlandırma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Tam zamanlı kaynaştırma öğrencilerinin tüm değerlendirmelerinde öğretimsel uyarlama sağlandığından emin olma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Tüm öğrencilerin bireysel öğrenme ihtiyaçlarına dayanarak çeşitli değerlendirme yöntemleri sağlama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil				Son derece olası
1. Eylem: Tüm öğrenciler için aynı dereceli puanlama anahtarı (rubrik) kullanma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Tam zamanlı kaynaştırma öğrencileri için farklı dereceli puanlama anahtarı (rubrik) geliştirme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Tüm öğrenciler için aynı dereceli puanlama anahtarı (rubrik) kullanma, ancak öğrencilerin bireysel yeteneklerine dayanarak rubrikteki kriterleri farklı bir şekilde	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

uygulamak için mesleki sağduyunuzu kullanma.

4. Senaryo: Sınıfınız için bir ünite planlıyorsunuz.

13. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Düzey belirleyici (summatif) değerlendirme tasarlayarak işe başlama ve sonrasında bu değerlendirmeye dayalı ders planları hazırlama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Ders esnasında kullanmak için biçimlendirici değerlendirmeye yönelik tasarımlar yapma. Biçimlendirici değerlendirmeden elde edilen bilgileri, sonraki derslerin, etkinliklerin ve düzey belirleyici (summatif) değerlendirmelerin tasarımına yol göstermesi için kullanma.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Öğrencilerle birlikte kazanımları gözden geçirerek işe başlama ve her bir öğrencinin ünite için kendi öğrenme ve değerlendirme planını geliştirmesini isteme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: Ünite ile ilgili tüm kazanımları içeren düzey belirleyici (summatif) değerlendirme tasarlama.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Eylem: Sınıfınızda notların nasıl belirlendiğini ve ödevlerin ağırlığını göz önünde bulundurma. Daha sonra belirlenen bu ağırlığa göre değerlendirmeyi tasarlama.
3. Eylem: Öğrencileriniz ile birlikte öğrenme hedefleri oluşturma ve onlarla üniteyle ilgili ödev ve notlandırma kriterlerini tartışma.

15. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

- | | Hiç olası
değil | | | | Son derece
olası |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Eylem: Programdaki öğrenci kazanımlarını kapsayan ve tüm öğrenciler için aynı olan dersler ve değerlendirmeler planlama. <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Eylem: Farklılaştırılmış öğrenme ve değerlendirme etkinlikleri için öğrencileri gruplandırmaya yönelik olarak, ünitenin başında tüm öğrencilere tanılayıcı değerlendirme yapma. <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Eylem: Tüm öğrencilere ünitenin başında tanılayıcı değerlendirme yapma ve öğrencilerin kendileri için uygun öğrenme ve değerlendirme etkinliklerini seçmesi için değerlendirme sonuçlarını kullanmalarını sağlama. <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

16. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

Hiç olası değil	Son derece olası
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|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Eylem: Öğrencinin öğrenmesini ölçmek için başkalarının hazırladığı mini sınavlar ve ünite testlerini kullanma (profesyonel olarak geliştirilmiş testler, çevrimiçi kaynaklar, vb.) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Eylem: İşlemiş olduğunuz derslerin içeriğine ve ders içi etkinliklerine dayalı olarak değerlendirme hazırlama. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Eylem: Değerlendirmeyi, kendi öğrencileriniz gibi diğer öğrencilerde iyi işlemiş soru/etkinliklere dayalı olarak geliştirme, ve işlemiş olduğunuz derslerin içerik ve etkinlikleriyle uyumlu düzenlemeler yapma. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

5. Senaryo: Tanı konulmuş öğrencilerinizden birinin velisi yaklaşan Liselere Giriş Sınavı (LGS) hakkında endişelidir.

108

17. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

- | | Hiç olası
değil | | Son derece
olası | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1. Eylem: Veliye; bu sınavın, okul sisteminin tüm öğrenciler için nasıl çalıştığına dair önemli bilgiler sağlayacağını söyleme. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 2. Eylem: Veliye; sınav sonuçlarının, çocuğunun kazanımları ne ölçüde sağladığına dair geribildirim sağlayacağını ve bu sonuçların öğrenme, öğretme sürecine rehberlik edeceğini söyleme | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| 3. Eylem: LGS sınavının, öğrencilerin öğrenme stratejilerini, sınava hazırlanma becerilerini ve öğrenmelerine yönelik hedefler belirleme becerilerini geliştirmelerine fırsat sağlayacağını veliye söyleme. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

18. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: LGS öncesi, tüm öğrencilere bu sınava hazırlanmaları ve sınavın formatına alışmaları için alışırma testleri uygulanacağını veliye söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: LGS sonuçlarının öğretimi daha iyi hale getirebilmeye katkıda bulunacağını veliye söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: LGS'den önce sınav hakkında tüm öğrencilere detaylı bilgi sağlanacağı ve sonuçların öğrenci ve velilerle gözden geçirileceğini veliye söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil			Son derece olası	
1. Eylem: LGS'ye girmenin zorunlu olmadığını veliye söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Sınav öncesi, özel eğitime ihtiyacı olan bireylere yönelik sınav hizmeti için Rehberlik Araştırma Merkezi'ne (RAM) başvurulması gerektiğini ve gerekli uyarlamaların sağlanacağını veliye söyleme	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: LGS'ye girmenin zorunluluk olmadığını ve sınıf içi değerlendirmelerin öğrencinin bireysel öğrenme ihtiyaçlarına göre uyarlandığını veliye söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. soru: Bu durumda bir öğretmen olarak, aşağıda verilen her eylemi gerçekleştirme olasılığınızın derecesini ilgili kutucuğu işaretleyerek belirtiniz.

	Hiç olası değil		Son derece olası		
1. Eylem: LGS'nin öğrencilerin başarı durumunu gösterdiğini veliye söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Eylem: Veliye, karne notlarının, öğrenci kazanımları açısından, çocuğunun gelişim ve başarısına yönelik çok daha geçerli yargılarda bulunmaya olanak sağlayacağını söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Eylem: Veliye, karne notlarıyla birlikte LGS sonuçlarının, öğrenci kazanımları açısından, çocuğunun gelişim ve başarısına yönelik daha bilinçli yargılarda bulunmaya olanak sağlayacağını söyleme. Yalnızca LGS sonuçlarına ya da yalnızca karne notuna odaklanmanın bilinçli bir yargıda bulunmak için yeterli olmayacağını söyleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

110

❖ **Çalışmanın bir sonraki aşamasında, bu anketten elde edilen veriler doğrultusunda, gönüllü katılımcılarla görüşmeler yapılacaktır. Bu aşamaya katkıda bulunmak ister misiniz?**

() Evet () Hayır

Yanıtınız 'Evet' ise

Adınız Soyadınız: _____

E-mail adresiniz: _____

C. Interview Questions

GÖRÜŞME SORULARI

Tarih:

Başlangıç Saati:

Bitiş Saati:

1. Hangi üniversitede okuyorsunuz? Kaçınıcı sınıftasınız?
2. Öğrenim gördüğünüz lisans programında ölçme değerlendirme yönelik ders aldınız mı?
 - a) Bu ders(ler) kapsamında, fen bilimleri dersindeki sınıf-içi değerlendirme yönelik neler öğrendiniz?
 - b) Almış olduğunuz bu ders(ler)in içeriğinin ileride sizin için yeterli olacağını düşünüyor musunuz? Yetersiz buluyorsanız, bu eksiği nasıl kapatmayı düşünüyorsunuz?
3. Sizce ölçme değerlendirmenin fen bilimleri eğitimindeki yeri ve önemi nedir?
4. Sizce, fen bilimleri dersinde, ölçme değerlendirmenin amacı ne olmalıdır? Ölçme, değerlendirme sonuçları ne amaçla ve nasıl kullanılmalıdır?
5. Sizce fen bilimleri derslerinde ölçme, değerlendirme neye odaklanmalıdır? Niçin böyle düşünüyorsunuz?
6. Sizce, fen bilimleri dersinde, sınıf-içi ölçme-değerlendirme en iyi nasıl yapılabilir?
 - a) Hangi sınıf-içi ölçme-değerlendirme yöntemlerinin daha etkili olduğunu düşünüyorsunuz? Neden?
 - b) İleride bu yöntemlerin hepsini kullanmayı düşünüyor musunuz? Hangi ölçme değerlendirme yöntemini kullanacağınıza karar verirken ne tür faktörleri/neleri göz önüne alınması gerektiğini düşünüyorsunuz?
 - c) Kullanacağınız yöntemleri seçerken veya oluştururken hangi kaynak/materyallerden faydalanmayı düşünüyorsunuz?
 - d) Sınıf-içi değerlendirmelerde, değerlendirme sürecine öğrencilerin dahil edilmesi konusundaki görüşünüz nedir?
7. Genel olarak, fen bilimleri dersinde, sınıf-içi ölçme-değerlendirme konusunda eksik hissettiğiniz bir alan var mı? Neden? Varsa bu eksiği kapatmak için bir destek almayı düşünüyor musunuz?

D. Consent Forms

ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU

Bu araştırma, ODTÜ Fen Bilimleri Eğitimi Bölümü Yüksek Lisans öğrencisi Ayşenur Çayır tarafından Prof. Dr. Semra Sungur danışmanlığındaki yüksek lisans tezi kapsamında yürütülmektedir. Bu form sizi araştırma koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir? Araştırmanın amacı fen bilimleri öğretmenlerinin ve öğretmen adaylarının sınıf-içi değerlendirmeye yönelik yaklaşımlarını belirlemektir.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz? Araştırmaya katılmayı kabul ederseniz, sizden beklenen ankette yer alan soruları derecelendirme ölçeği üzerinde yanıtlamanızdır. Bu çalışmaya katılım ortalama olarak 15 dakika sürmektedir.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız? Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Ankette, sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamıyla gizli tutulacak, sadece araştırmacılar tarafından değerlendirilecektir. Katılımcılardan elde edilecek bilgiler toplu halde değerlendirilecek ve bilimsel yayımlarda kullanılacaktır. Sağladığımız veriler gönüllü katılım formlarında toplanan kimlik bilgileri ile eşleştirilmeyecektir.

Katılımla ilgili bilmeniz gerekenler: Anket, genel olarak kişisel rahatsızlık verecek sorular içermemektedir. Ancak, katılım sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda anketi uygulayan kişiye, anketi tamamlamadığınızı söylemek yeterli olacaktır.

Araştırmayla ilgili daha fazla bilgi almak isterseniz: Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için Fen Bilimleri Eğitimi Bölümü öğretim üyelerinden Prof. Dr. Semra Sungur (E-posta: ssungur@metu.edu.tr) ya da yüksek lisans öğrencisi Ayşenur Çayır (E-posta: aysenur.cayir@metu.edu.tr) ile iletişim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

(Formu doldurup imzaladıktan sonra uygulayıcıya geri veriniz).

İsim Soyisim

Tarih

İmza

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ARAŞTIRMAYA GÖNÜLLÜ KATILIM FORMU

Bu araştırma, ODTÜ Fen Bilimleri Eğitimi Bölümü Yüksek Lisans öğrencisi Ayşenur Çayır tarafından Prof. Dr. Semra Sungur danışmanlığındaki yüksek lisans tezi kapsamında yürütülmektedir. Bu form sizi görüşme koşulları hakkında bilgilendirmek için hazırlanmıştır.

Çalışmanın Amacı Nedir? Araştırmanın amacı fen bilimleri öğretmenlerinin ve öğretmen adaylarının sınıf-içi değerlendirmeye yönelik yaklaşımlarını belirlemektir.

Bize Nasıl Yardımcı Olmanızı İsteyeceğiz? Araştırmanın ilk adımı olan anket çalışması sonrası yapılacak olan bu görüşmeye gönüllü olduğunuz için teşekkür ederim. Görüşmede sizden beklenen araştırmacının sorduğu açık uçlu soruları sözlü olarak cevaplamaktır. Katılım ortalama 10 dakika sürmektedir.

Sizden Topladığımız Bilgileri Nasıl Kullanacağız? Araştırmaya katılımınız tamamen gönüllülük temelinde olmalıdır. Görüşmede, sizden kimlik veya kurum belirleyici hiçbir bilgi istenmemektedir. Bu görüşmelerde vereceğiniz bilgiler çalışmada farklı isim altında kullanılacak, gerçek kimliğiniz gizli tutulacaktır.

Katılımınızla ilgili bilmeniz gerekenler: Görüşme, genel olarak kişisel rahatsızlık verecek sorular içermemektedir. Ancak, görüşme sırasında sorulardan ya da herhangi başka bir nedenden ötürü kendinizi rahatsız hissederseniz cevaplama işini yarıda bırakıp çıkmakta serbestsiniz. Böyle bir durumda araştırmacıya görüşmeyi tamamlamak istemediğinizi söylemek yeterli olacaktır. Görüşme öncesi ve sırasında sormak istedikleriniz olursa lütfen çekinmeden sorunuz. Ayrıca izin verirseniz görüşmeyi kayıt altına almak istiyorum.

Araştırmayla ilgili daha fazla bilgi almak isterseniz: Bu çalışmaya katıldığınız için şimdiden teşekkür ederiz. Çalışma hakkında daha fazla bilgi almak için Fen Bilimleri Eğitimi Bölümü öğretim üyelerinden Prof. Dr. Semra Sungur (E-posta: ssungur@metu.edu.tr) ya da yüksek lisans öğrencisi Ayşenur Çayır (E-posta: aysenur.cayir@metu.edu.tr) ile iletişim kurabilirsiniz.

Yukarıdaki bilgileri okudum ve bu çalışmaya tamamen gönüllü olarak katılıyorum.

İsim Soyisim

Tarih

İmza

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