

Differentiated Instruction: Analysis of Primary School Teachers' Experiences in Amhara Region, Ethiopia

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Abstract: The main purpose of this study was to investigate primary school teachers' practice of Differentiated Instruction (DI). For this study, a sequential mixed methods design was utilized. and data were collected from randomly selected primary school teachers, school principals, students and woreda education officers using questionnaire, interview, FGD and observation. Data were analyzed quantitatively using mean, standard deviation, one sample t-test, independent samples t-test, and one-way ANOVA and qualitatively through descriptions and narrations. The main findings of the quantitative data revealed that the majority of primary school teachers have limitations in practicing DI. Many teachers teach diversified learners in the same classroom in a form of 'one-size-fits all' approach. However, significant differences were scrutinized based on qualification, in-service training, and teaching experience in executing the content, process, learning environment, and product differentiations. In other words, degree holder teachers, teachers who participated in in-service training on DI, and experienced teachers (teachers of 10-20 years of teaching experience) practiced DI better than their counterparts. Similarly, the qualitative findings revealed that teachers' practice of both content differentiation and product differentiation were lower than process and learning environment differentiations. Knowledge and training gaps of teachers, scarce school facilities, low commitment of teachers, weak school leadership support, and lack of favorable school environment were the major impeding factors. Therefore, it is timely to devise mechanisms to strengthen in-service capacity building training for teachers to effectively execute DI so as to address the diversified interests, readiness and learning profiles of students.

Key words: *Differentiated instruction, content differentiation, process differentiation, product differentiation, instructional strategies*

INTRODUCTION

Background of the study

In the past few years, teacher education has faced an increase in student diversity, and this increase in diversity looks unavoidable (MoE, 2017; Roy, Guay & Valois, 2013; Subban, 2006). Students differ in their backgrounds and abilities (Tomlinson & McTighe, 2006), pace of learning, culture, gender, readiness, interest and learning profiles (Dee, 2010; Kanevsky, 2011; Landrum & McDuffie, 2010; Santangelo & Tomlinson, 2012), and the extent to which they need instruction and support during learning (Landrum & McDuffie, 2010; Kanevsky, 2011). Accordingly, the diverse student characteristics have made it necessary for teachers and schools

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to use appropriate and fitting teaching approaches (Bender, 2012; George, 2005; Heacox, 2012). As a result, many educational institutions try to address these needs by designing a more responsive pedagogy called differentiated instruction [DI] (Cox, 2008; Dee, 2010; Roy et al., 2013).

The Concepts of DI

DI refers to Tomlinson’s philosophy of teaching and a proactive student-centered approach for teaching diverse learners in a supported and heterogeneous environment in which assessment drives the instruction (Suprayogi, 2017; Tomlinson, 2014). It is a teacher mindset that all learners respond to instruction differently (Tomlinson, 2014). Therefore, teachers who utilize DI take into consideration the personal characteristics of students: readiness, interest, and learning profiles (Bender, 2012; Levy, 2008; Roy, Guay, & Valois, 2013; Santangelo & Tomlinson, 2012; Tobin & Tippett, 2013; Tomlinson, 2014; Tomlinson & Imbeau, 2010). Student *readiness* refers to students’ preparedness for the ability, skill and concept for a given subject (Tomlinson, 2005). Student *interest* is the attention, curiosity and involvement of a student in a given topic (Tomlinson & Imbeau, 2010). Whereas, *learning profiles*, which embrace learning styles, multiple intelligences and learning preferences of students, involve a preference for taking in, exploring, or expressing content (Tomlinson & Imbeau, 2010).

After understanding students’ learning characteristics, the teacher can differentiate instruction in terms of components of DI (content, process, product, and learning environment) (Bender, 2012; Levy, 2008; Roy et al., 2013; Santangelo & Tomlinson, 2012; Tobin &Tippett, 2013; Tomlinson, 2014; Tomlinson & Imbeau, 2010). *Content* is what students learn from the instruction and what teachers teach (Tomlinson, 2005; 2010). *Process* embraces how teachers teach and how students learn (Bender, 2012; Cox, 2008; Tomlinson, 2010). *Product* is the way students demonstrate what they have learnt (Bender, 2012; Cox, 2008; Levy, 2008; Tomlinson, 2010). Finally, *learning environment* is the way the classroom feels and functions safe and stimulating (Chamberlin & Powers, 2010; Santangelo & Tomlinson, 2012).

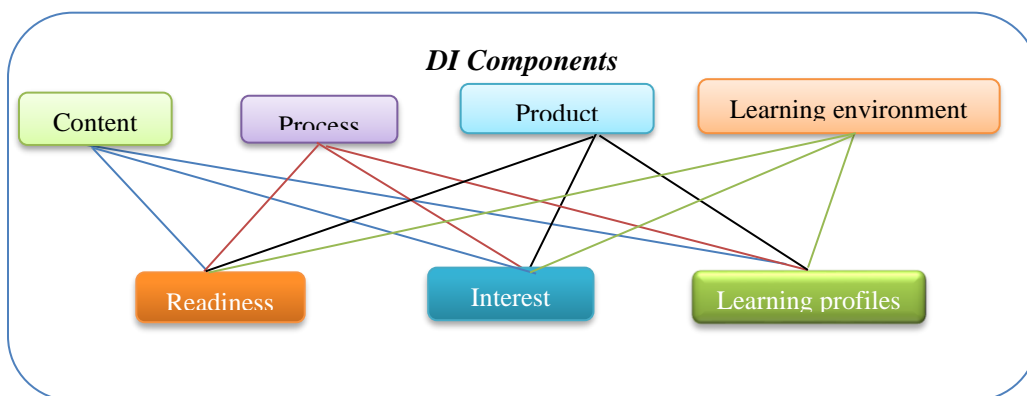


Figure1: The interweave between student characteristics and components of DI

Assumptions: Why is DI needed?

According to Tomlinson and Imbeau (2010), DI, a philosophy about teaching and learning, is based on the following beliefs: (a) students who are the same age differ in their readiness to learn, their interest, styles of learning, and their experiences; (b) differences in students are significant enough to make a major impact on what students need to learn, the pace at which they need to learn it, and the support they need from teachers and others to learn it well; (c) students will learn best when they are supported by adults; (d) students will learn best when they can make a connection between the curriculum and their interests and life experiences; and (e) students are more effective learners when classrooms and schools are comfortable.

Conceptual Framework

Several models and frameworks have emerged to address students’ learning diversity. In the context of DI, Tomlinson’s (2010, 2014) framework of DI has been widely used (Kanevsky, 2011; Landrum & McDuffie, 2010; Rodriguez, 2012; Santangelo & Tomlinson, 2012; Smit & Humpert, 2012; Tobin & Tippett, 2013; Tomlinson & Imbeau, 2010; Whipple, 2012). This model reveals that in order to address students’ readiness levels, interests and learning profiles, the teacher can differentiate content, process, product and learning environment or all of these components through applying various instructional strategies of DI. The rationale of this study is also to investigate teachers’ practice of DI using these components and instructional strategies. Accordingly, this study employed the adapted framework of Tomlinson (2010, 2014).

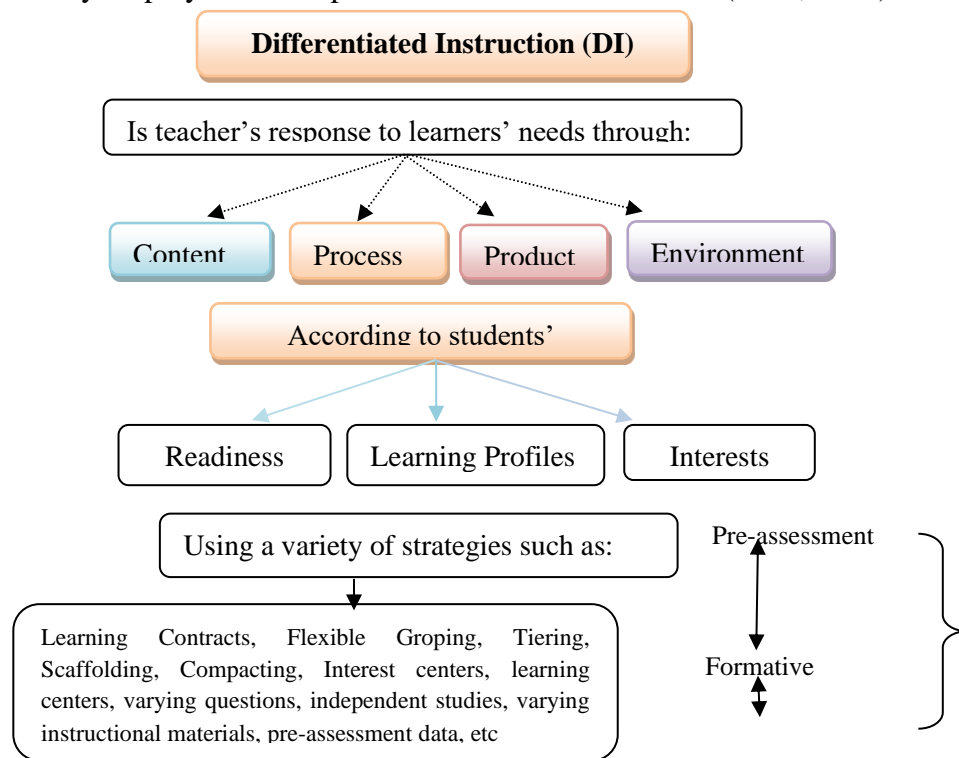


Figure2: Conceptual framework of the study (Source, Tomlinson, 2010, 2014)

PROBLEM STATEMENT

In many countries of the world, although DI reflects promising benefits for both teachers and students to cope with the diversity of students as well as to improve the student achievement (Koeze, 2007; Subban, 2006; Tobin & McInnes, 2008; Tomlinson, Brimijoin, & Narvaez, 2008; Tomlinson & Imbeau, 2010) and is also recommended as a promising approach to address diversity in learning (Rock, Ellis, Greg & Gable, 2008). Many research findings also support the use of differentiation as a way of meeting the needs of academically diverse learners in today's classrooms (Carolan & Guinn, 2007; Dee, 2010; Dunn & Dunn, 2008; Good, 2006; Heck, 2009; Mulder, 2014; Rakow, 2007; Roy *et al.*, 2013; Santamaria, 2009; Tieso, 2005; Tomlinson, 2006; Tomlinson *et al.*, 2008).

However, teachers' practice of DI remains critical (Nicolae, 2014; Roberts & Inman, 2013; Santangelo & Tomlinson, 2012; Tobin & Tippett, 2013; Tomlinson, 2014). Many teachers, although they are aware of the disadvantage of their traditional teaching style, seem quite willing to continue with this style (Dawit, 2008; George, 2005; Joshi & Verspoor, 2013; Smit & Humpert, 2012; Tesfaye, 2014; Watts-Taffe *et al.*, 2012). Other studies also reported that teachers' practice of DI varies from country to country due to various reasons. Even though many teachers are familiar with DI, some do not provide DI effectively because they ignore its relevance (Goodnough, 2010; Santangelo & Tomlinson, 2012). Other teachers do not differentiate instruction due to lack of knowledge (Santangelo & Tomlinson, 2012), lack of confidence to differentiate (Goodnough, 2010), and also poor pre-service teacher preparation and training (Dee, 2010; Rodriguez, 2012; Smit & Humpert, 2012; Tadesse, 2018; Wan, 2017).

All the formerly mentioned experiences revealed that teachers of different countries have different practices of DI. Ethiopia is not an exception. Ethiopia is truly a land of contrast and extreme diversity. It is also a country of over 108 million people belonging to more than ninety ethnic and linguistic groups (MoE, 2017). Nevertheless, in the diverse Ethiopian society, education is entangled with complex problems of relevance, quality and equity (MoE, 2015, 2017; Tesfaye, 2014). According to the reports of different researchers (e.g., Fekede & Fiorucci, 2012; Tessema, 2006) and policy documents and national exam results (e.g., MoE, 2010, 2015, 2016, 2017), the quality of education is not still enhanced and students' achievement in different exams not improved. The four national education assessments (NEAs) conducted in 2000, 2004, 2007 and 2010 mirror the critical status of Ethiopian educational quality (MoE, 2010, 2015, 2016).

On the other hand, despite policy backups on DI (MoE, 2015; 2017) and teachers have high perceptions on DI (Tadesse, 2018), some researchers (e.g., Dawit, 2008; Joshi & Verspoor, 2013; Tesfaye, 2014) replied that there is little evidence of active student learning and inquiry processes. Also, Tadesse's (2015) study on the practice of DI in another setting revealed that variations among teachers in executing the components of DI (content, process, affect and product differentiations) which is subject to further investigation. Moreover, Joshi and Verspoor (2013) informed that in Ethiopia teachers' knowledge, commitment and practice of DI to address the students' learning diversity is not significantly investigated.

In the Amhara Region also, many primary school teachers (86.99%) are not widely utilizing appropriate learner-centered approaches in their classroom teaching (BoE, 2017). The bureau also coined this problem with teachers' content knowledge deficit. As a result, the achievement of primary school students in the General Primary School Completion Exam (GPSCE) is getting lower (i.e, 86 pass rates as compared to the 88 national pass rate) (MoE, 2016). A study conducted by BoE (2016), by drawing 9,332 sixth grade students of the Amhara Region revealed that 80.1% of grade six students scored less than 50% in every subject. These problems can be partly attributed to the poor quality of teachers in their subject matter or pedagogical content knowledge (BoE, 2017) and due to their perception differences to address students' learning diversity (Tadesse, 2018).

Furthermore, public discourses and discussion results with teachers at different training sessions on DI during various community service practices revealed their alterations in practicing DI. For instance, the practical intervention practices gained from teachers and school principals during the DI in-service training in Bahir Dar, West Gojjam and Awi administrative zones over the last three years through community service programs designated that teachers have different exposures to and practices of DI in the classroom. Therefore, the diverse practices of teachers on DI to address students' learning diversity and the absence of research examined on teachers' practice of DI in the study focus areas triggered the researcher to conduct research in the topic under investigation. To this end, the intention of this study was to examine the primary school teachers' practice of DI.

Objective of the study

The main objective of this study was to investigate primary school teachers' practice of DI. Hence, in this study two leading questions were raised: *(1) To what extent do primary school teachers in Awi administrative zone practice DI in order to address students' readiness, interest, and learning profiles? (2) Is there a statistically significant difference in the practices of DI by primary school teachers as a function of qualification, training and teaching experience?*

METHOD

Research Approach and Design

A mixed methods approach with explanatory sequential design was utilized for this study. The reason that the quantitative and the qualitative research approaches are not only compatible but also complementary calls for the mixed methods research approach having its own philosophical worldview: pragmatism (Creswell, 2014; Miles, Huberman, & Saldana, 2014). The same authors believed that compatibility of qualitative and quantitative approaches is useful because the types of questions posed lend themselves to mixed-methods. Accordingly, the key guiding questions include a confirmatory question to highlight teachers' practice of DI and whether differences exist in the practice of DI, and an explanatory question to seek meaning about teachers' practice of DI in primary schools.

As this study was a sequential, first quantitative survey was administered to solicit data from a wide number of sources about the respondents' practices of DI. This was followed by open questions. These questions were informed by an initial analysis of the quantitative data gathered. Categories of open questions on the practice of DI and its components (content, process, learning environment and product differentiations) sought to elicit additional insights via qualitatively collected rich explanations or descriptions. Consequently, first, the quantitative approach was used to generate data through a questionnaire from a cohort of 492 primary school teacher participants. Second, the qualitative approach (through interviews, FGDs, and classroom observations) was employed to get data about the different dimensions of the local participants' (teachers, school principals, and students) experiences, personal perspectives, and practices of DI from the inside (Miles et al., 2014; Saldana, 2011).

Data Sources and Sampling Techniques

The target populations of the study were primary school teachers, school principals, and students of Awi administrative zone. The study employed a multi-stage random sampling technique. In using multi-stage random sampling, first, the researcher selected Awi zone purposely and then, four *woredas* in the zone were selected using simple random sampling technique. These *woredas* were: Fageta Lekoma, Banja, Guagusa Shikudad and Dangela town. Among the 93 general primary schools in the four *woredas*, 30 general primary schools were selected using simple random sampling technique. Out of 1,069 primary school teachers enrolled in these primary schools, 535 (50%) teachers were selected through simple random sampling.

However, out of 535 sample teachers, 43 teachers who did not properly fill out and timely return the survey questionnaire were deliberately rejected and the direct respondents for the final analysis were 492 teachers. These teachers were stratified based on their qualification, teaching experience and exposure of in-service training of DI. Therefore, 327 (66.5%) and 165 (33.5%) of teachers were diploma (10/12+3 year graduates) and degree holders respectively. Based on their teaching experience, 105 (21.3%) of the teachers had 0-5 years of experience, 104 (21.1%) of the teachers had 6-10 years of experience, 99 (20.1%) of the teachers had 11-15 years of experience, 95 (19.3%) of the teachers had 19-20 years of experience, and 89 (18.1%) had twenty or more years of experience. Out of all participants of the study, 209 (42.5%) teachers obtained in-service trainings on DI but 283 (57.5%) of them did not obtain the training. Besides the quantitative data, qualitative data were obtained from teachers, school principals, and students via interviews and FGDs. Students from grade five to eight, who properly articulate and provide valuable information (e.g., student representatives, class monitors, one-to-five group leaders, and clever students), were also selected by the support of the school directors using purposive sampling.

Methods of Data Collection

For this study, multiple data collection methods such as questionnaire, interviews, FGDs, and classroom observations were utilized.

Questionnaire

For the quantitative data, the researcher collected data through close ended questionnaire. The questionnaire was divided into two sections. The first section comprised questions related to demographic information whereas the second part consisted of twenty-seven items ranked with a scale ranging from 1 (never) to 4 (always). The practice items of DI were obtained and adapted from the tools of Whipple's (2012) *Teacher Survey on Differentiated Instruction*.

In order to make communication easier, the questionnaire was translated by language experts into Amharic. Besides, the face validity of the questionnaire was checked and edited by experts in the field. Moreover, the translated questionnaire was pilot tested by non-sample fifty participant teachers of Kossober primary school, and its reliability was checked using Cronbach's alpha as 0.804.

Interviews

Interview was considered as another appropriate data collection instrument for the purpose of this study. Accordingly, individual based face-to-face semi-structured interviews were employed to probe further explanations. Questions were designed to generate details about how teachers practice DI and its components, and the practice differences among teachers with different demographic variables. Thus, a total of ten teachers, seven students, and eight school principals were interviewed, and interviews were tape-recorded based on interviewees' consent.

Focus Group Discussions (FGDs)

This study also employed FGDs in order to triangulate the data collected through interviews on individual bases on teachers' practice of DI. Therefore, a group of teachers with different qualifications, teaching experience and training exposure on DI, that range from four to six years, were selected for the discussions. FGDs with teachers and students helped to further investigate teachers' practices of DI in their classrooms. Hence, a total of four FGD groups from teachers and five FGD groups from students participated in the discussions.

Classroom Observations

Classroom observations were conducted to check further teachers' practices of DI. How teachers try to address diverse interests of students and how they differentiate the lessons learnt (content), the methods of teaching (process), the assessment (product), and aspects of the classroom environment were observed in the classrooms using observation checklists.

Data Analysis

Since the QUAN-Qual model of the mixed methods design was applied in this study, both the collection and analysis of data were sequential in procedure. Primarily, the quantitative data collected through questionnaire were gathered and analyzed quantitatively; then, this was followed by qualitative descriptions and narrations. For the quantitative research, mean, standard

deviation, one sample *t*-test, independent samples *t*-test, effect size test, and ANOVA were employed.

One sample *t*-test was used to determine the status of teachers' practice of DI and its components. Whereas, the independent samples *t*-test was used to compare the mean scores between different groups of primary school teachers (qualification and training differences) up on their practice of DI. Comparisons using ANOVA were also made within groups to see the significant difference in teachers' practices of DI based on teachers' teaching experience. Besides level of significance ($\alpha = 0.05$), effect size test (Cohn's *d* effect size index) was conducted to measure the strengths of the differences between the mean scores of groups at all levels. The guidelines to determine whether effect sizes are strong in *t*-test were: 0-0.20 = weak effect, 0.21-0.50 = modest effect, 0.51-1.00 moderate effect, and > 1.00 = strong effect (Muijs, 2004). Moreover, the data collected through interviews and FGD were analyzed qualitatively through descriptions and narrations.

RESULTS

Teachers' Practice of DI

The one sample *t*-test results displayed in Table 1 below inform that primary school teachers' overall practice of DI ($M=2.42$), as compared to the expected mean (in this case 2.5), was low ($t=-4.146$, $df=492$, $p=.000$). Moreover, in terms of the components of DI, except in differentiating the process ($M=2.71$), the practice of teachers in differentiating the content ($M=2.33$), the product ($M=2.27$), and the learning environment ($M=2.47$) was low because in all cases the mean scores are below the expected mean, which is 2.5.

Table 1

One sample t-test results of teachers' practices of DI and its components

Variable	N	EM	OM	SD	df	t	P
Overall practice of teachers on DI	492	2.5	2.42	.45	491	-4.146	.000
Content differentiation	492	2.5	2.33	.73	491	-5.007	.000
Process differentiation	492	2.5	2.71	.63	491	.222	.825
Product differentiation	492	2.5	2.27	.60	491	-8.349	.000
Environment differentiation	492	2.5	2.47	.57	491	-1.139	.255

Note. EM= Expected Mean, OM=Observed Mean, SD= Standard Deviation, df= Degree of Freedom

Nevertheless, the qualitative data garnered from teachers, students, and school principals on teachers' practices of DI through either content, process, learning environment or product differentiations revealed different. For instance, the interview responses of teachers disclosed that they were trying to cover the content of the subject matter. They justified that teachers lack the necessary preparation in their subject matter and methodology. These were also confirmed by some of the students and school principals. During their inward looking, school principals

refrained from explaining the extent to which they were supporting teachers to fill teachers' gaps of PCK and create conducive learning environments.

Equally important, student representatives did not appreciate the direct or indirect contributions of their school principals in their learning. According to the students, creating conducive learning classrooms and school environment is the duty of the school principals, yet school principals were not seen doing this. As a result, some schools were below the standards and classrooms were not found to be conducive for learning. Lack of chairs and tables, broken windows and doors, scarce teaching materials, dusty and unclean classrooms, and lack of quality blackboards were the major identified problems of the sample schools. As regards principals' support for teachers to differentiate instruction, the interview made with school supervisors indicated that "in order to differentiate instruction in terms of content, process, product, and learning environment, school principals should have the necessary knowledge and skills".

In addition to knowledge gaps, school principals (directors and supervisors) did not still believe teachers to differentiate the contents and the products for diverse students. But they are in a good position to assist teachers differentiate the process and aspects of the school environment. Besides, the other FGDs made with teachers regarding their practices of DI also disclosed that even though there are teachers who are trying to fill the academic gaps of students through either preparing additional tutorial programs or special support services, the majority of teachers were not in a position to equip every learner attain at least the minimum learning competences. The FGD participants [students] in this regard also severely questioned the proficiency of teachers [*mainly the newly employed teachers*] in their subject matters and the way they conveyed the lessons to the students. Teachers' proficiency problems [*mainly for novice teachers*] are also identified during classroom observations.

Teachers' Overall Practices of DI Based on Qualification

Primary school teachers' practice of DI was also analyzed based on their qualification differences. Accordingly, there is a statistically significant difference in the mean scores of degree holder teachers ($M=69.08$, $SD=12.81$) and diploma holders ($M=63.31$, $SD=11.23$) in their practice of DI in their respective classrooms ($t = -5.131$, $df = 490$, $p = .000$, $d = 0.52$). This implies that, in order to meet the learning interests, readiness and learning profiles of students, degree holder teachers have better practices of DI than diploma holder teachers.

Also in terms of components of DI, there is a significant mean score difference between diploma and degree holder teachers in practicing content differentiation ($t=-6.063$, $df = 490$, $p=.000$, $d =0.59$) and process differentiation ($t =-4.756$, $df = 490$, $p=.000$, $d=0.45$). In both cases, though the effect size was not strong, degree holder teachers practiced content and process differentiations better than diploma holder teachers. Nevertheless, a statistically significant mean score difference was not found between them in environment differentiation ($t=.547$, $df= 490$, $p=.584$, $d= 0.05$) and in product differentiation ($t=-2.373$, $df= 490$, $p=.018$, $d= 0.22$).

Table 2

Comparison of the mean scores of teachers' practices of DI based on qualification

Variables	Qualification	N	Mean	SD	df	t	p	Cohen's d
Overall differentiation practice of teachers	Diploma	327	63.31	11.23	490			
	Degree	165	69.08	12.81				
• Content differentiation	Diploma	327	10.99	3.65	490			
	Degree	165	13.03	3.21				
• Process differentiation	Diploma	327	26.54	6.80	490			
	Degree	165	29.61	6.71				
• Environment differentiation	Diploma	327	12.40	2.53	490			
	Degree	165	12.25	3.41				
• Product differentiation	Diploma	327	13.37	3.24	490			
	Degree	165	14.18	4.21				

Consistent with the quantitative data, the interviews conducted with teachers revealed that degree holder teachers are better at differentiating the contents than diploma teachers. However, these teachers described their doubts in having strong differentiations between degree and diploma holder teachers on methods of teaching (process differentiation). Besides, the school principals indicated that degree holder teachers are good in their content knowledge as well as in varying the contents for their diverse students. They justified that the long years of pre-service training helped them to have good subject matter (content) knowledge. But these participants described no differences in practicing product and learning environment differentiations. Classroom observation results also revealed that degree holders are good at content understanding and have limitations in utilizing various methods of teaching.

In contrast, students who participated in the FGDs favored diploma teachers on varying the methods of teaching more than degree holders, acknowledging that degree holders have good subject matter knowledge. Interview responses of school principals also replied that content and product differentiation are not widely applied in schools since these are new thoughts, but teachers are using a variety of methods of teaching. According to them, differentiating the school environment is made by few diploma and degree holder teachers.

Mean Score Comparisons of Teachers' Practices of DI Based on Training

In analyzing primary school teachers' practices of DI, a statistically significant difference was found in the mean scores of trained teachers ($M=68.34$, $SD=12.82$) and untrained teachers ($M=62.95$, $SD=10.98$) in the practice of DI in their classrooms ($t = 5.006$, $df = 490$, $p = .000$, $d = 0.45$). Similarly, there is a significant difference in the mean scores of trained teachers and untrained teachers in content differentiation ($t=5.119$, $df=190$, $p=.000$, $d=0.47$), in process differentiation ($t=2.884$, $df=490$, $p=.004$, $d=0.26$), in product differentiation ($t=3.997$, $p=.000$, $d=0.47$), and in learning environment differentiation ($t=2.446$, $df=490$, $p=.015$, $d=0.23$). In all cases, trained teachers' practice was better than untrained teachers.

Table 3

Comparison of trained and untrained teachers' practice of DI

Variables	Training	N	Mean	SD	df	t	p	Cohen's d
Overall practices of teachers on DI	Trained	209	68.34	12.82	490	5.006	.000	0.45
	Untrained	283	62.95	10.98				
• Content differentiation	Trained	209	12.63	3.35	490	5.119	.000	0.47
	Untrained	283	10.98	3.68				
• Process differentiation	Trained	209	28.61	7.33	490	2.884	.004	0.26
	Untrained	283	26.80	6.40				
• Environment differentiation	Trained	209	12.72	2.74	490	2.446	.015	0.23
	Untrained	283	12.08	2.90				
• Product differentiation	Trained	209	14.38	3.63	490	3.977	.000	0.36
	Untrained	283	13.09	3.50				

The qualitative data obtained from teachers, students, and school principals through interviews and FGDs revealed that the majority of teachers who took the in-service training on DI practiced the components of DI to address students' learning interest, readiness, and learning profiles better than the untrained teachers. Many trained teachers disclosed that, after gaining this training, they qualified the various instructional strategies (tiering, curriculum compacting, contracting, scaffolding, etc.) that help them address students' differences, recognized students' differences, interests and abilities while giving activities and assignments, and provided additional tasks for academically weak students. Few classroom observations also assured that some teachers (mainly in Amharic and Environmental Science subjects) were seen attempting to vary different activities to diverse students, arranging students into diverse groups (flexible grouping), and also providing tutorial sessions based on the gaps of students.

However, in contrast to the responses of the above participants, classroom observations and the FGD responses of some teachers and students revealed that still many teachers are teaching the same content with the same teaching methodologies. The assessment mechanisms they are using and the learning environment are not different.

Mean Score Comparisons of Teachers' Practices of DI Based on Experience

Teachers' teaching experience has an impact on addressing learners' interests, readiness and learning profiles. Thus, investigations made using ANOVA revealed that there is a statistically significant difference among them based on teaching experience ($F_{4, 487} = 6.828, P < 0.05$).

Table 4

One-way ANOVA in the practices of teachers on DI based on experience

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3806.108	4	951.527	6.828	.000
Within Groups	67868.109	487	139.360		
Total	71674.217	491			

The Tukey test HSD test discovered that teachers whose teaching experiences are between 11-15 years (M=67.83) and 16-20 years (M= 67.07) performed DI better than those whose experience is between 0-5 years (M= 60.33), 6-10 years (M= 64.62), and >20 years (M= 66.93) respectively. The mean scores implied that those recently employed or novice teachers (0-5 years of teaching experience) indicated the lowest practice of DI followed by teachers above 20 years of teaching experience.

Table 5

Tukey mean comparisons of teachers’ practice of DI based on experience

(I) Experience	(J) Experience	Mean Difference(I-J)	Sig.
	11-15 years	-7.49*	.000
0-5 years	16-20 years	-6.74*	.001
	>20 years	-6.60*	.001
11-15 years	0-5 years	7.49*	.000
16-20 years	0-5 years	6.74*	.001
>20 years	0-5 years	6.60*	.001

* p < 0.05

In line with the quantitative data, qualitative data obtained from teachers and school principals revealed that the capability of teachers to differentiate instruction varies as experience differs. Teachers and school principals in the same way disclosed that at present academically incompetent and professionally demotivated teachers, who are unable to properly teach in their major areas, are joining the profession as a ‘waiting station.’ Conversely, experienced teachers practice of DI to address the interests of students seems better. While applying these strategies, classroom observations also testified that experienced teachers’ knowledge of the subject matter and application of some strategies of DI such as varying questions, independent tasks and flexible grouping were better than novice teachers.

DISCUSSION

Teachers' Practice of DI

In order to address the needs of academically diverse students, many international scholars favored DI as a promising approach (Dee, 2010; Hall *et al.*, 2011; Heck, 2009; Mulder, 2014; Roy *et al.*, 2013; Santamaria, 2009; Stronge *et al.*, 2008; Tomlinson *et al.*, 2008). However, as Heacox (2012) and Watts-Taffe *et al.* (2012) investigated, there is a large variation in the implementation of DI. The one sample *t*-test result of this study also informed that the overall practice of DI by primary school teachers ($M=2.42$), as compared to the expected mean (in this case 2.5), was low. This finding was consistent with earlier research findings (e.g., Dee, 2010; Goodnough, 2010; McTighe & Brown, 2005; Mulder, 2014; Roy *et al.*, 2013). The researchers disclosed that many teachers experience difficulty in providing DI and tend to teach in a traditional one-size-fits-all approach. In this regard, George (2005) elucidated that the actual practice of DI by teachers remains critical and many scholars (e.g., Knowles, 2009; Santangelo & Tomlinson, 2012; Tobin & Tippett, 2013) attribute this lower practice to lack of knowledge and skills in adapting the curriculum material with students' interests.

However, the finding of this study is not in line with results reported by other researchers (e.g., Lora, Nancy & Jerita, 2014; Roy *et al.*, 2013; Supryogi, 2017; Whipple, 2012). For instance, Suprayogi (2017) indicated that there is a relatively high level of DI implementation in Hong Kong. The study of Whipple (2012) in the USA also revealed a higher level of DI implementation in regular classroom teachers and special education teachers. Lora *et al.*'s (2014) study on classroom application and the effectiveness of teachers on DI also found that DI is successfully practiced if there is available time and if teachers are professionally developed to manage a class and apply effective strategies of DI. Roy *et al.* (2013) in Canada also found out that teachers can more likely use DI when school climate and resources are adequate.

The present study also investigated teachers' practice of the components of DI (content, process, product, and learning environment differentiations). But the findings show that except in differentiating the process, many teachers did not differentiate the contents (lessons learnt), the product (assessment), and aspects of the learning environment depending on learners' differences. Besides, the qualitative data informed that many teachers were trying to focus more on covering the content of the subject matter than differentiating it. Teachers and school principals have also misconceptions about content and product differentiations. They believed that, in a standardized and fixed curriculum it may be difficult to differentiate contents (lessons learnt) and also assessment (product) for diverse students. In this regard, even though the MoE (2002, 2015, 2017) claimed that curriculum should be flexible and adaptable to enable differentiation so that teachers can target curriculum content at learners' pace depending on their level, needs and preferences, a one-size-fits approach to teaching still predominates (Tadesse, 2015). The findings of this study also revealed that teachers dominantly apply the same lesson, with the same assessment mechanisms. This can be linked with the finding of Dee (2010) who stated that teachers' practice in changes to content and the way in which they demonstrate learning (product) were low. As the study indicated, due to lack of knowledge and commitment

to practice DI, many teachers still prefer to teach using the traditional approach [chalk and talk approach]. Also, teachers' assessment was not persistently enhancing students' learning.

Nevertheless, it is argued that traditional teaching methods can no longer support learning in meta-modern mixed ability classrooms. Consistent to this finding, Joshi and Verspoor (2013), McBride (2004) and Tomlinson (2014) investigated that the majority of teachers' classroom practices still tend to the one-size-fits-all approach. However, various scholars (e.g., McBride, 2004; Tomlinson & Imbeau, 2010) constantly noted that, the use of one-size-fits-all curriculum no longer meets the needs of the majority of students.

When teachers are providing the same content for academically diverse students and if assessment is the same for all, meeting individual students' interests, readiness and learning profiles could be challenging. Tomlinson (2014) argues that this act "disregards students' individuality." Other scholars, in contrast, suggest that differentiating the content increases interest in learning and enhances learners' skills (Roberts & Inman, 2013; Tomlinson, 2014). Thus, matching the content with the level of the thinking processes, the complexity and choice of the product, and/or the assessment to the student or group of students is decisive (Roberts & Inman, 2013). On the other hand, when students' interests are not addressed during lesson delivery, their motivation and eagerness to learn could not be enhanced. In criticizing the low content differentiation due to fixed curriculum, Darling-Hammond (2012) found that teacher effectiveness in addressing students' learning diversity has limitations.

For students' learning, effective teachers have to recognize the way students learn best and make instructional adaptation strategies accordingly (Roy et al., 2013). These possible instructional adaptation strategies include altering contents, varying multi-sensorial resources or materials, changing teaching strategies and pace of instruction, and using flexible grouping and providing extra support (Nicolae, 2014; Roy *et al.*, 2013). Rodriguez (2012) also suggested flexible grouping, varied instructional materials, varying questions, and independent projects as strategies to vary the process. In this regard, teachers' practice of differentiating the process was relatively encouraging. These help teachers to attain students' learning styles, learning preferences and also intelligences. As the process (methods of teaching) can be differentiated in response to readiness, interest and learning profiles of students (Anderson, 2007; Tomlinson, 2005), earlier studies (e.g., Knowles, 2009; Levy, 2008) also suggest that teachers are encouraged to offer a variety of learning options and fit those options to the learning process that best meets such a diversity. Other scholars also unveiled that different students have different learning styles; some learn the content through movement, others through visual aids, and others via listening (Bender, 2012; Sousa & Tomlinson, 2011) and such learning style differences of students should be addressed.

As a third component, this research finding revealed that teachers' practice of differentiating the product (giving students the chance to demonstrate what they have learnt verbally, in written forms, practically or in action), was low. This confirms that all students are given the same assessment to show what they have learnt, disregarding students' individual differences. Nevertheless, the finding was not congruent with the previous findings of many

scholars (Anderson, 2007; Chamberlin & Powers, 2010; Heacox, 2002; Levy, 2008; Santangelo & Tomlinson, 2012; Smit & Humpert, 2012; Tomlinson, 2006). As these researchers suggest, depending on the nature of the lessons or courses they have learnt, students have to be given the chance to demonstrate their final learning through written works, oral expositions, practical demonstrations, performance-based projects and problem solving. For instance, Tomlinson (2006) noted that product differentiation consists of the alternative ways that students can demonstrate mastery of the concepts and application of knowledge learnt. Hence, product differentiation can be something tangible, verbal, or action that provides students with a variety of opportunities to demonstrate what they have learnt (Heacox, 2002; Levy, 2008).

Teachers can also offer multiple ways to students such as presentation, quiz, models, etc. to demonstrate what they have learnt (Knowles, 2009; Levy, 2008; Wan, 2017) and inspire them to ask reasonable questions that are honored and important (Tomlinson & Strickland, 2005). To this end, art projects, role-play, mini-dramas for groups of students, library works, paper-and-pencil projects, written or oral reports, and tiered assignments all represent admirable projects that students may complete to demonstrate their knowledge and skill (Bender, 2012).

The findings also disclosed low practice of teachers in the study areas. In many of the primary schools, there is no favorable classroom environment for learning. Many schools have no sufficient resources and laboratory and library services; there is shortage of comfortable chairs and tables; and many of them have dusty rooms with unappealing physical appearances inside and outside the classrooms. Thus, creating appealing learning environment to the students was very low. However, the result is not in line with many of the previous research findings (Goddard *et al.*, 2010; Kanevsky, 2011; Roy *et al.*, 2013; Santangelo & Tomlinson, 2012; Watts-Taffe *et al.*, 2012). For instance, Kanevsky (2011) stated that to maintain differentiation in the classroom, teachers always have to build favorable environment for learning and develop routines to support differentiation. These include developing classroom systems that allow children to work in small peer groups and independently while the teacher provides targeted instruction to other groups of students (Watts-Taffe *et al.*, 2012). It also consists of the practices, procedures, and physical arrangement of the classroom, as well as the overall tone or mood that exists among and between students and the teacher (Santangelo & Tomlinson, 2012).

Teachers' Practice of DI Based on Qualification

This study also compared teachers' practice of DI in terms of qualification. Thus, a statistically significant difference was investigated in the mean scores of degree holder and diploma holder teachers in their practices of DI. Moreover, the *t*-test value depicted that there is a significant mean score difference between them in practicing content and process differentiations. The results display that degree teachers' practices of differentiating contents and processes were higher than diploma teachers. Previous research (Dixon, Yssel, McConnell, & Hardin, 2014; Koeze, 2007; Suprayogi, 2017) were consistent with this finding. Dixon *et al.* (2014) found that there is a positive relationship between teachers' qualifications and their effectiveness in implementing DI. Koeze's (2007) finding added that qualified teachers differentiated frequently in the areas of readiness, interest, flexible grouping, choice, and learning styles. For Suprayogi

(2017) too, teachers with a teaching certificate have a significantly higher DI implementation compared to teachers with no certification. Also, MoE (2002, 2015) as well as Workneh and Tassew (2013) argued that proper schooling cannot be conceived without the presence of qualified teachers. To improve any educational system, the important factor that should be considered most is improving the quality of teachers' qualification along with the standards of teaching (MoE, 2015, 2017; Tesfaye, 2014).

Unlike content and process differentiations, findings disclosed no significant differences between diploma and degree holder teachers in product and learning environment differentiations. This finding was consistent with the findings of Schleicher (2016) who found no or less evidence about the benefits of advanced qualifications varying the learning environment and the product. This author noted that since degree and diploma teachers are working in the same school environment under fixed curriculum structure, differentiating aspects of the learning environment and the product is not significant. Instead, Schleicher (2016) realized that high qualification contributes to teachers' relatively high social status and attracts competent people into the profession.

Teachers' Practice of DI Based on Training

Professional development or training is crucial to implement new instructional approaches like DI. While training on DI is necessary, it is not always available fully in the ground due to limited school budgets and little time given for coaching teachers to effectively use it in the classroom (Darling-Hammond, 2012).

Accordingly, also in this part of the study, a significant difference was noted between the mean scores of trained teachers and untrained teachers in the practice of DI in the classroom. Similarly, in terms of the components of DI, a significant difference was identified in the mean scores of trained teachers and untrained teachers in content differentiation. Based on the inferences of the results, those teachers who received in-service training on DI and its components practiced content, process, product, and environment differentiations better than those who did not receive. In all components of DI, trained teachers practiced better than untrained teachers. As the qualitative data also showed, in many of the primary schools on which continuous in-service training or professional development on DI was given, teachers' practice of differentiating instruction was relatively better.

Many international research findings are also consistent with this finding (Al-Natour, 2016; Dee, 2010; Koeze, 2007; Smit & Humpert, 2012; Watts-Taffe *et al.*, 2012). They reported that in-service training helped teachers to effectively implement DI. The findings of Koeze (2007) and Smit and Humpert (2012) described opportunities for training and the availability of material resources as facilitators for effective DI. Teachers who have the exposure to DI can utilize different instructional strategies. Cognizant of this, various scholars make clear that teachers who participate in DI training use frequent differentiation strategies (Edwards, Carr, & Siegel, 2006; Koeze, 2007). These authors clarify that teachers who do not receive training on DI may use undifferentiated instructions which did not enhance students' achievement.

Al-Natour (2016) added that lack of special training programs makes teachers to practice DI in a lower rate. Other researchers (e.g.,; Santangelo & Tomlinson, 2012; Watts-Taffe *et al.*, 2012) supplemented that due to the lack of knowledge on relevant strategies to differentiate and meet the needs of students, teachers continue to use the same practices (Dee, 2010) and without including DI into their lesson plans (Watts-Taffe *et al.*, 2012). But to improve teachers' practice, as Darling-Hammond (2012) informed, professional learning opportunities must be of high quality to the kind of sustained and focused learning. Other scholars supplemented that consistent training events and workshops have greater uses for teachers to understand the diverse teaching strategies in their lessons (Shymansky & associates, 2012 in Maddox, 2015), and to change their practices of DI (Goodnough, 2010; Koeze, 2007; Rodriguez, 2012; Subban, 2006; Walker-Dalhouse *et al.*, 2010;). In order to facilitate effective DI, such a teacher training can clearly be linked to its purpose or DI implementation (Suprayogi, 2017). On top of this, internal staff training is effective and cost efficient as experienced educators train their fellow colleagues by sharing strategies and techniques (Freedman, 2015). Also, creating systems collaborative work and giving time for teachers to work and learn together during the school days is crucial (Darling-Hammond, 2012). Hence, as the same author noted, schools and districts must develop conditions that provide teachers and principals with sufficient organizational and instructional support to carry out a system of continuous teacher professional learning. Nonetheless, training on DI should not be given for the sake of reports; rather it has to base on the needs of teachers and their identified gaps so as to enable them to effectively implement DI. In other words, the contents of the training should match to the current context of a teacher's classroom reality. Thus, teacher educators should provide pre-service teachers with the full understanding of the tenets of DI (Holloway, 2000 in Erickson, 2010; Ruys *et al.*, 2013).

Teachers' Practice of DI Based on Experience

As the findings of this study expounded, primary school teachers, whose teaching experiences are between 11-15 years and 16-20 years performed DI better than those with 0-5 years, 6-10 years, and greater than 20 years of experience. The novice teachers (0-5 years of teaching experience) indicated the lowest practice of DI. This finding was also supported by the qualitative results. The results revealed that novice teachers' competence and motivation to teach was lower than experienced teachers. The findings are also congruent with previous research findings (Al-Natour, 2016; Dack, 2015; Dee, 2010; Freedman, 2015; Hilyard, 2004; Rodriguez, 2012; Unianu, 2012) which found that experience in teaching brings a significant difference on the practice of DI. Moreover, experienced teachers had the ability to discern the different instructional strategies of DI (Rodriguez, 2012), see themselves as committed to student success and achievement (Freedman, 2015), and are more convinced to adapt the educational activity in accordance with the needs of all students (Unianu, 2012).

In contrast, James (2009) found no statistically significant correlation between years of teaching experience and implementation of DI. Hilyard (2004) and Al-Natour (2016) also found no significant correlation between teaching experience and adoption of teaching practices of DI. Finally, incongruent with the findings of the present study, the Suprayogi (2017) found that

teachers with five or less years of experience seem more eager to adopt innovations. Whereas, teachers with more than twenty years of experience are more likely to resist change and criticize the new instructional practices. For the same author, mid-career teachers (6-20 years of experience) have mixed reactions to educational innovations. These teachers feel competent and confident but are cautious about innovations that require the development of new competences.

CONCLUSIONS AND IMPLICATIONS

Primary school teachers' classroom performance of DI in addressing students' learning diversity was low. However, variations were found among teachers within the practice of the four components of DI (content, process, product, and environment differentiations). These differences were also identified based on teachers' qualification, in-service training, and teaching experience. Accordingly, those diploma holders (10/12 +3 year graduates), teachers who lack in-service training on DI, and less experienced teachers (< 5 years) have lower practice of DI. More specifically, their practices of content differentiations and product differentiations were very low, and this can be due partly to knowledge gaps, shortage of resources and lack of administrative support from school leaders. Therefore, in order to address learners' learning diversity in the same classrooms, special attention should be given to teachers' capacity building training on how to implement DI and its components. Moreover, as the existing systems rarely help teachers improve or clearly distinguish those who are succeeding from those who are struggling (Darling Hammond, 2012 Erickson, 2010; Tobin & McInnes, 2007), newly employed teachers have to be coached by experienced teachers on how to implement DI that are integral to creating a successful differentiated classroom. Besides, learning facilities should be fulfilled and teachers should be provided with the necessary support and follow up from school principals.

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