

Research Trend in the Practice of Differentiated Instruction

Mohd Hasrul Kamarulzaman*

Pusat PERMATApintar Negara, Universiti Kebangsaan Malaysia (UKM), 43650 Bangi, Selangor, Malaysia

Hazita Azman

Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia (UKM), 43650 Bangi, Selangor, Malaysia

Azizah Mohd Zahidi

Pusat PERMATApintar Negara, Universiti Kebangsaan Malaysia (UKM), 43650 Bangi, Selangor, Malaysia

Abstract

The influence of diversity in education has affected the shift in pedagogical practice, moving from the traditional teacher-centered classroom to student-based teaching approach. Such teaching approach that has received extensive review from educators as well as researchers is differentiated instruction. Differentiated instruction has been practiced in numerous contexts with different types of students around the globe, in various academic subjects such as languages, mathematics, and sciences. Simultaneously, researchers, and practitioners alike, have indicated growing interest in conducting studies in the practice of differentiated instruction. These studies contributed to the expansion of the use of differentiated instruction in teaching and learning as well as in the improvement of its practice and students' learning outcomes. This paper therefore discusses the current trend, or perspectives, of the researches in the practice of differentiated instruction, highlighting the research contexts, objectives, methods, and findings.

Keywords: Differentiated instruction; Pedagogy.



CC BY: [Creative Commons Attribution License 4.0](https://creativecommons.org/licenses/by/4.0/)

1. Introduction

The influence of diversity in education has affected the shift in pedagogical practice, moving from the traditional teacher-centered classroom to student-based teaching approach. Such teaching approach that has received extensive review from educators as well as researchers is differentiated instruction. Differentiated instruction has been practiced in numerous contexts with different types of students around the globe, in various academic subjects such as languages, mathematics, and sciences. Simultaneously, researchers, and practitioners alike, have indicated growing interest in conducting studies in the practice of differentiated instruction. These studies contributed to the expansion of the use of differentiated instruction in teaching and learning as well as in the improvement of its practice and students' learning outcomes.

Extensive review of literature has been conducted to explore the essence of the researches exploring the practice of differentiated instruction. The existing studies consist of an accumulation of various themes in the implementation of differentiated instruction in academic subject areas such as languages, mathematics, and sciences. In one area, differentiation studies have looked into various groups of learners that include mixed-ability students, high-ability students, and also students with learning disabilities (Baumgartner *et al.*, 2003; Lawrence-Brown, 2004; Rock *et al.*, 2008; Tieso, 2001a); (Geisler *et al.*, 2009). In another area, researchers have investigated the varying influence of differentiated instruction on the learning outcomes of students such as motivation, engagement, attitude, emotion or desire to learn (Cheng, 2006), (Brimfield *et al.*, 2002; Skinner and Belmont, 1993; Tieso, 2001b) (Heacox, 2009; Logan, 2011; Olah, 2008). Another scope of differentiation studies that is related to either English language or language arts learners highlights the common or best practices and effects on student achievement (Aliakbari and Khales, 2014; Hung, 2015; Karadag and Yasar, 2010; Langley, 2015; Renkema, 2014), (Gorman, 2011; Wallis, 2015). Moreover, this review also revealed related studies benefitting gifted education, revealing its best practices, and effects on achievement and motivation of gifted learners, in various academic subjects (Ann and Sizemore, 2015; Brulles *et al.*, 2010; Caldwell, 2012; Launder, 2011; Martin and Pickett, 2013; Powers, 2008; Reis and Boeve, 2009; Ruggiero, 2012; White, 2013), (Altintas and Özdemir, 2015; Brulles and Winebrenner, 2012; Edwards, 2007; Hyde, 2007). The following sections discuss the current trend, or perspectives, of the studies conducted in investigating the practice of differentiated instruction, highlighting the research contexts, objectives, methods, and findings.

2. Research Contexts

Although differentiated instruction has been practiced for quite some time, most of the research contribution came from only certain contexts, and thus the research contexts were still limited. As shown in Table 1 below, the most recent studies on differentiated instruction mainly came from the school districts in the United States. Some of them include the schools in Wisconsin, Missouri, New York, Los Angeles and etc. The reason for the significant

*Corresponding Author

contribution of researches from the U.S. may be due to its No Child Left Behind (NCLB) policy. Having a policy makes it somewhat compulsory for teachers to implement this teaching approach, making the U.S. (its schools) as the most convenient contexts available.

Other parts of the world have also contributed their inputs and findings on differentiated instruction but very minimal, and this appeared to indicate either the scarcity of researches conducted, or perhaps the limited practice of this teaching approach. This nonetheless may explain the previous findings that differentiated instruction is overall challenging in nature (Ann and Sizemore, 2015; Burris, 2011; Langley, 2015; Yamat *et al.*, 2011) Tramonto (2013). Review on the literature has found one study from Alberta, Canada; and also, one from the European region such as the Netherlands. Several studies came from Turkey and Iran, while several others came from Asia, with the most contribution from Taiwan.

Table-1. Contexts of the Studies Investigating Differentiated Instruction

Contexts	States/Districts	
International	U.S.	Wisconsin, South Carolina, Ohio, Minnesota, Missouri, New York, Oregon, Los Angeles, California, New England Glendale, AZ Border of U.S. Mexico
	Canada	Alberta
	Asia	Taiwan
	European	Netherlands
	Arab Regions	Istanbul, Turkey Iran
	Africa	Bukwai, Cameroon Meru County, Kenya
South East Asia region	Sg. Petani, Kedah, Malaysia Bangi, Selangor, Malaysia Serdang, Selangor, Malaysia	

Despite the limited number of research contribution in the international context, there were few studies of differentiated instruction conducted in the South East Asia region such as Malaysia (Jin, 2015; Meyad *et al.*, 2014) (Yamat *et al.*, 2011). Those studies were conducted in Sg. Petani, Kedah; Bangi, Selangor; and, Serdang, Selangor.

Jin (2015) conducted a mixed methods study investigating the practice of differentiated instruction in one school in Sg. Petani, Kedah focusing on reading. The study investigated a) the relationship between differentiated instruction and student readiness, interest, and learning profiles, and b) teachers' views on differentiated instruction on 2 English teachers and 76 Form 3 students. The study found that differentiated instruction is time consuming although it greatly improved students' interest to learn English.

Meyad *et al.* (2014) conducted an experimental study investigating the effect of differentiated instruction on student motivation in one school in Serdang, Selangor focusing on Arabic language. The study investigated students' motivation having experienced differentiated instruction gathered through instrumental and MSLQ questionnaires. The data were collected from 100 Form 4 students. The study found that the students from the experimental group were generally more motivated than the control group, which proved that the differentiated instruction is an effective approach in improving students' motivation towards studying the Arabic Language as a foreign language.

Yamat *et al.* (2011) conducted a qualitative case study exploring the implementation of differentiated instruction in an enrichment writing course for gifted children called 'Crafting the Essay', during a School Holiday Camp program in Bangi, Selangor, focusing on writing. 15 gifted students participated in the program and contributed to the data collected through observations and interviews. The study revealed that teachers need to encourage students. This would help students develop confidence as they enjoyed the lesson, and were more creative and descriptive in their thinking. In addition, grouping contributes to improvement as students had the opportunity to work on each other's work. Despite such positive learning outcomes, teacher revealed that differentiated instruction is meaningless or useless. It requires much effort, organization, preparation, and commitment.

The existing contexts of research where the investigation on the practice of differentiated instruction were conducted revealed that its practice is not as widespread/ rampant as it appears to be. Most of the studies, however, came from the U.S. where its practice is policy-bound, making it compulsory for teachers to differentiate their lessons, and thus making convenient for researchers to find their research contexts. Thus, this explains the greater contribution of studies from the U.S.

Conducting a research (pertaining to the practice of differentiated instruction) in contexts other than the U.S. may require extra effort, or intervention, by researchers e.g. to train the teacher participants about differentiated instruction before the actual research can begin. This may stretch the research span to be longer, and incur extra financial research cost. This factor explains the inadequacy of researches on differentiated instruction, especially in the South East Asia region as shown in Table 1 above.

3. Subject Areas

The current researches on differentiated instruction reviewed indicate that the studies had been conducted on numerous subject areas. In Table 2 below, the subject areas were categorized into a) languages, b) mathematics, c) sciences, d) others, and e) combination of 2 or more subjects.

In the languages category, the existing studies had explored the practice of differentiated instruction in various English language related courses such as ESL, EFL, and ELA (Berntsen, 2016; Borja *et al.*, 2015; Chien, 2014;2015; Corre, 2013; Flaherty, 2010; Gorman, 2011; Hubbard, 2009; Hung, 2015; Koeze, 2007; Langley, 2015; Reis and Boeve, 2009; Ruggiero, 2012; Santisteban, 2014; Valiande and Tarman, 2011) reading, or literacy (Aliakbari and Khales, 2014; Azah, 2016; Sabb-Cordes, 2016; Servilio, 2009) (Behncke, 2015; Defrancesco, 2015; Ghyzel, 2015; Jin, 2015; Oswald, 2016b; Schlag, 2009; Tramonto, 2013) (Cheng, 2006); vocabulary (Alavinia and Farhady, 2012); writing (Yamat *et al.*, 2011); listening (Moreno, 2015); Arabic (Meyad *et al.*, 2014); Turkish (Karadag and Yasar, 2010); and, Spanish (Santisteban, 2014)

However, most of the researches on differentiated instruction were contributed by the studies focusing on the mathematics subject areas (Abbati, 2012; Amadio, 2014; Brulles *et al.*, 2010; Gamble, 2011; Hackenberg *et al.*, 2016; Hung, 2015; Least, 2014; Maddox, 2015; Martin and Pickett, 2013; Mulder, 2014; Muthomi and Mbugua, 2014; Williams, 2012), (Altintas and Özdemir, 2015; Chamberlin and Powers, 2010; Gorman, 2011; Scott, 2012; Sizemore, 2015; Tieso, 2001a). In the sciences category, few studies had attempted investigation on academic subjects such as science, chemistry, and biology (Hogan, 2014; Olah, 2008; Osuafor and Okigbo, 2013) (Decovsky, 2012; Palmer and Maag, 2010a)

Table-2. Academic Subject Areas Involved in Exploring Differentiated Instruction

Areas	Subjects	Studies
Languages	English language (ESL, EFL, ELA)	Berntsen (2016) Chien (2015) (Borja <i>et al.</i> , 2015); (Langley, 2015); (Hung, 2015) Chien (2014); (Santisteban, 2014) (Corre, 2013) (Ruggiero, 2012) Valiande and Tarman (2011) Gorman (2011) (Gamble, 2011) (Reis and Boeve, 2009); Hubbard (2009) (Koeze, 2007)
	Reading, Literacy	Oswald (2016b); (Sabb-Cordes, 2016) ; (Azah, 2016) Jin (2015); Defrancesco (2015); Ghyzel (2015) (Aliakbari and Khales, 2014) (Tramonto, 2013) (Schlag, 2009); (Servilio, 2009) (Cheng, 2006)
	Vocabulary	(Alavinia and Farhady, 2012)
	Writing	(Yamat <i>et al.</i> , 2011)
	Listening	(Moreno, 2015)
	Arabic	(Meyad <i>et al.</i> , 2014)
	Turkish	(Karadag and Yasar, 2010)
	Spanish	(Santisteban, 2014)
Mathematics		(Hackenberg <i>et al.</i> , 2016) (Hung, 2015; Maddox, 2015);(Sizemore, 2015); (Altintas and Özdemir, 2015) (Mulder, 2014; Muthomi and Mbugua, 2014) (Amadio, 2014; Least, 2014); (Martin and Pickett, 2013) (Abbati, 2012); (Scott, 2012); (Williams, 2012) (Gamble, 2011); (Gorman, 2011) (Brulles <i>et al.</i> , 2010); (Chamberlin and Powers, 2010) (Tieso, 2001a)
Sciences	Science, chemistry, Biology,	(Hogan, 2014) (Osuafor and Okigbo, 2013) (Decovsky, 2012) (Palmer and Maag, 2010a) (Olah, 2006)
Others	Special Education Course, History,	(Swaby, 2016) (Joseph <i>et al.</i> , 2013); (Gentry <i>et al.</i> , 2013)

	Curriculum Studies, Education and Psychology	(Santangelo and Tomlinson, 2009)
Combination of 2/more areas		(McCarthy and McCarthy, 2006) (Wan, 2015) (Robinson <i>et al.</i> , 2014) (Burkett, 2013) (Caldwell, 2012; Rodriguez, 2012) (Burris, 2011); (Gorman, 2011) (Fenner <i>et al.</i> , 2010; McQuarrie and McRae, 2010); (Danzi <i>et al.</i> , 2008) (Koeze, 2007); (Hyde, 2007)

In addition, there are also studies that made comparison between two or more subject areas s *McCarty et al.* (2016); *Wan* (2015); (*Burkett, 2013; Burris, 2011; Caldwell, 2012; Robinson et al., 2014; Rodriguez, 2012*); *Gorman* (2011); (*Fenner et al., 2010; McQuarrie and McRae, 2010*); *Danzi et al.* (2008); *Koeze* (2007); *Hyde* (2007) *Hyde* (2007) while other studies were also conducted on courses such as Special Education Course, History, Curriculum Studies, and Education and Psychology (*Joseph et al., 2013; Swaby, 2016*) (*Gentry et al., 2013*); (*Santangelo and Tomlinson, 2009*).

The existing researches on differentiated instruction mentioned above seem to indicate that most of the studies came from the languages subject area, but that is not the case. The languages category comprise of various types of English language courses i.e. ESL, EFL and ELA; language skills, i.e. reading, writing, listening, vocabulary; and other world languages i.e. Arabic, Turkish, and Spanish. It can be seen that most of the studies were contributed from the mathematics subject area. This serves to rationalize that more studies investigating the practice of differentiated instruction focusing on English language teaching and learning are needed. Next, the following section will discuss the scope of the research objectives and approaches adopted by the previous studies in investigating the practice of differentiated instruction.

4. Research Approaches and Objectives

As shown in *Table 3* below, most of the recent studies investigating differentiated instruction employed either quantitative or qualitative approach. Several studies had employed explanatory mixed methods, while few had attempted exploratory or concurrent mixed methods. The rationale to employ a particular approach depends on the research objectives.

It was found that most of the studies examining the effect of differentiated instruction on students’ achievement employed quantitative approach (*Altintas and Özdemir, 2015; Defrancesco, 2015*); (*Aliakbari and Khales, 2014; Mulder, 2014; Muthomi and Mbugua, 2014; Osuafor and Okigbo, 2013; Ruggiero, 2012*); *Scott* (2012); (*Alavinia and Farhady, 2012; Williams, 2012*) (*Valiande and Tarman, 2011*) ; (*Brulles et al., 2010; Gamble, 2011*); . Few studies had attempted examining students’ motivation, engagement, or attitude (*Meyad et al., 2014*); (*Corre, 2013; Martin and Pickett, 2013*), and teachers’ practices (*Gentry et al., 2013*); (*Caldwell, 2012; Rodriguez, 2012*) through quantitative measures.

Table-3. Research Approaches and Objectives Exploring Differentiated Instruction

Approaches	Objectives	Studies
Quantitative	<ul style="list-style-type: none"> Examine the effect of differentiated instruction on students’ achievement Examine students’ motivation, engagement, or attitude Investigate teachers’ practices 	(Azah, 2016); (Defrancesco, 2015) (Altintas and Özdemir, 2015) (Aliakbari and Khales, 2014; Mulder, 2014; Muthomi and Mbugua, 2014); (Meyad <i>et al.</i> , 2014) (Corre, 2013; Martin and Pickett, 2013; Osuafor and Okigbo, 2013); (Gentry <i>et al.</i> , 2013) (Rodriguez, 2012; Ruggiero, 2012); (Scott, 2012) (Williams, 2012); (Alavinia and Farhady, 2012); (Caldwell, 2012) (Valiande and Tarman, 2011) (Gamble, 2011) (Brulles <i>et al.</i> , 2010)
Qualitative	<ul style="list-style-type: none"> Investigate teachers’ perceptions Investigate teachers’ practices 	(Oswald, 2016a);(Hackenberg <i>et al.</i> , 2016);(Sabb-Cordes, 2016) (Maddox, 2015) (Ghyzel, 2015) (Chien, 2015); (Langley, 2015)

	<ul style="list-style-type: none"> Explore students' motivation, engagement, attitude 	(Hogan, 2014); (Chien, 2014); (Least, 2014; Robinson <i>et al.</i> , 2014) (Abbati, 2012) (Abbati, 2012); (Decovsky, 2012) (Yamat <i>et al.</i> , 2011) (Burris, 2011) (McQuarrie and McRae, 2010) (Servilio, 2009) (Olah, 2006)	
Mixed Methods	Explanatory	<ul style="list-style-type: none"> Teachers' perceptions Teachers' practice Students' achievement Student attitude Student motivation Student engagement Best DI strategies 	(McCarty <i>et al.</i> , 2016) (Jin, 2015) (Behncke, 2015); (Wan, 2015); (Hung, 2015) (Sizemore, 2015) (Amadio, 2014) (Joseph <i>et al.</i> , 2013) (Karadag and Yasar, 2010) (Flaherty, 2010); (Palmer and Maag, 2010a) (Koeze, 2007)
	Exploratory	<ul style="list-style-type: none"> Student achievement Student attitude, perceptions Teachers' practice 	(Swaby, 2016) (Santisteban, 2014) (Hubbard, 2009)
	Concurrent	<ul style="list-style-type: none"> Student achievement 	(Chamberlin and Powers, 2010)

Most of the studies that employed qualitative approach sought to gather teachers' perceptions (Burkett, 2013; Hogan, 2014; Maddox, 2015; Robinson *et al.*, 2014; Sabb-Cordes, 2016) . Similarly, many studies had also employed qualitative procedures in documenting teachers' practices of differentiated instruction (Oswald, 2016a); (Hackenberg *et al.*, 2016) (Ghyzel, 2015); (Chien, 2015) (Langley, 2015; Robinson *et al.*, 2014) (Abbati, 2012; Burkett, 2013; Least, 2014; Yamat *et al.*, 2011) (McQuarrie and McRae, 2010) (Olah, 2008; Servilio, 2009). A couple of studies had attempted to explore students' motivation, engagement, or attitude through qualitative approach (Chien, 2014; Decovsky, 2012).

Quite a number of studies had employed mixed methods, although most of them were explanatory i.e. quantitative method precedes qualitative method. Studies employing explanatory mixed methods had examined the effect of differentiated instruction on students' achievement, examined students' motivation, engagement, or attitude, and investigated teachers' practices (Behncke, 2015; Jin, 2015; McCarty *et al.*, 2016; Wan, 2015); (Hung, 2015); (Sizemore, 2015); (Amadio, 2014; Joseph *et al.*, 2013; Karadag and Yasar, 2010); (Flaherty, 2010) (Palmer and Maag, 2010a); (Koeze, 2007); (Hyde, 2007). Only three studies were found to have employed exploratory mixed methods (Swaby, 2016); (Hubbard, 2009; Santisteban, 2014) while only one attempted concurrent mixed methods (Chamberlin and Powers, 2010). In the exploratory mixed methods, qualitative method precedes quantitative method. The existing studies utilizing exploratory mixed methods had explored the impact, or effect, or relationship, of or between differentiated instruction and student achievement, student attitude, student perceptions, and also investigated teachers' practices. Through concurrent mixed methods, both quantitative and qualitative methods are conducted simultaneously. Chamberlin and Powers (2010) investigated the impact of differentiated instruction on student achievement utilizing concurrent mixed methods.

5. Finding of the Existing Researches

The existing studies investigating differentiated instruction had revealed several themes of findings. The studies conducted with different contexts, participants, research approaches and objectives yielded varied results and findings. Depending on the research objectives, the themes of the findings include teachers' practices and perceptions towards differentiated instruction, and the impact of differentiated instruction on students' learning outcomes such as achievement, motivation, engagement, attitude, and perception.

5.1. Findings Related to Teachers' Practice

Table 4 displays the summary of findings related to teachers' practice. The existing studies that explored teachers' practice of differentiated instruction revealed varied findings that can be categorized into several themes.

Some studies had highlighted the importance of assessment of students ability levels (Burris, 2011; McQuarrie and McRae, 2010; Olah, 2008; Servilio, 2009); (Gentry *et al.*, 2013). (McQuarrie and McRae, 2010) for example, stated that differentiated instruction not only begins with, but also is determined by ongoing assessments. Burris (2011) also revealed that in providing differentiated lessons that are meaningful, teachers need to assess students' knowledge by using assessments.

There are also studies that indicated certain teaching behaviours in differentiated classroom (Hackenberg *et al.*, 2016) (Borja *et al.*, 2015) (Hackenberg *et al.*, 2016); (Borja *et al.*, 2015); (Tramonto, 2013); (Servilio, 2009; Yamat *et al.*, 2011). It was found in some studies that teachers should provide students with choices and monitor the students (Hackenberg *et al.*, 2016); Borja, Soto & Sanchez, 2015 (Yamat *et al.*, 2011)). revealed that teachers need to encourage the students [so that they will enjoy the lesson and develop confidence].

There are also studies that highlighted differentiated instruction as a challenging teaching approach (Langley, 2015); (Sizemore, 2015); (Tramonto, 2013); (Burris, 2011; Yamat *et al.*, 2011). In a study investigating best practices of differentiated instruction, (Tramonto, 2013) revealed that differentiated instruction is challenging. It was revealed that although the teacher participants in the study believed that differentiated instruction would benefit students, however, they also believed that implementing differentiated instruction is not feasible. This is perhaps, as revealed by Yamat *et al.* (2011) in a study, because differentiated instruction requires a lot of effort as well as commitment.

Some studies revealed that implementing differentiated instruction requires a lot of time (Jin, 2015; Oswald, 2016b); (Langley, 2015); (Sizemore, 2015); (Yamat *et al.*, 2011); (Burris, 2011); (McQuarrie and McRae, 2010). (Burris (2011)) for example, revealed that time was insufficient to plan differentiated activities. Likewise, Oswald (2016) revealed in a recent study that more time is needed in order to plan lessons and gather resources.

Quite a number of studies have revealed the impacts on students (Sizemore, 2015); (Least, 2014; Yamat *et al.*, 2011); (Jin, 2015); (Olah, 2008); (Least, 2014); (Olah, 2008) Earlier, Olah (2008) stated that differentiated instruction may increase academic achievement. Recently, (Least, 2014) for example found that differentiated instruction was highly effective. It was found that students' scores were higher. In addition, Jin (2015) revealed that differentiated instruction greatly improved students' interest to learn English. Finally, Least, 2014 and Olah (2008) also found that differentiated instruction may increase student engagement by providing activities that suit their readiness or interest.

Table-4. Findings Pertaining to Teachers' Practice of Differentiated Instruction

Studies; Subjects; Contexts	Objectives; Participants	Approaches; Instruments	Findings
Oswald (2016a) Literacy middle school content area Suburban Wisconsin, U.S.	To explore teachers' understanding and implementation of DI 7 teachers	Qualitative case study Semi-structured interviews, Lesson plans	Knowledge, practices, perceptions, supports Participants implemented DI to some extent; Participants needed additional supports: time to plan and gather resources, opportunities to collaborate with colleagues, and professional development to learn strategies to better differentiate instruction
(Hackenberg <i>et al.</i> , 2016) Mathematics	To investigate teachers' practice of DI 21 teachers	Qualitative Observation, interview	providing students with choices; monitoring actively during group work
Chien (2015) English language Taiwan	To investigate teachers' practice of DI 13 teachers	Qualitative, case study Surveys, documents, interviews	Teachers were reluctant due to lack of competence in DI, time
Jin (2015) ESL, Reading Sg. Petani, Kedah, Malaysia	To investigate relationship between DI and students' readiness, interest and learning profiles; teachers' views on DI 2 English teachers 76 F3 students	Mixed methods, explanatory MI Excel Survey, observation, interviews	Time consuming; The use of DI in the classroom greatly improved students' interest to learn English.
Borja <i>et al.</i> (2015) Language, EFL	To provide best practices of DI for EFL classroom		Let students demonstrate their spoken skills through a menu of different activities allowing choices Students should have the choice to present their learning results individually, pairs, or in small groups Let students work within different grouping configurations so that they can support each other to scaffold their learning Teachers should monitor their students while they are working
(Langley, 2015)	To investigate	Qualitative	Teachers' practices, challenges,

English	teachers' practice of DI 7 teachers	Interviews, documents	lack of time
Sizemore (2015) Mathematics Central Ohio	To investigate teachers' practice of DI for gifted and high ability students 10 math teachers	Mixed methods, explanatory Questionnaire, semi-structured interviews, observation, document analysis	Teachers view DI as important, time consuming, challenging
Least (2014) Mathematics	to investigate how a mathematics teacher and a literacy expert co-teach to provide DI 1 teacher and 1 co-teacher	Qualitative case study Student results, interviews, document analysis of lesson plans, literacy support plans, & assessments	DI was highly effective; Students scored 12% higher; students work best when given the opportunity to become engaged in a lesson
Gentry et al. (2013) Special Education Course	To understand how DI can be better implemented 30 undergraduate teachers	Quantitative Self-developed questionnaire	Effective differentiation includes identifying students' readiness levels, modifying instruction, applying collaboration and autonomy in learning, and integrating teaching and practice to enhance learning
Tramonto (2013) Language, reading	To identify best practices for differentiating instruction that lead to increase student achievement		Challenges: teachers indicate that they believe differentiated or responsive teaching would benefit students, they also indicate they do not believe it is feasible for them to differentiate instruction. Practices: Reading instruction was differentiated by the use of flexible groups, texts on different reading levels, student-selected texts during independent reading, and guided reading groups according to the identified need for individual students; the need to provide learners with choices about what they read and in the design of their work products so that they are a better match for learners
(Yamat et al., 2011) Language, writing An enrichment course 'Crafting the Essay' Bangi, Malaysia	To explore the implementation of DI in teaching gifted children 15 gifted students	Qualitative, case study Interviews, observations	Students developed confidence as they enjoyed the lesson; Teachers encouraged students; Grouping contributes to improvement as students had the opportunity to work on each other's work; Students were more creative and descriptive in their thinking; Teachers find DI meaningless or useless; DI requires much effort, organization, preparation, and commitment;
(Burris, 2011) Mathematics, Reading	To explore teachers' practice of DI 2 teachers	Qualitative, case study Structured	Teachers utilized assessments in order to assess students' knowledge and then determine how to provide meaningful instruction

		interview, observations	Lack of time necessary for planning activities, the variety of ability levels in which they were challenged to provide instruction, and classroom management
(McQuarrie and McRae, 2010) Alberta, Canada	To explore DI practices	Qualitative Schools annual reports, focus group interviews	Effective differentiation begins with and is shaped by ongoing assessment for learning activities; Embedding differentiated practices into student learning takes time, even when excellent teacher learning is taking place Differentiation requires time, training, intentional planning and long-term commitment on the part of educators, government and wider school communities
(Servilio, 2009) Reading	To explore effective DI strategies in improving student engagement and achievement 24 students	Qualitative	Identify Student Needs and Learning Styles, Assess Current Achievement Select Research-based Strategies for Reading, Comprehension, and Personal Connection Differentiate Reading Material Provide Options for Student Choice
(Olah, 2008) College Preparatory Chemistry a high school in the northeastern United States	To investigate the practice of differentiated instruction for chemistry 17 students in grades ten and eleven	Qualitative; Field log, student survey, student interview, document analysis of student work,	Differentiating instruction according to student profile may increase academic achievement; Assessing student readiness is clearly crucial when designing meaningful instruction; support may increase student interest in a topic, and, in turn, student engagement.

5.2. Findings Related to Teacher Perceptions

Table 5 displays the summary of findings related to teachers' perceptions. These include the views, beliefs, perspectives, or attitude expressed by the participants in the existing studies. The findings related to teachers' perceptions also highlighted similar themes as discussed in the previous sections i.e. challenging, time, assessment of students, teaching behaviors, and attitude.

In a study exploring teachers' perceptions of differentiated instruction by Sabb-Cordes (2016), it was reported that teachers faced challenges in using the strategies. Maddox (2015) stated that differentiated instruction was challenging because teachers found materials were lacking and the need to provide for diverse learner needs.

Rodriguez (2012) highlighted that because of the immense amount of preparation time involved coupled with lack of resources, many teachers do not differentiate instruction in their classrooms. Robinson *et al.* (2014) reported that teachers require a lot of time to differentiate. Amadio (2014) echoed similar point that teachers might differentiate better with sufficient time.

Hung (2015) indicated in a study that learner needs are the key for differentiation. Teachers need to constantly assess students and adjust their instruction according to students' current achievement. Likewise, Robinson *et al.* (2014) reported that teachers differentiate based on student assessments. This is because every student is different and their success depends on the varied strategies used.

In the same study, Hung (2015) also revealed that teachers responded positively on their experience of differentiated instruction. It was reported that providing choice is the key for successful practice of differentiation.

Some other studies had found the effect of differentiated instruction on the attitudes. Wan (2015) revealed that teachers had positive attitudes towards differentiated instruction. However, because of insufficient class management skills and personal teaching beliefs, the implementation of differentiated instruction was in conflict. Hung (2015) also found that differentiated instruction improved student attitude towards learning as they were engaged in group work activities.

Table-5. Findings Pertaining to Teachers' Perceptions towards Differentiated Instruction

Studies; Subjects; Contexts	Objectives; Participants	Approaches; Instruments	Findings
(Sabb-Cordes, 2016) Reading South Carolina	To explore teachers' perceptions of DI 10 teachers	Qualitative, exploratory, case study Questionnaire, interviews	The teachers faced challenges using face-to-face instruction, including time management, planning, administrative support, and lack of professional development opportunities
Jin (2015) ESL, Reading Sg. Petani, Kedah, Malaysia	To investigate relationship between DI and students' readiness, interest and learning profiles; teachers' views on DI 2 English teachers 76 F3 students	Mixed methods, explanatory MI Excel Survey, observation, interviews	Time consuming; The used of DI in the classroom greatly improved students' interest to learn English.
Wan (2015) Overall (not stated)	To examine teachers' teaching beliefs toward DI	Mixed methods Adapted questionnaire of teacher efficacy, focus group interviews, and individual interviews	Positive attitudes toward DI; although class management and conflicts with personal teaching beliefs intervened implementation
(Hung, 2015) English language Taiwan	To investigate how students and teachers perceive differentiated instruction 1 teacher, 26 2nd graders	Mixed methods Self-developed interview questions, Self-designed 3-level Likert scale questionnaire to assess student perception on DI	Teacher and students reported positively on DI experience; students were generally satisfied with the role-play activity and being offered choices of tasks; students enjoyed the activities; providing a choice of tasks are the keys of a successful DI classroom; The need of each student is key for planning; Content and assessment is multi-leveled; DI improved students' learning attitudes as students engaged in activities and group work; The teacher constantly adjust their instruction based on students' performances in the assessment.
(Maddox, 2015) Mathematics	To explore how teachers define, familiarize, use, and perceive differentiation 12 elementary teachers (K5)	Qualitative Interview questions	Participants knew what differentiated instruction is and focused on student grouping to create differentiated classrooms; participants perceived differentiation as time consuming and challenging due to lack of materials and divers learners
(Hogan, 2014) Science	To explore teachers' perception on DI 5 teachers	Qualitative Interviews, observations, artifacts	Teachers experienced successes and difficulties in implementing DI
(Robinson <i>et al.</i> , 2014) Maths, Language Arts, reading, science, social studies, and AP physics.	To investigate teachers' perceptions and practice of DI 9 teachers of math, Language Arts, reading, science, social studies, and AP physics.	Qualitative, case study Surveys, interviews and document analysis (lesson plans)	Teachers differentiate, through assessment, process-grouping; Rationale to differentiate - each student is different and their successes are achieved through a variety of approaches Requires time to differentiate Assessment is one of the pieces that drives DI
(Amadio, 2014)	examine	Mixed methods,	Teachers would benefit from more time , more

Secondary mathematics a metropolitan school district in Minnesota	teachers' perceptions about the effectiveness of DI	explanatory Self-developed survey, teacher interviews	concise curriculum, and more professional development to effectively implement DI
(Burkett, 2013) Elementary subjects a school district in eastern Missouri	To explore the perceptions and lived experiences of teachers utilizing DI 11 elementary teachers	Qualitative Semi-structured interviews	Differentiated instruction is essential in an effective classroom ; differentiated instruction occurs naturally; in-service professional development influences differentiated instruction; early schooling influences differentiated instruction; pre-service professional development influences differentiated instruction; differentiated instruction is prevalent; classroom environment conducive to learning.
(Rodriguez, 2012)	To investigate teachers' knowledge of DI, their frequency, and factors that help or hinder the implementation	Quantitative,	Although the majority of the teachers are familiar with DI; however, because of their unfamiliarity of available tools, the immense amount of preparation time involved coupled with lack of resources, many teachers do not differentiate instruction in their classrooms.
(Caldwell, 2012)	To investigate teachers' perspectives i.e. teachers' attitude and efficacy toward willingness to practice DI 341 teachers who teach gifted learners	Quantitative Survey of Practices, Teachers' Sense of Efficacy Scale, Survey of Instructional Practices	Teachers' efficacy in DI influences their willingness to practice DI compared to teachers' attitudes
(Abbati, 2012) Mathematics	To investigate personal factors and organizational conditions that contribute to high implementation of DI	Qualitative, multi case study Observation, document analysis, journal and field notes, interview	DI requires: Willingness to forge ahead and overcome obstacles; Willingness to grow professionally and improve practice; Strong competency, capability, and confidence teaching the subject matter; Ability to implement complex instruction in a variety of situations

5.3. Findings Related to Student Achievement

Table 6 displays the summary of findings related to the impact of differentiated instruction on student achievement. The findings related to student achievement can be found in most of any studies investigating the practice of differentiated instruction. The findings however differ or vary depending on the research objectives. Some studies had found positive effect on student achievement while others negative.

Some studies had found significant increase in student achievement. According to Azah (2016), there was a significant improvement in the student performance of decoding and fluency skills i.e. in reading. Likewise, Behncke (2015) also generated a significant increase in the fluency scores in the student participants. In a quantitative study involving 374 students, (Muthomi and Mbugua, 2014) investigated the effectiveness of differentiated instruction on student achievement, and concluded that differentiated instruction improved student achievement.

Another pool of studies that examined student achievement had yielded results based on the **differences in** scores i.e. based on experimental studies involving experimental and control groups. Several studies had found that there was a significant difference between the students in the experimental group (received DI) and the students in the control group (Alavinia and Farhady, 2012; Osuafor and Okigbo, 2013) (Valiande and Tarman, 2011). However, quite a number of studies had generated contradicting results. These studies indicated that there was no significant difference between the achievement of students who received DI and those who did not (Gamble, 2011; Ruggiero, 2012). Additionally, according to Scott (2012), differentiated instruction did not have an impact on overall students' learning.

There were also studies that examined the association between differentiated instruction and student achievement (Corre, 2013; Mulder, 2014; Williams, 2012) Gorman (2011). A study conducted by Gorman (2011) found significant positive association between differentiated instruction and student achievement. However, most of the studies examining the association between differentiated instruction and student achievement post- Gorman (2011) revealed otherwise. Williams (2012) for example, revealed that there was no significant effect between differentiated instruction and students' results. Corre (2013) echoed that student achievement was not correlated to the use of DI. Most recently, Mulder (2014) reported that although differentiated instruction had no significant effect on student achievement, however, it was found in that study that the relationship between differentiated instruction and mathematics achievement was positive.

Table-6. Findings Pertaining to the Impact of Differentiated Instruction on Student Achievement

Studies; Subjects; Contexts	Objectives; Participants	Approaches; Instruments	Findings
(Azah, 2016) Language , reading skills Bukwai, Cameroon	To examine the effect of DI on student performance in reading skills 14 students	Mixed, quasi experimental Pretest, posttest, Interview, observation	There was a significant improvement on the student performance in decoding and fluency skills.
(Swaby, 2016) History St Elizabeth	To investigate the effect of DI on student academic performance; looking into relationship between DI & achievement 15 grade 9 th students	Mixed methods Learning Channel Preference questionnaire, attitude questionnaire, learning style questionnaire, diagnostic test of the subject content, Achievement tests, Observation	
Behncke (2015) Language , reading Western New York	To examine the effect of DI on students' reading progress 5 students	Mixed methods, explanatory case study Scott Foresman Reading Street Baseline Test, Aimsweb test, Developmental Spelling Assessment, Anecdotal records	There was a significant increase in the fluency scores of 4 out of the 5 students; Small group discussions improved students' reading and confidence in general; Students demonstrated willingness and eagerness to participate in small group work
Defrancesco (2015) Language , reading Anne Arundel County	To determine the impact of DI in reading on students without and with disabilities	Quantitative, quasi experimental County's Instructional Coaching Tool, Students' academic results	Students without disabilities continued to have higher scores in reading compared to students with disabilities
Altintas and Özdemir (2015) Mathematics Istanbul	To determine the effect of DI on the mathematics achievement of gifted and non-gifted students 57 gifted students, 60 non-gifted students	Quantitative Mathematics Achievement Test, Multiple Intelligences Domains Inventory	There was a significant increase in the achievement scores of the experimental students, in both gifted and non-gifted groups.

(Hung, 2015) Mathematics Netherlands	To investigate how students and teachers perceive differentiated instruction 24 teachers	Quantitative developed observation instrument based on theoretical framework and adapting ICALT (Van de Grift, 2007)	Differentiated instruction has no statistically significant effect on student mathematics achievement, which was against expectations. The relationship between differentiated instruction and mathematics achievement was positive, which means that the more the teacher differentiates, the higher the mathematics achievement of the students is.
(Aliakbari and Khales, 2014) Language, reading comprehension Ilam Institute, Iran	To investigate the effectiveness of DI (and traditional method) 47 elementary students	Quantitative, quasi experimental Pretest, posttest: One proficiency exam, one achievement test	Students from the experimental group outperformed the control group. Female students from the experimental group performed better than the males.
(Santisteban, 2014) Language; English and Spanish Bogota, Colombia	To examine the impact of DI on literacy (reading, writing) 15 students	Mixed methods Survey, interview, observation	Students had better results in reading comprehension than in writing;
(Muthomi and Mbugua, 2014) Mathematics Meru County, Kenya	To investigate the effectiveness of DI on student achievement 374 Form 3 students	Quantitative, quasi experimental Mathematics Achievement Test	DI significantly improved student achievement
(Mulder, 2014) Mathematics Netherlands	To measure DI in math lessons to determine what effect it has on student achievement 24 teachers	Quantitative developed observation instrument based on theoretical framework and adapting ICALT (Van de Grift, 2007)	Differentiated instruction has no statistically significant effect on student mathematics achievement; The relationship between differentiated instruction and mathematics achievement was positive, which means that the more the teacher differentiates, the higher the mathematics achievement of the students is.
(Corre, 2013) English language arts Los Angeles Basin	to examine the difference between differentiated instruction strategies used in two schools, and the difference between the student achievement teachers of 7th & 8th grade gifted students	Quantitative Questionnaire, utilizing Online Survey Monkey	No clear preference for differentiation, student achievement was not correlated to the use of DI
(Joseph <i>et al.</i> , 2013) Curriculum Studies	To examine the impact of DI; to determine the extent to which DI had a positive impact on students 219 undergrad students	mixed methods questionnaire, focus group discussions, teacher and student interviews, classroom observations, students' semester grades, and student reflections.	Students favoured DI, 90% had higher levels of growth and interest in the subject; Students demonstrated sound understanding of the concepts taught;
(Osuafor and Okigbo, 2013) Biology	To investigate the effect of DI on student achievement in Biology 67 students	Quantitative, quasi experimental Biology achievement test	There was a significant difference between students taught with DI and without.

(Ruggiero, 2012) English language arts New York State	To examine the effects of DI in gifted and talented programs on student achievement 30 4 th grade students, gifted and talented	Quantitative Standardized student achievement data	There was no significant difference between the achievement of students who did and did not receive DI approach; however, the achievement of students who received DI was slightly higher.
Scott (2012) Mathematics	To determine the effects of DI on student achievement 3 teachers, 75 students	Quantitative, quasi experimental Math assessments, pretest, posttest	DI did not have an impact on the students' learning in general; Neither male nor female students demonstrated greater achievement at a significant level i.e. DI does not benefit one gender over the other; DI benefits one ability level over the other.
(Williams, 2012) Mathematics Border of U.S. Mexico	To examine the effect of differentiated instruction on student achievement 891 7th grade students	Quantitative, quasi experimental Teaching Style Inventory (TSI), COS-R, Exam results	a significant effect was not present between student results and differentiated instruction
(Alavinia and Farhady, 2012) English Language Vocabulary Iran Language Institute, Urmia	To investigate the effects of DI on vocabulary learning 80 students	Quantitative Pretest, posttest of vocabulary achievement test	There was a significant difference between the achievement of the students from the experimental groups and the control groups.
(Valiande and Tarman, 2011) Language course	To examine the effect of DI on student achievement 479 students	Quantitative Evaluation of students' prior attainment and their educational progress via written tests, a literacy test and a test to determine students' comprehension level	statistically significant difference between students' achievement taught by DI and students that did not received DI; progress in the experimental group was significantly higher than the progress of the control group in the comprehension test
Gorman (2011) Mathematics, Language literacy Anytown Township School District	To determine the association between DI and student achievement i.e. whether DI had significant effect 203 students	Quantitative, quasi experimental Pretest, posttest [Employed descriptive and inferential stats]	There was a significantly positive association between DI and student achievement
(Gamble, 2011) Mathematics	To examine the effects of DI on student attitude and achievement 68 5 th grade students	Quantitative, quasi experimental Pretest and posttest (Measures of Academic Progress), attitude survey	There was no significant difference between the achievement of students taught using DI and traditional instruction; There was no significant difference in the achievement of students from different race and gender; There was no significant difference in student attitude toward maths (of confidence, value, motivation); There were significant differences in student attitude toward maths (of enjoyment)

(Brulles <i>et al.</i> , 2010) Mathematics Glendale, AZ	To examine the mathematics achievement of gifted students who received different grouping strategies i.e. clustered and non-clustered 772 gifted students	Quantitative	Gifted students in the cluster classes experienced greater academic growth Gifted students in the cluster classes demonstrated statistically significant and meaningful achievement growth regardless of their demographic (e.g. group, gender, ethnicity, ELL status, and grade level)
(Chamberlin and Powers, 2010) Mathematics	To investigate what impact does DI in a college mathematics class have on students' mathematical understanding 224 college students	Concurrent mixed methods Semi-structured interview questions, document analysis of student work, pre-test and post-test	The treatment group experienced higher growth in performance; providing lesson that "meet student needs will ultimately increase the retention of students" (p. 131). DI based on readiness, interest and learning profile led to enhanced achievement, study habits, social interaction, cooperation, attitude toward school, self-worth, motivation and engagement
(Schlag, 2009) Reading	To examine the relationship between DI of grouping and achievement in reading 130 5 th grade students	Quantitative, quasi experimental Standardized test results, Pre-test, post-test	DI significantly enhanced student achievement
(Hubbard, 2009) English language arts Yuba City, California	To investigate the effectiveness of DI among ELLearners	Exploratory mixed methods Observations, Weekly assessment (tests),	DI had greater positive influence on students' performance than teacher-centered instruction
(Koeze, 2007) Reading, ELA, Mathematics	To determine the effect of DI on student achievement	Mixed methods Test scores, Classroom observation, interviews	Providing choice and differentiation of interest contributes to student achievement and satisfaction in learning; Teachers should first administer a learning style inventory
(Tieso, 2001a) Mathematics New England	To investigate the effects of DI on mathematics achievement 31 grade 4/5 teachers, and their students	Quantitative Developed assessment/ test	Students in differentiated classroom demonstrate positive and significant gains in mathematics achievement; i.e. the treatment groups had significantly higher posttest means than the control groups. Suggests that students who received differentiated e.g. enhanced and revised curriculum can demonstrate gains in achievement

5.3 Findings Related to Impact on Students' Learning Outcomes

Table 7 displays the summary of findings related to the impact of differentiated instruction on students' learning outcomes. The themes of the findings yielded from the review of the existing studies are motivation, engagement, and attitude or interest. These studies reported that differentiated instruction had varied implications on students as reported based on their motivation, engagement, and attitude or interest towards the learning experience.

Some studies had revealed that differentiated instruction had impacted students motivationally (Berntsen, 2016; Meyad *et al.*, 2014); (Fenner *et al.*, 2010; Flaherty, 2010; Martin and Pickett, 2013); (Hyde, 2007); (Cheng, 2006). (Berntsen, 2016) for example, concluded in a study that providing choice in teaching motivated students towards

learning. In an experimental study, (Meyad *et al.*, 2014) reported that the students in the experimental group receiving DI were more motivated than the students in the control group. The study concluded that differentiated instruction is an effective approach in improving student motivation. Martin and Pickett (2013) revealed that the students participants in their study experienced changes in their motivation in learning. A study by Gamble (2011) however reported a slightly different finding. His finding indicated no significant difference in students' confidence, value, and motivation. Other studies reported increase in student motivation (Fenner *et al.*, 2010; Flaherty, 2010); (Hyde, 2007);(Cheng, 2006).

There are also studies that indicated student engagement as one of the impact of differentiated instruction (McCarty *et al.*, 2016; Moreno, 2015); (Martin and Pickett, 2013); (Decovsky, 2012); (Palmer and Maag, 2010a) (Olah, 2008; Santangelo and Tomlinson, 2009) (Hyde, 2007). McCarty *et al.*, (2016) and (Moreno, 2015) reported that differentiated instruction increased student engagement. Martin and Pickett (2013) stated that differentiated instruction positively changed students' perception of their engagement. In relation to this, (Decovsky, 2012) found that students' interest in learning was highly dependent on the activities provided. (Palmer and Maag, 2010a) concluded that differentiated instruction proved to be engaging the students in learning. Santangelo and Tomlinson (2009) mentioned this earlier that "the time, effort, and dedication required for effective differentiation is unequivocally worthwhile when the high level of student engagement and mastery are experienced" (p.320). Olah (2008) and Hyde (2007) also added that differentiated instruction not only increased academic achievement but also student engagement.

Some other studies had documented differentiated instruction affecting attitude. While some studies reported that students had positive attitude toward differentiated instruction (Chien, 2014); (Karadag and Yasar, 2010), and increased students' interest (Olah, 2008); (Cheng, 2006), (Gamble, 2011) however indicated that there was no significant difference in student attitude.

Table-7. Findings Pertaining to the Impact of Differentiated Instruction on Students' Learning Outcomes (Motivation, engagement, attitude, perception)

Studies; Subjects; Contexts	Objectives; Participants	Approaches; Instruments	Findings
(Berntsen, 2016) English Language Arts upstate New York	to investigate the effect of providing choice toward student engagement and motivation 21 3 rd grader students	Mixed methods Observations, anecdotal notes, pre and post surveys, interviews	Implementing choice encouraged group discussion and collaboration among students. Implementing choice motivated students to feel empowered by their learning.
(McCarty <i>et al.</i> , 2016)	To explore the practice of DI in higher education setting 26 faculty members of mixed subjects	Mixed methods Questionnaire, open-ended questions	Results indicated an encouraging degree of success, especially in technology integration, providing clear objectives and feedback to students, and enhanced student engagement.
(Moreno, 2015) English , listening comprehension	To explore effective DI strategies that contribute to students' learning ELL students		DI would raise students' interest and engagement in listening comprehension
(Chien, 2014) English class	To explore students' attitude toward DI approach 52 college students	Qualitative case study Students' projects, presentations, class evaluations, and powerpoint slides and syllabus	The students had a positive attitude toward DI
(Meyad <i>et al.</i> , 2014) Arabic Language Serdang, Malaysia	To investigate the effect of differentiated instruction on student motivation 100 Malaysian Form 4 students	Quantitative Instrumental questionnaire (Mori 2004); Motivational Strategies for Learning Questionnaire (MSLQ)	The experimental group was generally more motivated than the control group which proves that the DI is an effective approach in improving students' motivation towards studying the Arabic Language as a foreign language.

(Martin and Pickett, 2013) Mathematics	To investigate the effect of DI on student motivation and engagement 25 gifted students	Quantitative Student attitude survey	DI positively impacted changes in students' perception of their engagement and motivation
(Decovsky, 2012) High school science	To explore the effect of DI on students' interest 11 students, 3 teacher High school, gifted and talented students	Qualitative Interviews, document analysis of teaching materials and student work	Students' interest in learning was highly dependent on the activities provided
(Karadag and Yasar, 2010) Turkish course Turkey	To examine the effects of DI on student attitude toward Turkish course 5 th grade students	Mixed methods, explanatory Tukish Course Attitude Scale, Semi-structured interviews	DI influenced student attitude toward Turkish course positively.
(Gamble, 2011) Mathematics	To examine the effects of DI on student attitude and achievement 68 5 th grade students	Quantitative, quasi experimental Pretest and posstest (Measures of Academic Progress), attitude survey	There was no significant difference between the achievement of students taught using DI and traditional instruction; There was no significant difference in the achievement of students from different race and gender; There was no significant difference in student attitude toward maths (of confidence, value, motivation); There were significant differences in student attitude toward maths (of enjoyment)
(Fenner <i>et al.</i> , 2010) ESL, Science, Language Arts	To explore the effects of DI on student motivation 6 th , 7 th , and 8 th graders	Mixed methods Self-assessment motivation survey, Motivational behavior checklist, Pre and post motivation questionnaire	DI allowed students to be motivated Implementation of DI improved students' learning and increased student motivation.
(Flaherty, 2010) Reading	To explore the effects of DI on students' intrinsic motivational behaviors 4 th & 6 th grade elementary students	Mixed methods Classroom observations, Student motivation survey	DI increased student involvement and improvement in class participation, homework completion, group behaviours, leading to enhanced intrinsic motivation. Increase in academic achievement was also noted.
(Palmer and Maag, 2010a) Science Wisconsin	To determine the effect of DI on student learning, by investigating their perceptions of challenge and engagement in learning 66 8 th grade students	Mixed methods Interview, observations, questionnaire	DI is proven to be engaging and challenging the students in learning
(Reis and Boeve, 2009) Language, reading	To investigate the effectiveness of DI in reading 5 gifted and talented students	Mixed methods, comparative case studies Elementary Reading Attitude Survey, Pretest, posttest of oral reading assessment, The Scales for Rating the Behavioral	Although students' reading fluency improved, they were frustrated with higher level of reading task. Encouragement enabled the students to be able to read higher level materials.

		Characteristics of Superior Students-Reading, The Reading Interest-analyzer	
(Santangelo and Tomlinson, 2009) Education and Psychology of Exceptional Learners Course	Evaluated the effectiveness of differentiated instruction in an introductory graduate-level course 25 introductory graduate level students	Mixed methods Student Instructional Report (SIR) II, Semi-structured survey questions	differentiated instruction had a “positive and meaningful impact on student learning” (p. 316), Also found that preparing for and conducting a course using differentiated instruction was more intensive. Yet, “the time, effort, and dedication required for effective differentiation is unequivocally worthwhile when the high level of student engagement and mastery are experienced” (p. 320).
(Danzi <i>et al.</i> , 2008) Mathematics, Science, English/language arts, Social science	To investigate the effects of DI on students’ academic motivation 72 3 rd , 5 th , 8 th grade students	Mixed methods Parent survey, student survey, observation checklist	Pre-Di intervention: Students spoke positively about school, Half of the student participants felt bored in learning, distracted; however, some students felt excited distracted while few felt excited, and others felt the learning was not challenging. Post-DI intervention: Fewer students felt distracted, more students felt bored, fewer were excited about school. Although, off-task behaviors decreased
(Olah, 2008) College Preparatory Chemistry a high school in the northeastern United States	To investigate the practice of differentiated instruction for chemistry 17 students in grades ten and eleven	Qualitative; Field log, student survey, student interview, document analysis of student work,	Differentiating instruction according to student profile may increase academic achievement; Assessing student readiness is clearly crucial when designing meaningful instruction; support may increase student interest in a topic, and, in turn, student engagement.
(Hyde, 2007) Portland, Oregon	To investigate the effects of DI on student engagement and motivation 24 students, 6 gifted and talented students	Mixed methods Student and parent interviews, motivation surveys, observations	There was a slight increase in student engagement and motivation, The need to plan curriculum that meets students’ interest and learning style is emphasized
(Cheng, 2006) English Reading Course Taiwan	To examine the effect of differentiated instruction in teaching English as a Foreign Language 89 students	Quantitative, quasi experimental Adapted Language Learning Motivation Scale (Schmidt et al., 1999); Adapted Foreign Language Classroom Anxiety Scale (Horwitz et al., 1986)	DI increased student motivation and interest; When content, process, product are differentiated according to students' readiness, interest and learning profile, English learning is more interesting and creates higher motivation; DI did not produce significant decrease in anxiety level.

6. Discussion and Conclusion

The discussion on the current researches of differentiated instruction above has unfolded the perspectives within the realm of the current researches investigating the practice of differentiated instruction. This paper revealed that studies investigating the practice of differentiated instruction have some common features despite differences in terms of the research contexts as well as the research objectives and methods of inquiry. As a whole, this review concludes that differentiated instruction, despite continues to be challenging for teachers, is deemed pertinent as a pedagogy that it encompasses the elements that are required of teachers to apply in their preparation for a differentiated lesson; that it benefits and applicable not only to a particular group or type of learners as well as academic subject areas. Thus, continuous researches should be undertaken to explore differentiated instruction in order to benefit both the teachers and students.

To sum up, much of the research contribution came from the international contexts, with most of the studies came from the American continent while very few studies came from other parts of the world such as Asia, European, Africa and the Arab countries. Likewise, only few studies were found for the South East Asia region indicating that more researches are definitely needed in this particular part of the world.

These existing studies had focused on several subject areas such as languages, mathematics, and science while some others had explored the practice of differentiated instruction in two or more subjects. Most of the contribution however came from the studies investigating the practice of differentiated instruction in mathematics and reading. More studies are needed in exploring the practice of differentiated instruction in the teaching and learning of English language as well as on other subject areas such as sciences.

Although the existing studies had attempted exploring the practice of differentiated instruction with various research objectives and approaches, few studies had employed exploratory mixed methods, and focused on teachers. Most of the research objectives of these studies varied; ranging from investigating teaching and learning outcomes such as achievement, motivation, engagement, attitude, teachers' perceptions, to teachers' practice. These studies, thus, indicate the 'post-pedagogical impact' on students, revealing either positive or negative effects as well as the difficulties posed by the teaching approach i.e. differentiated instruction. This explains the lack of studies focusing on the actual teaching scenario in the classroom i.e. the *how-to* that documenting the actual differentiation strategies employed by teachers. Thus, a study that focuses on investigating teachers' practice of differentiated instruction would be very beneficial – not only in explaining its relative impact on students' learning outcomes (as revealed in the existing studies) – but also would be able to highlight at which juncture of its implementation is the most appropriate and at which requires improvement.

The inadequacy of such research focusing on teachers' implementation of differentiated instruction may be due to the unavailability of specific or related research instrument to gather data for related studies investigating differentiated instruction. This review found that no specific research instrument was employed, or developed, for a particular research objective exploring the practice of differentiated instruction. For example, most of the studies investigating students' motivation accumulated the data based on teachers' perceptions towards the students. A self-checked questionnaire would be very useful and convenient to be used in that kind of study. Thus, a specific questionnaire measuring students' motivational perspective towards differentiated teaching would provide greater impact in the field of differentiated instruction and its practice.

On that note, future researches in differentiated instruction should explore the relationship between differentiated instruction as practiced by the teachers, and examine its impact on students' learning outcomes e.g. motivation or achievement, through exploratory mixed methods approach, guided by appropriate educational theories and differentiation model.

Acknowledgement

This research was supported by the research grant FRGS/1/2017/SSI01/UKM/01/1

References

- Abbati, D. G. (2012). Differentiated instruction, understanding the personal factors and organizational conditions that facilitate differentiated instruction in elementary mathematics classrooms, a dissertation submitted in partial satisfaction of the requirements for the degree of doctor of education in the graduate division of the university of california at berkeley committee.
- Alavinia, P. and Farhady, S. (2012). Using differentiated instruction to teach vocabulary in mixed ability classes with a focus on multiple intelligences and learning styles. *International Journal of Applied Science and Technology*, 2(4): 72–82.
- Aliakbari, M. and Khales, H. J. (2014). Impact of differentiated instruction strategies and traditional-based instruction on the reading comprehension of iranian efl students. *Research in Applied Linguistics*, 5(1): 109–29.
- Altintas, E. and Özdemir, A. S. (2015). The effect of the developed differentiation approach on the achievements of the students. *Eurasian Journal of Educational Research*, 61: 199–216.
- Amadio, R. (2014). Differentiated Instruction in Secondary Mathematics.
- Ann, E. and Sizemore, K. (2015). A phenomenological study of differentiated instruction.
- Azah, A. J. (2016). Effect of differentiated instruction on the fluency and decoding skills of children with English language reading problems. *A Case Study of Primary Four Pupils of Government School*, 3(8): 28–49.

- Baumgartner, T., Lipowski, M. B. and Rush, C. (2003). Increasing reading achievement of primary and middle school students through differentiated instruction.
- Behncke, M. (2015). *Higher levels of differentiation in reading instruction, A potential framework*. State University of New York. http://digitalcommons.brockport.edu/ehd_theses
- Berntsen, N. M. (2016). *Using choice to promote intrinsic motivation within students during their literacy activities*. State University of New York. Available: http://digitalcommons.brockport.edu/ehd_theses
- Borja, L. A., Soto, S. T. and Sanchez, T. X. (2015). Differentiating Instruction for EFL Learners. 5(8): 30–36.
- Brimfield, R., Masci, F. and DeFiore, D. (2002). Differentiating instruction to teach all learners. *Middle School Journal*, 33: 14–18.
- Brulles, D. and Winebrenner, S. (2012). Clustered for success. *Educational Leadership*, 69(5): 41–45.
- Brulles, D., Saunders, R. and Cohn, S. J. (2010). Improving performance for gifted students in a cluster grouping model. *Journal for the Education of the Gifted*, 34(2): 327–50.
- Burkett, J. A. N. N. (2013).
- Burris, L. A. (2011). A Case study of Differentiated Instruction in Upper Elementary Mathematics and Reading Classroom 176.
- Caldwell, D. W. (2012). *Educating gifted students in the regular classroom, Efficacy , Attitudes , And differentiation of instruction*. Georgia Southern University. Available <http://digitalcommons.georgiasouthern.edu/etd>
- Chamberlin, M. and Powers, R. (2010). The promise of differentiated instruction for enhancing the mathematical understandings of college students. *Teaching Mathematics and its Applications*, 29(3): 113–39.
- Cheng, A.-C. (2006). Effects of differentiated curriculum and instruction on Taiwanese EFL students' motivation, anxiety and interest. Available: http://search.proquest.com/docview/304968996?accountid=14548%5Cnhttp://metadata.lib.hku.hk/hku?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+&+theses&sid=ProQ:ProQuest+Dissertations+&+Theses+A&I&atitle=&title=Eff.
- Chien, C.-W. (2014). College students' attitude toward and learning of differentiated instruction in products. *Journal of English Language and Literature*, 1(2): 26–37. Available: <http://www.jellonline.com/index.php/jell/article/view/1200000019>
- Chien, C.-W. (2015). Analysis of taiwanese elementary school english teachers' perceptions of designs and knowledge constructed about differentiated instruction in content. *Cogent Education*, 2(1): 270–81.
- Corre, M. K.-L. (2013). *Meeting the needs of gifted and talented (gate) middle school students in two southern California public school districts*. Argosy University Inland Empire.
- Danzi, J., Reul, K. and Smith, R. (2008). Improving student motivation in mixed ability classrooms using differentiated instruction. *Online Submission*: 81.
- Decovsky, M. (2012). *The effects of differentiated instruction on the interests of talented students in high school science classes. School science and mathematics. Graduate school of natural sciences*. Utrecht University.
- Defrancesco, M. A. (2015). *Effects of classroom setting and instructional practices on academic performance*. Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Edwards, R. A. (2007). *Differentiating instruction for gifted students in the english/language arts classroom*. The University of Georgia.
- Fenner, D., Mansour, S. K. and Sydor, N. (2010). *The effects of differentiation and motivation on students' performance*. Saint Xavier University. 1–150.
- Flaherty, S. (2010). *Exploring the effects of differentiated instruction and cooperative learning on the intrinsic motivational behaviors of elementary reading students*. Saint Xavier University. 1–52.
- Gamble, V. (2011). *The impact of differentiated versus traditional instruction on math achievement and student attitudes* Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Geisler, J. L., Hessler, T., Gardner, R. and Lovelace, T. S. (2009). Differentiated writing interventions for high-achieving Urban African American elementary students. *Journal of Advanced Academics*, 20(2): 214–47.
- Gentry, R., Sallie, A. and Sanders, C., 2013. "Differentiated instructional strategies to accommodate students with varying needs and learning styles." In *The Urban Education Conference, Hlm. Jackson State University*. pp. 1–21.
- Ghyzel, A. W. (2015). *Enhancing reading comprehension in students with disabilities through differentiated instruction*. State University of New York. http://digitalcommons.brockport.edu/ehd_theses
- Gorman, J. (2011). *The association between grades pre k-12 student achievement and differentiated instructional strategies in the anytown township school district explored through units of study*. Rowan University. <http://rdw.rowan.edu/etd>
- Hackenberg, A. J., Creager, M., Eker, A. and Lee, M. Y., 2016. "Understanding How to Differentiate Instruction for Middle School Students." In *Nctm Research Conference, Hlm. .* pp. 1–28.
- Heacox, D. (2009). *Making differentiation a Habit, How to ensure success in academically diverse classrooms*. Free Spirit Publishing Inc. www.freespirit.com
- Hogan, M. R. (2014). *Differentiated instruction in a standards-based middle school science classroom*. Walden University.
- Hubbard, D. A. (2009). A study of the impact of differentiated instruction for English language learners at the secondary level with a focus on gender.
- Hung, Y. (2015). International. *TESOL International Journal*, 10(2).

- Hyde, K. A. C. (2007). One size may not fit all, but the right teaching strategies might, The effects of differentiated instruction on the motivation of talented and gifted students. *Differentiation*. 1–35.
- Jin, E. A. W. N. (2015). *Teachers' practices of using differentiated reading instruction in esl classroom*. Wawasan Open University.
- Joseph, S., Thomas, M., Simonette, G. and Ramsook, L. (2013). The impact of differentiated instruction in a teacher education setting, Successes and challenges. *International Journal of Higher Education*, 2(3): 28–40.
- Karadag, R. and Yasar, S. (2010). Effects of differentiated instruction on students' attitudes towards Turkish courses: an action research. *Procedia-Social and Behavioral Sciences*, 9: 1394–99.
- Koeze, P. A. (2007). *Differentiated instruction, The effect on student achievement in an elementary school*. Eastern Michigan University. <http://commons.emich.edu/theses>
- Langley, M. L. (2015). *Secondary English Teachers' Perceptions of differentiated instruction for limited English proficient students*. Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Lauder, B. L. (2011). *Supporting gifted students in the regular education elementary classroom through differentiated instruction*. Bowling Green State University.
- Lawrence-Brown, D. (2004). Differentiated instruction, Inclusive strategies for standards-based learning that benefit the whole class. *American Secondary Education*, 32(3): 34–62. Available: <http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=def73189-e639-40df-85ff-9f9b6a621bc1%40sessionmgr101&vid=3&hid=123>
- Least, S. K. (2014). *Differentiated Instruction, Its effect on proximal development*. State University of New York. http://digitalcommons.brockport.edu/ehd_theses
- Logan, M. N. (2011). *An examination of attitudes and actions of regular classroom and gifted teachers toward differentiating for gifted learners involved in a pull-out gifted program*. The University of Mississippi.
- Maddox, C. (2015). *Elementary (K-5) Teachers' Perceptions of differentiated instruction*. Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Martin, M. and Pickett, M. (2013). *The effects of differentiated instruction on motivation and engagement in Fifth-Grade gifted math and music students*. Online submission. Saint Xavier University.
- McCarthy, B. and McCarthy, D. (2006). *Teaching around the 4MAT® cycle, Designing instruction for diverse learners with diverse learning styles*. Corwin Press.
- McCarty, W., Crow, S. R., Mims, G. A., Potthoff, D. E. and Harvey, J. S. (2016). Renewing teaching practices, Differentiated instruction in the college classroom. *Journal of Curriculum, Teaching, Learning, and Leadership in Education*, 1(1): 35–44. Available: <http://digitalcommons.unomaha.edu/ctlle>
- McQuarrie, L. M. and McRae, P. (2010). A provincial perspective on differentiated instruction, The Alberta Initiative for School Improvement (AIS). *Journal of Applied Research on Learning*. *Journal of Applied Research on Learning*, 3(4): 1–18.
- Meyad, N. A., Roslan, S., Abdullah, M. C. and Maming, P. H. (2014). Method in teaching arabic language council for innovative research. *Journal of Social Sciences Research*, 5(1): 671–78.
- Moreno, S. (2015). *Di erentiated instruction , Strategies for English language learners listening comprehension development*. Bridgewater State University. <http://vc.bridgew.edu/theses>
- Mulder, Q. (2014). *The effect of differentiated instruction on student mathematics achievement in primary school classrooms*. University of Twente.
- Muthomi, M. W. and Mbugua, Z. K. (2014). Effectiveness of differentiated instruction on secondary school students achievement in mathematics. *International Journal of Applied Science and Technology*, 4(1): 116–22.
- Olah (2006). Esl learning strategies, motivation, And proficiency, A comparative study of university and high school students in japan. *文京学院大学人間学部研究紀要*, 8(1): 189-205.
- Olah (2008). *Increasing student achievement and motivation by differentiating instruction in an inclusive high school chemistry classroom*. Moravian College.
- Osuafor, A. M. and Okigbo, E. C. (2013). Effect of differentiated instruction on the academic achievement of Nigerian secondary school biology students. *Educational Research*, 4(7): 555–60.
- Oswald, B. A. (2016a). *Differentiation for content area literacy, Middle school teachers' perceptions and practices*. Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Oswald, B. A. (2016b). *Differentiation for content area literacy, Middle school teachers perceptions and practices*. Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Palmer, T. and Maag, M. (2010a). *Differentiating instruction to challenge all students*. University of Wisconsin Oshkosh.
- Powers, E. A. (2008). The use of independent study as a viable differentiation technique for gifted learners in the regular classroo. *Gifted Child Today*, 31(3): 57–65.
- Reis, S. M. and Boeve, H. (2009). How academically gifted elementary, urban students respond to challenge in an enriched, differentiated reading program. *Journal for the Education of the Gifted*, 33(2): 203–40.
- Renkema, T. F., 2014. "Implementing differentiated instruction in the classroom teresa f .Renkema kuyper college expanding our perspectives " In *From the Classroom to the Community Michigan Teachers of English to Speakers of Other Languages Conference*. Dlm. Woyciehowicz (pnyt.) & Losey (pnyt.). *Expanding our Perspective, From the Classroom to the Community*,. Grand Rapids, Michigan. pp. 82–91.
- Robinson, L., Maldonado, N. and Whaley, J. (2014). Perceptions about implementation of differentiated instruction. 1–22. Available: <http://files.eric.ed.gov/fulltext/ED554312.pdf>

- Rock, M. L., Gregg, M., Ellis, E. and Gable, R. A. (2008). REACH, A framework for differentiating classroom instruction, alternative education for children and youth. *Preventing School Failure*, 52(2): 31–47.
- Rodriguez, A. (2012). *An analysis of elementary school teachers' knowledge and use of differentiated instruction*. Olivet Nazarene University. http://digitalcommons.olivet.edu/edd_diss
- Ruggiero, M. J. (2012). *Effects of gifted and talented programs on standardized test scores of fourth grade students in two school districts*. State University of New York.
- Sabb-Cordes, M. L. (2016). *Teachers' Perceptions of differentiated learning for at-risk second-grade students in reading*. Walden University.
- Santangelo, T. and Tomlinson, C. A. (2009). The application of differentiated instruction in postsecondary environments, Benefits, Challenges, And future direction. *International Journal of Teaching and Learning in Higher Education*, 20(3): 307–23. Available: <http://www.isetl.org/ijtlhe/>
- Santisteban, L. N. (2014). The effects of differentiated instruction on the literacy process of learners with interrupted schooling. *Gist Education and Learning Research Journal*, 9(9): 31–49. Available: <http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=101135115&lang=es&site=ehost-live>
- Schlag, G. E. H. (2009). *The relationship between flexible reading groups and reading achievement in elementary school students*. Walden University. <http://scholarworks.waldenu.edu/dissertations>
- Scott, B. E. (2012). *The effectiveness of differentiated instruction in the Elementary Mathematics classroom*. Ball State University.
- Servilio, K. L. (2009). You get to choose! motivating students to read through differentiated instruction. *Teaching Exceptional Children Plus*, 5(5): 10.
- Sizemore, E. A. K. (2015). *A phenomenological study of differentiated instruction for fifth grade gifted and high ability learners through math in focus*. Liberty University.
- Skinner, E. A. and Belmont, M. J. (1993). Motivation in the classroom, Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of educational psychology*, 85(4): 571.
- Swaby, T. D. (2016). *The effects of differentiated instruction by learning styles on the academic performance of a set of mixed ability grade nine History students in a High School in St Elizabeth*. Bethlehem Moravian College.
- Tieso, C. (2001a). Curriculum, Broad brushstrokes or paint-by-the-numbers? *The Teacher Educator*, 36(3): 199–213.
- Tieso, C. (2001b). Curriculum, Broad brushstrokes or paint-by-the-numbers. *The Teacher Educator*, 36(3): 199–213.
- Tramonto, S. A. (2013). *Differentiation in the elementary school reading program and student achievement*. State University of New York. http://digitalcommons.brockport.edu/ehd_theses
- Valiande, S. and Tarman, B. (2011). Differentiated teaching and constructive learning approach by the implementation of ict in mixed ability classroom. *The 4th International Computer And Instructional Technologies Symposium, Hlm*, 12: 169–84.
- Wallis, K. (2015). Instructional practices of english as second language teachers. Walden University: Available: <http://scholarworks.waldenu.edu/dissertations>
- Wan, S. W.-Y. (2015). Differentiated instruction, Hong kong prospective teachers' teaching efficacy and beliefs. *Teachers and Teaching*, 22(2): 148–76.
- White, S. E. (2013). The aquila digital community differentiating instruction for gifted learners in the regular classroom a quick-reference guide for teachers. Available: http://aquila.usm.edu/honors_theses
- Williams, K. G. (2012). *The effect of differentiated instruction on standardized assessment performance of students in the middle school mathematics classroom*. Liberty University.
- Yamat, H., Alias, A., Yassin, S. F. M., Majid, R. A., Yaakub, A. and Hamidi, A. (2011). Supporting differentiated instruction through the, Crafting the essay, enrichment course. *World Applied Sciences Journal (Special Issue of Innovation and Pedagogy for Diverse Learners)*, 14: 6–10.