VIRTUAL DIFFERENTIATED INSTRUCTION AND ITS IMPLEMENTATION IN MANDARIN TEACHING: A REVIEW

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ABSTRACT

Differentiated instruction, also known as differentiated learning, is a teaching philosophy that considers the needs of all students, including when they are in a virtual learning environment. Virtual strategies and differentiated instruction could be tailored to every learner's needs and are more convincing than the traditional "one-size-fits-all" approach to teaching. Virtual differentiated instruction shows concerns about students' existence, encouraging engagement while fulfilling the needs of high-performance students. However, there is little information regarding the application of virtual differentiated instruction by teachers. Besides, teachers might not regularly adapt instruction to students' specific characteristics. Hence, this research intends to determine the status of differentiated instruction's implementation in Mandarin virtual learning. The review demonstrates that educators are aware of the existence and importance of differentiated instruction. The practice of differentiated instruction is growing among Mandarin educators, with voices urging for proper training and guidance for its realisation. Of late, Mandarin researchers have been focusing on technology-enhanced learning. Scholars have directly or indirectly been applying the differentiated instruction approach in their teaching practices, with positive impacts on students' learning. Nevertheless, some discrepancies need

to be considered in ensuring its success. An understanding of differentiated instruction in Mandarin virtual classes can help instructors adopt the approach efficiently with attuned strategies to cater to students' diversity. It could also provide ideas to other educators in differentiating their teaching strategies towards enhancing students' learning performances.

1.0 INTRODUCTION

The use of smart technology has increased dramatically in the education sector. The integration of advanced technology provides alternatives to educators on ways to boost students' learning. Technology-enhanced instruction can be adapted to various learning styles to provide long lasting experiences. Lindner, Alnahdi, Wahl, and Schwab (2019) found that the emerging smart online invention offers educators various alternatives for the implementation of differentiated instruction (sometimes referred to as differentiated learning or differentiation) to achieve learning goals. Virtual strategies and differentiated instruction could be tailored to each student's needs and are more convincing than the traditional "one-size-fits-all" approach to teaching. With conventional teaching methods, struggling students may have to practice skills that are too difficult for them. At the same time, high-performing students may be forced to practice the skills they already know (Tomlinson et al., 2003). Indeed, the differentiated instruction approach ensures students' engagement and safeguards the interest of high-performing students. However, there is little information regarding online instruction's efficacy (Beck & Beasley, 2020) and how differentiated instruction is accomplished in classrooms (James & Kang, 2009). In many countries, teachers have not adapted their instruction to meet each student's needs (Schleicher, 2016). Hence, there is a need to better understand the effectiveness of its practices. Thus, this paper focuses on the distinct practices of Mandarin instruction as a foreign language with the following research question:

> To what extent is virtual differentiated instruction put into practice in Mandarin teaching and learning as a foreign language?

2.0 CONCEPTUALIZING DIFFERENTIATED INSTRUCTION

Differentiated instruction, also known as differentiated learning, is a teaching philosophy that considers the needs of all students, including when they are in a virtual learning environment. Lee, Yeung, and Ip (2016) discovered that differentiated instruction allows students to discover their learning styles and optimise their learning. Technology-based teaching has become the trend in providing engaging learning. Baron, Hogan, Schechter, Hook, and Brooke (2019) found that advanced technology programmes have effectively improved most readers' profiles through online instruction. These findings help to inform the best educational practices that can efficiently identify effective interventions for all students. Therefore, knowledge of virtual differentiated instruction is essential. According to Tomlinson (2000), differentiation means tailoring instruction to meet individual needs. Whether teachers differentiate content, process, products, or the learning environment, the use of ongoing assessment and flexible grouping makes this a successful approach to instruction.

In an investigation on the implementation of differentiated instruction in Chinese societies in China, Hong Kong, and Taiwan, Wan (2019) posited two dimensions for understanding differentiated instruction: the pragmatic dimension and the philosophical dimension. First, the pragmatic dimension involves gaining a basic understanding of differentiated instruction routines, developing classroom routines, and classroom management strategies that can facilitate respectful learning tasks. Teachers must consider how to respond to learners with different characteristics through differentiated instruction and planning and organising curricula. Instruction can be differentiated to fit students' different interests, abilities, and learning styles (Tomlinson et al., 2003). Second, under the philosophical dimension, the humanistic method of instruction is grounded on the humanist philosophy. It represents an inclusive and loving learning environment that accommodates each student's unique diversity. The study describes a fundamental paradigm change from behaviourism to constructivism. The idea of differentiation in instruction focuses on student-centred teaching and an active learning orientation. Differentiated instruction focuses on individual differences to determine how to deliver content effectively. Students decide at their own pace and ability and take responsibility for the learning processes.

According to Bosker (2005), there are two types of differentiation. First, convergent differentiation refers to the educators who want to increase the educational performance of low-performing students, and they should focus more on helping them. Second, divergent differentiation caters for teachers who aim for equity by applying an equal measure to all students and allowing for diverse learning goals achieved, durations used, and results

generated. For a further understanding of differentiated instruction, Smale-Jacobse, Meijer, Helms-Lorenz, and Maulana (2019) provided two aspects of differentiated instruction in the classroom, as shown in Table 1. The first aspect, pedagogy and didactics, is concerned with what and how teachers use the teaching techniques and methods to actualise differentiated instruction. The second aspect, organisational, entails the structure embedded in instruction. Differentiated instruction can accommodate both the homogeneous clustering and heterogenous clustering of students.

Table 1: Aspects of differentiated instruction

Pedagogy and didactics	Organisational
The teacher offers students various differentiations to address students' learning needs (Tomlinson, 2014): • adapted content, • various learning process options, • different assessments, • adapting the learning environment	**Homogeneous Clustering** Teachers may organise their students using some form of homogeneous clustering such as interest or readiness (Corno, 2008) as below. • fixed grouping of students • flexible grouping of students
Coubergs, Struyven, Engels, Cools, and De Martelaer, (2013) suggested teachers may also offer individual students: • Various length of time to learn. • The motivation the high-performance learners to speed in their learning process. Also, Smets and Struyven (2018) suggested that teachers may use mentioned differentiations to cater to students' needs: • pre-teaching • extended instruction • Adapt instructions throughout the lesson.	**Heterogeneous Grouping** Teachers may organise their students using heterogeneous grouping, including differentiation of the learning process (Coubergs et al., 2013) as stated: • Students divide tasks among them in the group follow their learning interests or skills. • A teacher may suggest a different task or support based on the assessment requirement. • Individual students work at their level, called individualisation (Education Endowment Foundation, n.d.).

2.1 Crucial Behaviours Influencing the Implementation of Differentiated Instruction

Literature reveals many crucial factors that influence the implementation of differentiated instruction, as summarised in Table 2. To ensure an effectiveness implementation of differentiated instruction, educators need to adopt a selection of crucial behaviours such as continuous monitoring and formative assessment, frequent assessments and flexible

adaptations, pre-lesson preparation, creating a safe and stimulating context, questioning methods, as well as explaining, and giving examples.

Table 2: Crucial behaviours of differentiated instruction

Crucial Behaviours
• They are continually **monitoring** and **assessment** (formative) (Tomlinson, 2014; Denessen & Douglas, 2015).
• Frequent assessment and flexible **adaptations** (Smale-Jacobse et al., 2019)
• **Pre-lesson**- clear goals, pre-assessment, plan adaptive instruction, and teachers should evaluate students' progress after the lesson (Van Geel et al., 2019).
• Designing a secure and encouraging learning **environment** (Tomlinson, 2014), **Classroom management** (Tomlinson, 2014)
• Differentiated **the way** of giving examples, questioning, or explaining the lesson content (Smale-Jacobse et al., 2019)

2.2 Specific Operationalisations of Differentiated Instruction

In addition to understanding the definitions of differentiated instruction and the crucial behaviours involved, operational terms are another way to understand the process of differentiated instruction deeply. According to Smale-Jacobse et al. (2019), differentiated instruction has some specific operationalisations including ability grouping, tiering, heterogeneous grouping, individualised instruction, and group-based mastery learning.

One form of operationalisation that is often reviewed is *ability grouping*. Teachers group and classify students according to criteria such as ability and readiness. Tieso (2003) suggested that grouping can be helpful if teachers can adapt their instruction to different groups' needs. Steenbergen-Hu, Makel, and Olszewski-Kubilius (2016) determined that all ability groups were equally effective in the classroom. However, the study's findings about differences in effectiveness remain inconclusive. The *tiering* of a programme entails using the same curriculum material for all learners but tailoring the depth of content, the learning activity process, and the type of product developed by the student to each learner's readiness, interest, or learning style (Richards & Omdal, 2007). Teachers include special features or variations in the learning process, task, or product. Students are rated by their performance. *Heterogeneous* grouping is a way to differentiate instruction for grades and courses. Students of varying backgrounds working together can see how knowledge differs from their own and how others make mistakes (Nokes-Malach, Richey, & Gadgil, 2015). *Mastery-based learning* positively impacts students' academic outcomes (Kulik, Kulik, & Bangert-Drowns, 1990; Hattie, 2009).

It is the most effective teaching methodology but does not provide well-rounded skills training (Slavin, 1990). Finally, *individualisation* may have a small effect on student achievement (Hattie, 2009). The primary function of ICT-based education is in individualising instruction. Studies have found that adaptive methods of teaching can positively impact student performance (Kulik & Fletcher, 2016; Shute & Rahimi, 2017). Thus, these areas of specific operationalisations that involve ability grouping, tiering, heterogeneous grouping, individualised instruction, and group-based mastery learning should be emphasised in applying differentiated instruction.

2.3 Strategies, Model, and framework of Differentiated Instruction

It is essential to investigate the strategies, model, and framework for differentiated instruction in ensuring its effective implementation. Previous studies show that among the models or strategies used by practitioners are group-based mastery learning, flipped classroom models, problem-based learning, and peer tutoring (Coubergs et al., 2013; Altemueller & Lindquist, 2017). Meanwhile, micro-adaptation refers to spontaneous, unexpected adaptations to students' needs (Corno, 2008).

One of the well-known frameworks is the differentiated instruction model proposed by Tomlinson (2014), which is shown in Figure 1. This model is based on effective educational practice framed around six critical elements: respectful tasks, high-quality curriculum, and teaching up, flexible grouping, continual assessment, and building community.
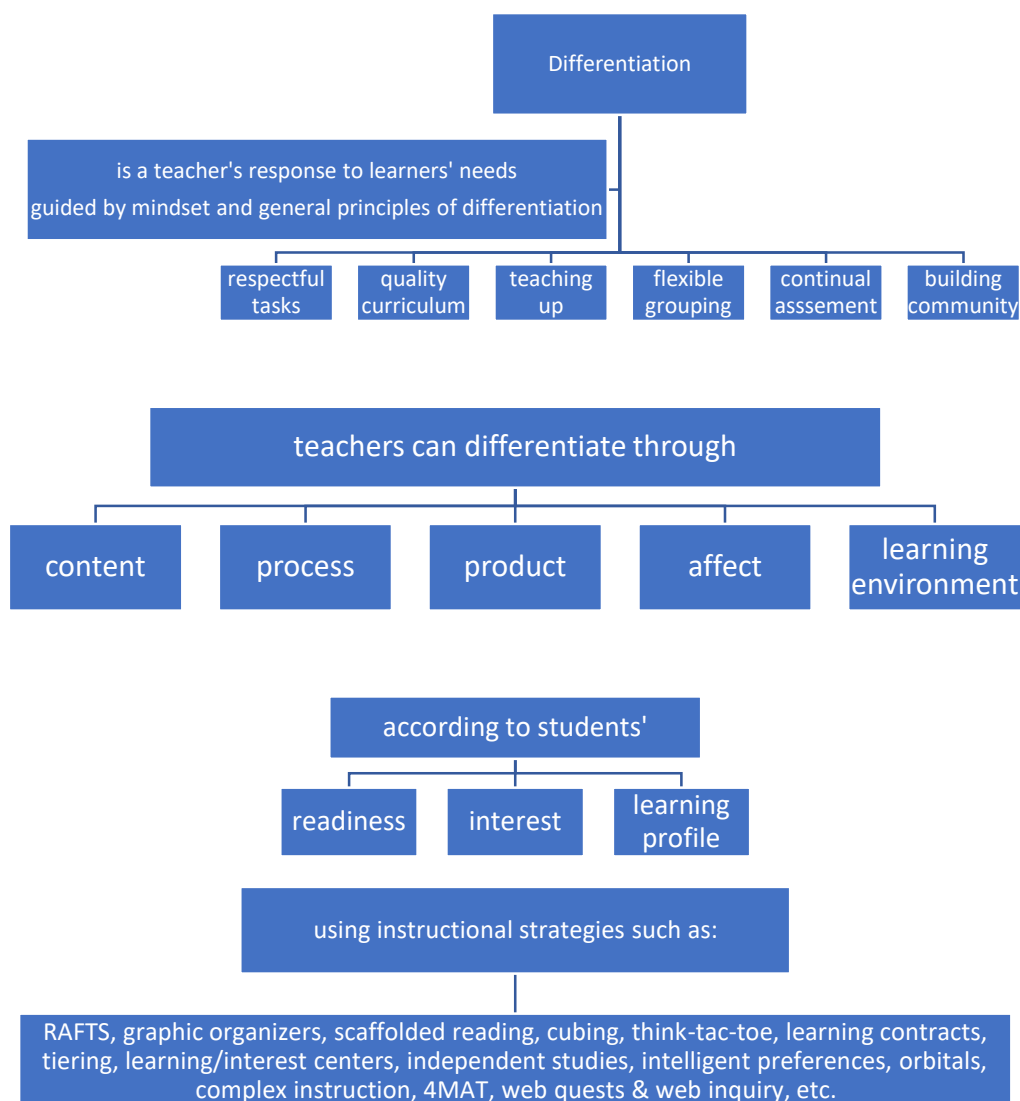
Figure 1: Differentiated instruction model (Tomlinson, 2014)

As shown in Figure 1, differentiation entails approachable teaching rather than a one-size-fits all teaching (Tomlinson, 2014). It means that teachers proactively intend to work differently to deliver what students need to learn as effectively as possible (Tomlinson, 2014).

Developing *quality curriculum* means planning activities that address all students' needs and learning preferences. It engages students to explore essential ideas and develop skills and attitudes. Next, the teacher uses *assessment* to group students at the beginning of the lesson. During the lesson, continuous assessments enable the teacher to adjust and plan appropriately for the next steps, activities, lesson, or class. At the end of the topic, summative assessments allow students to demonstrate what they have learned. The teacher should ensure the *tasks* given are respectful, meaning that they are challenging, engaging, and worth doing. In a differentiated classroom, the tasks may be adjusted for different readiness levels, interests, or

learning preferences. The teacher then focuses on building a safe, accepted, and supported *learning community*. The practice of *flexible grouping* is characterised by effectiveness in the differentiated classroom, where students can frequently work with various students. *Teaching up* means raising the "ceiling" for all students. In a differentiated classroom, all students should be working at a level of complexity just above their comfort levels. Thus, the teacher should *plan* the most complex learning activity that would challenge the most advanced learner in the class, then modify that activity for students who are currently at lower readiness levels.

2.3.1 REACH: A Framework for Differentiating Classroom Instruction

The strategies, model, and framework discussed above shed light on how to apply differentiated instruction practically. Rock, Gregg, Ellis, and Gable (2008) offered an approach known as the REACH framework to guide the implementation of differentiated instruction. They developed a blueprint consisting of strategies for a successful management practice of differentiated instruction. When used together, the indicators and steps provided allow teachers to chart their course of action in developing and refining differentiated instruction. The REACH steps are (a) reflect on what you want and can do, (b) evaluate current curriculum, (c) analyse learner data, (d) design research-based lessons, and (e) focus on the data and results. This REACH framework provides practical and feasible steps for the implementation of differentiated instruction.

3.0 PREVIOUS STUDIES ON VIRTUAL DIFFERENTIATED INSTRUCTION

During the COVID-19 pandemic, many schools switched to online learning due to teachers' shortage and the movement control order imposed by the government. The critical aspects of teaching may look different online compared to in a face-to-face classroom. However, teachers still need to meet all students' needs (Bransford, Brown, & Cocking, 2000). The literature provides evidence that differentiated instruction positively impacts student achievement. However, studies on virtual differentiated instruction in higher education and Mandarin are scarce. Nonetheless, several reviews and studies on Mandarin and other subjects have shed some light on the implementation of differentiated instruction in these specific areas.

Regarding the differentiated instruction practice in higher education, Turner, Solis, and Kincade (2017) examined a large research institution situated in the south eastern United States. They found that differentiated instruction is difficult to realise in large classes. Thus, instructors need to have a better understanding of the implementation strategies.

Shparyk (2019) reflected American, Ukrainian, and Chinese scholars' rationale for supporting differentiated instruction. The scholars determined that most researchers emphasise on using differentiated instruction to maintain students' educational potentials and academic progress besides offering various learning methods to achieve extended knowledge.

Regarding its application in a virtual school, Beck and Beasley (2020) reported that most virtual school teachers are inexperienced in differentiation, testing, curriculum, grouping, and strategies. New teachers may find it difficult to develop and use online tools. Hence, teachers need to gain a better understanding regarding the ways virtual schools serve students' needs. However, little research has been done to determine how online teachers differentiate teaching. Some online teachers shared their belief that students must be differentiated by content, product, and process. However, they did not apply this concept in their teaching. Hence, there is a need to investigate and expand upon effective practices to help teachers develop differentiated instruction. Research on differentiated instruction should identify the obstacles in implementing differentiated instruction and propose solutions to address them.

James and Kang (2009) emphasised that teachers should know several teaching approaches for effective differentiated instruction. Many students are eager to learn to gain as much knowledge as possible. A teacher's response to various readiness levels reflects both professionalism and respect. The study found that more training and guidance are needed to improve poorly conceived ideas and enhance classroom performance.

Language scholars in the United Arab Emirates found that collaborative learning is a valuable training procedure for differentiated instruction and promotes student engagement, classroom social interaction, and cultural appreciation (Ismail & Al Allaq, 2019). Their findings may influence teacher training, academic administration, curriculum designing, and classroom decision making, as well as provide valuable guidance for more extensive studies on differentiated instruction and cooperative learning.

Dixon, Yssel, McConnell, and Hardin (2014) found a positive association between differentiated instruction and teachers' efficacy. Teacher effectiveness is a crucial dimension in implementing differentiation, regardless of the teacher's level or content (elementary, middle, or high school). The scholars stressed that continuing studies on differentiation development could reveal the link between differentiation and increased online teachers' effectiveness.

There is a need to accommodate different learning styles in Chinese speaking societies such as China, Hong Kong, and Taiwan. School teachers generally accept differentiated instruction under the prevailing Confucian heritage culture, believing that every student is teachable and deserves equal learning opportunities. Teachers adapt teaching topics to meet

learners' needs (Wan, 2019). This is reflected in the famous Chinese idiom "*yincaishijiao*", which means teaching students according to their abilities and aptitude, tailoring the instruction to each student's level, and displaying individualised instruction.

Fernandez (2014) conducted a study in a French secondary school by adopting differentiated instruction theory (its main ideas and strategies, overall methodology, and practical techniques) to address the challenges arising from classroom heterogeneity (different language knowledge, origins and backgrounds, teaching and learning objectives, as well as cultural and social factors). Educators differentiated the content, task selection, course structure, and evaluation to meet the needs of every student. The study found substantial discrepancies in students' knowledge and work pace besides an increase in teachers' workload. However, it was suggested that differentiated instruction for teaching Mandarin, such as grouping students based on their varied language skills, could help address the challenges.

Recently, there has been an increase in the number of studies on Chinese teaching and learning given the advantages of technology. Previous technological instruction has shown that technological innovation benefits both research and pedagogy by providing more choices concerning data collection, instruction, and investigations used in different technology-mediated contexts. For example, Wong and Hsu (2016) found that mobile-assisted games fostered peer coaching among Chinese students in Singapore. All the students performed better at what they were doing. The underpinning principle is the differentiated learning principle offered using mobile-assisted games.

Arnold and Ducate (2015) found that technology-enhanced Chinese teaching and learning motivated and engaged students. Also, educators could maximise the potential of all kinds of technologies to achieve targeted objectives. They tended to adopt more than one technology to help teach and learn Chinese. The most widely used technology was mobile apps, followed by Web 2.0 technologies and web conferencing technologies. Other technologies included Massive Open Online Courses, virtual reality, and interactive whiteboard. Technologies were used for various learning activities due to the unique approach that facilitated the learning and teaching of Chinese languages. The scholars determined that each technological tool could meet educational requirements based on its functional design, thus adhering to the principles of differentiated instruction.

Lyu and Qi (2020) reviewed 33 studies on teaching Mandarin Chinese that were published outside China from 2008 to 2018. They examined Chinese teaching and learning, the research topics, and the different technologies used during instruction. Approximately one-third of the reviewed articles (10 out of 33) looked at how technology use during instruction

enhanced specific language skills. The use of technology in Chinese character learning attracted a great deal of attention among these studies. For example, Lu, Meng, and Tam (2014) described how they designed and developed a mobile app for primary school students to learn and practise Chinese characters in a bilingual school in Hong Kong. The study found that students were positively engaged in practising and learning Chinese characters with the mobile app. The teachers also reported that using the mobile app helped them implement differentiated instruction to accommodate students' different learning skills.

Subsequently, Chen and Zhan (2020) determined that the WeChat recording tool could help instruct mixed classes in studies abroad, albeit with some technical difficulties. It created opportunities for learners to engage in different oral learning tasks, helped the curriculum stay on track, and enabled instructors to provide differentiated and timely feedback.

In Malaysia, Ibrahim, Kamaruddin, and Ling (2017) developed the Hanzi app to help students learn Chinese characters through instructors' and students' active participation. The findings demonstrated that students needed to adopt a self-learning concept to be more effective. The students could learn anytime and anywhere depending on their availability. The app allowed the students to learn in a fun way, and differentiation in context and technology led to the creation of students' learning sites for virtual conversations.

The literature review shows the importance of differentiated instruction in encouraging students' learning. However, some weaknesses were also discovered, depicting the research gap in teaching practices. Stollman (2018) reported that differentiated instruction is not always practical, even after interventions have taken place. This contention was confirmed by a study done by Mills et al. (2014) in Queensland, Australia. The scholars reported that teachers were more comfortable streaming students into different teaching groups rather than considering individual students' characteristics even after a state-wide intervention in the form of audit and workshops regarding implementing differentiated instruction in teaching. In this era, most Mandarin educators focus their research on technology-enhanced teaching and learning. According to some researchers, technological tools could help them differentiate instruction to suit current digital natives' learning preferences. Most Mandarin educators focus on using or developing apps and other online tools to differentiate the curriculum for the targeted goal. The studies show that virtual technology tools are promising applications for dealing with students' unique learning preferences virtually. However, there is still a dearth of research on the detailed implementation of differentiated instruction.

4.0 DIFFERENTIATED INSTRUCTIONS IN TEACHING MANDARIN VIRTUALLY

There is a dearth of studies concerning virtual differentiated instruction in Mandarin learning. For a better outcome, teachers are challenged to know, be alert, learn, plan, act, tailor, reflect, assess, and re-plan to achieve the objective of differentiated instruction. Most of the studies aimed to obtain practitioners' views regarding the implementation of differentiated instruction. For example, Beck and Beasley (2020) obtained virtual school teachers' views on the definitions, assessments, curriculum, grouping, and strategies, while Smale-Jacobse et al. (2019) studied the crucial success factors and specific operationalization of differentiated instruction. They found that educators lacked in-depth knowledge concerning implementation and needed training to realise the objectives of differentiated instruction. Educators knew the existence and importance of the differentiated instruction approach (James & Kang, 2009). However, challenges and misunderstandings have hindered implementation. It is a challenge to realise differentiated instruction in higher education, especially on a large scale (Turner et al., 2017). Teachers need guidance and training to implement differentiated instruction for self-practice. Besides the benefits, there are also some inhibiting factors such as large numbers of participants, students' knowledge, different work pace, teachers' increased workload, and teachers' readiness and knowledge.

In Chinese societies, teachers generally accept the idea of differentiated instruction and find that differentiated instruction is crucial to cater to the diversity of learners (Wan, 2019). Many studies have examined the use of technology in teaching Mandarin Chinese as a second or foreign language. Most of the studies reported the use of various technologies in Chinese teaching and learning as well as teacher education (Lin, Liu, & Hu, 2017). However, not many of studies are related to virtual differentiated instruction for Mandarin. Nonetheless, Lu et al. (2014) had designed and developed a mobile app for primary school students to learn and practise Chinese characters at a bilingual school in Hong Kong. They found that the mobile app helped teachers in implementing differentiated instruction and accommodating different students' learning skills. Technology tools such as the learning app, WeChat, virtual reality, and others offer a promising potential for various learning activities and as excellent pedagogical assistants.

The implementation of differentiated instruction can positively affect students' learning. To make it more effective, students need to adopt the self-learning concept. Tomlinson (2014) has developed a blueprint (REACH) to guide teachers in implementing differentiated instruction that describes steps related to proven effective practices. Also, Fernandez (2014) provided an explanation about the implementation methods, such as

differentiation of content, task selection, course structure, and evaluation. In the study, REACH was used to address the challenges of heterogeneity in the classroom. Substantial discrepancies were found on students' knowledge, different work pace, and teachers' increased workload. Other challenges include alertness to differentiate at the micro and macro stage, pre-lesson plan, and re-plan. The findings show that the differentiated instruction approach is an ongoing process and educators need to practise to improve their skills.

The 21st century education has moved from being teacher-centred to student-centred. However, the integrating competence is still a crucial factor in ensuring an effective learning process (Chua et al., 2020). Nowadays, technology provides alternatives and assists human life, especially in education. The internet enables sharing and communication supported by connectivism and personalised learning theories. This is in line with the findings of Callum, Day, Skelton, Lengyl, and Verhaart (2015) that flexibility to engage with a diverse student cohort and the application of technology in a practical way provide an enjoyable learning experience to students. The approach is underpinned by the theory of behaviourism. For example, the study on Quizzes via Kahoot and Plickers, discussions conducted in class or through Padlet and Oceania, Cram and Quizlet flashcards and dictionary-based apps for vocabulary enhancement (Chua et al., 2020) was supported by the theory of behaviourism. The reinforcement activities were done in an enjoyable way to make learning happen. Kahoot cultivated learners' competing moods in answering questions as they became excited to use the QRcode to answer the quiz via Plickers. The vocabulary enhancement via Cram and Quizlet supported behaviourism as the students were able to grasp new vocabulary in the language game by playing the game frequently. This study supports Storz, Mailler, Brienne, Chotel, and Dang (2012) that in behaviourist learning principles, the app's core aspect focuses on repetitive language activities.

When teachers differentiate according to students' readiness, they benefit by achieving success in all four areas of achievement: study habit, social interaction, cooperation, and engagement (Tomlinson et al., 2003). Students' "readiness" is supported by brain research and is aligned with Vygotsky's (1978) descriptions of the zone of proximal development and the scaffolding process where competent adults help learners develop their abilities in a way that maximises student learning. When education is aligned with student interests, it maximises student engagement, productivity, achievement, positive learning attitudes, willingness and persistence to challenge, self-determination, and creativity (Tomlinson et al., 2003). The approach confirms Dewey's (1938) basic teaching principles that (1) human beings learn by doing, but that not all experiences are beneficially educational, and therefore the central

challenge for teachers is to create fruitful experiences and to organise them forward to guide students' learning; and (2) successful experiences will be enjoyable and have a positive impact. Thus, virtual differentiated instruction adheres to the theory of behaviourism whereby students may involve in drilling activities based on their needs.

In sum, theoretically or conceptually, teachers know what differentiated instruction entails. Educators need support and direction in implementing healthy learning environments. Hence, more training and guidance should be provided to encourage good classroom behaviour.

5.0 CONCLUSION

The famous Chinese idiom "*Yincaishijiao*" highlights the importance of tailoring teaching to suit each student's ability. Differentiated instruction is an approach that educators should be aware of before, during, and after instructions are given because this approach gives learners meaningful and worthwhile experiences. Especially what types of strategies and targeted goals that scholars should choose. Many teachers found it challenging to address all of their students' needs, including their interests, learning styles, and abilities. The differentiated instruction approach adjusts teaching to reflect students' existing abilities, interests, and preferences. It is characterized by clear learning goals, ongoing and diagnostic assessments that modify instructions, and providing challenging tasks for students. However, differentiated instruction is not a common feature in the Mandarin language online classroom. In the age of advanced technology, Mandarin virtual differentiated instruction needs to be used to offer instructions with various ways for content presentation, various forms for learner self-expression, and various approaches for learner interest engagement. The limitation of this study is that it did not cover the entire aspects of virtual differentiated instruction engagement. Hence, future research should use the quantitative approach and mixed approach to looking into all the aspects to obtain an in-depth understanding of virtual differentiated instruction for Mandarin teaching specifically and all foreign language instructions in general. It is a feasible approach that requires teachers to tailor their teaching to cater to all the available components in realizing students' learning, particularly by using online technology in face-to-face sessions as well as the virtual Mandarin classroom environment.

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REFERENCES

Altemueller, L., & Lindquist, C. (2017). Flipped classroom instruction for inclusive learning. *British Journal of Special Education, 44*(1), 341–358.

Arnold, N., & Ducate, L. (2015). Contextualised views of practices and competencies in call teacher education research. *Language Learning & Technology, 19*(1), 1-9.

Baron, L. S., Hogan, T. P., Schechter, R. L., Hook, P. E., & Brooke, E. C. (2019). Can educational technology effectively differentiate instruction for reader profiles? *Reading and Writing*, *32*(9), 2327–2352.

Beck, D., & Beasley, J. (2020). Identifying the differentiation practices of virtual school teachers. *Education and Information Technologies, 26*(1), 2191–2205.

Bosker, R. J. (2005). *De Grenzen van Gedifferentiëerd Onderwijs.* Rijksuniversiteit Groningen.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school.* National Academies Press.

Callum, K. M., Day, S., Skelton, D., Lengyl, I., & Verhaart, M. (2015). *A multiple case study approach exploring innovation, pedagogical transformation and inclusion for mobile learning.* Communications in Computer and Information Science.

Chen, L., & Zhan, H. (2020). Wechat assisted differentiated CFL instruction in study abroad: A pilot case study. *Journal of Technology and Chinese Language Teaching*, *11*(2), 64–92.

Chua, N. A., Tajuddin, A. J. B. A., Soon, G. Y., Rashid, R. A., Zakaria, R., Zaid, C. M., & Ahmad, M. (2020). Classroom research on Mandarin foreign language learning via smartphone applications. *Journal of Physics: Conference Series, 1529*(4), 1–8.

Corno, L. (2008). On teaching adaptively. *Journal of Educational Psychology, 43*(1), 161–173.

Coubergs, C., Struyven, K., Engels, N., Cools, W., & De Martelaer, K. (2013). *Binnenklas-Differentiatie. Leerkansen Voor Alle Leerlingen.* Uitgeverij Acco.

Denessen, E. J. P. G., & Douglas, A. S. (2015). Teacher expectations and within-classroom differentiation. In C. M. Rubie-Davies, J. M. Stephens, & P. Watson (Eds.), *Routledge international handbook of social psychology of the classroom* (pp. 296-303). Routledge.

Dewey, J. (1938). *Experience and education*. Kappa Delta Pi.

Dixon, F. A., Yssel, N., McConnell, J. M., & Hardin, T. (2014). Differentiated instruction, professional development, and teacher efficacy. *Journal for the Education of the Gifted, 37*(2), 111–127.

Fernandez, R. Z. (2014). *Teaching Chinese in heterogeneous classrooms: Strategies and practices* [L'enseignement Du Chinois Dans Une Classe Heterogene: Strategies Et Pratiques]. Linguistica.

Hattie, J. (2009). V*isible learning. A synthesis of over 800 meta-analyses relating to achievement*. Routledge.

Ibrahim, N., Kamaruddin, S. F., & Ling, T. H. (2017). Interactive educational Android mobile app for students learning Chinese characters writing. In *2017 International Conference on Computer and Drone Applications (IConDA)* (Vol. 2018-January, pp. 96–101). IEEE.

Ismail, S. A. A., & Al Allaq, K. (2019). The nature of cooperative learning and differentiated instruction practices in English classes. *SAGE Open, 9*(2), 1-17.

James, D., & Kang, R. (2009). Differentiated instruction: One school' s survey analysis. *The Journal of Student Research at GCSU*, *10*(1), 169–191.

Kulik, J. A., & Fletcher, J. D. (2016). Effectiveness of intelligent tutoring systems: A meta-analytic review. *Review of Educational Research, 86*(1), 42–78.

Kulik, C. C., Kulik, J. A., & Bangert-Drowns, R. L. (1990). Effectiveness of mastery learning programs: a meta-analysis. *Review of Educational Research, 60*(1), 265–299.

Lee, C., Yeung, A. S., & Ip. T. (2016). Use of computer technology for english language learning: Do learning styles, gender, and age matter? *Computer Assisted Language Learning, 29*(5), 1033–1049.

Lin, C.-H., Liu, H. X., & Hu, Y. (2017). Technology and the education of Chinese-language teachers: Where are we now? *Journal of Technology and Chinese Language Teaching, 8*(1), 1−15.

Lindner, K. T., Alnahdi, G. H., Wahl, S., & Schwab, S. (2019). Perceived differentiation and personalisation teaching approaches in inclusive classrooms: Perspectives of students and teachers. *Frontiers in Education, 4*(58), 1-11.

Lu, J., Meng, S., & Tam, V. (2014). Learning Chinese characters via mobile technology in a primary school classroom. *Educational Media International*, *51*(3), 166–184.

Lyu, B., & Qi, X. (2020). A review of research on technology-assisted teaching and learning of Chinese as a second or foreign language from 2008 to 2018. *Frontiers of Education in China*, *15*(1), 142–163.

Mills, M., Monk, S., Keddie, A., Renshaw, P., Christie, P., Geelan, D., & Gowlett, C. (2014). Differentiated learning: From policy to classroom. *Oxford Review of Education, 40*(1), 331–348.

Nokes-Malach, T., Richey, J., & Gadgil, S. (2015). When is it better to learn together? Insights from research on collaborative learning. *Educational Psychology Review, 27*(1), 645–656.

Richards, M. R. E., & Omdal, S. N. (2007). Effects of tiered instruction on academic achievement in a secondary science course. *Journal of Advanced Research, 18*(1), 424–

453.

Rock, M. L., Gregg, M., Ellis, E., & Gable, R. A. (2008). REACH: A Framework for differentiating classroom instruction. *Preventing School Failure: Alternative Education for Children and Youth, 52*(2), 31–47.

Schleicher, A. (2016). *Teaching excellence through professional learning and policy reform: Lessons from around the world.* OECD Publishing.

Shute, V. J., & Rahimi, S. (2017). Review of computer-based assessment for learning in elementary and secondary education. *Journal of Computer Assisted Learning, 33*(1), 1–19.

Shparyk, O. (2019). An issue of differentiated instruction under the individualisation of education tendency. Reflections of the American, Ukrainian and Chinese scholars. *Вісник КНЛУ. Серія Педагогіка та психологія. Випуск 31*(1), 139-147.

Slavin, R. E. (1990). Mastery learning re-reconsidered. *Review of Educational Research, 60*(1), 300–302.

Smale-Jacobse, A. E., Meijer, A., Helms-Lorenz, M., & Maulana, R. (2019). Differentiated instruction in secondary education: A systematic review of research evidence. *Frontiers in Psychology*, *10*(2366), 1-23.

Smets, W., & Struyven, K. (2018). Realist review of literature on catering for different instructional needs with preteaching and extended instruction. *Education Sciences, 8*(113), 1-18.

Steenbergen-Hu, S., Makel, M. C., & Olszewski-Kubilius, P. (2016). What one hundred years of research says about the effects of ability grouping and acceleration on K−12 students' academic achievement: Findings of two second-order meta-analyses. *Review of Educational Research, 86*(1), 849–899.

Stollman, S. H. M. (2018). *Differentiated instruction in practice: A teacher perspective.* ICLON, Leiden University Graduate School of Teaching.

Storz, C., Maillet, K., Brienne, C., Chotel, L., & Dang, C. (2012). Mobile devices increasing opportunities for informal learning and second language acquisition. In I. A. Sánchez & P. Isaías (Eds.), *IADIS international conference mobile learning 2012* (pp. 83-89). IADIS Digital Library.

Tieso, C. L. (2003). Ability grouping is not just tracking anymore. *Roeper Review, 26*(1), 29–36.

Tomlinson, C. A., Brighton, C., Hertberg, H., Callahan, C. M., Moon, T. R., Brimijoin, K., … Reynolds, T. (2003). Differentiating instruction in response to student readiness, interest,

and learning profile in academically diverse classrooms: A review of literature. *Journal for the Education of the Gifted*, 27(1), 119–145.

Tomlinson, C. A. (2014). Instructional strategies that support differentiation. In C. A. Tomlinson (Ed.), *The differentiated classroom: Responding to the needs of all learners* (pp. 102-121). ASCD.

Tomlinson, C. A. (2000). Differentiation of instruction in the elementary grades. https://files.eric.ed.gov/fulltext/ED443572.pdf

Turner, W., Solis, O., & Kincade, D. (2017). Differentiating instruction for large classes in higher education. *International Journal of Teaching and Learning in Higher Education, 29*(3), 490–500.

Van Geel, M., Keuning, T., Frèrejean, J., Dolmans, D., Van Merriënboer, J., & Visscher, A. J. (2019). Capturing the complexity of differentiated instruction. *School Effectiveness and School Improvement, 30*(1), 51–67.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press.

Wan, S. W.-Y. (2019). *Encyclopedia of educational innovation*. Springer.

Wong, L. H., & Hsu, C. K. (2016). Effects of learning styles on learners' collaborative patterns in a mobile-assisted, Chinese character-forming game based on a flexible grouping approach. *Technology, Pedagogy and Education*, *25*(1), 61–77.