

Direct/Explicit Instruction and Social Constructivist Practices in Inclusive Classrooms

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Abstract

Effective educational practices play an instrumental role in student success. In the context of an inclusive classroom, it is crucial that educators use evidence-based practices to ensure all students meet educational outcomes. This literature review paper focuses on two evidence-based pedagogies, namely direct/explicit instruction (DI/EI) and social constructivist approaches, and their effects on an inclusive classroom. Special consideration is given to cooperative learning and concrete implementation guidelines. Lastly, the complimentary effects of combining DI/EI and social constructivist practices are investigated to advance an argument for using a variety of evidence-based practices within inclusive classrooms.

Keywords: Inclusive education, direct instruction, explicit instruction, social constructivism.



Direct/Explicit Instruction and Social Constructivist Practices in Inclusive Classrooms

Many researchers, such as Kurth and Mastergeorge (2010), suggest that students with developmental disabilities benefit from being in an inclusive classroom rather than a self-contained special education classroom. In this paper, an inclusive classroom is defined as a heterogeneous learning environment whereby students with developmental disabilities learn alongside their neurotypical peers (Rasmitadila & Boeriswati, 2017). Kurth and Mastergeorge (2010) found that students with developmental disabilities attained significantly higher scores on measures of math, reading, and writing when in an inclusive classroom compared to a non-inclusive classroom. Szumski et al. (2017) conducted a meta-analysis to explore how academic achievement is affected when students with developmental disabilities are taught alongside their peers without developmental disabilities. These authors concluded that inclusive classrooms do not have any significant negative effects on the academic achievement of students without disabilities. Two pedagogies that may foster success in the classroom are direct/explicit instruction (DI/EI), which aligns with behavioural analytic psychology (Kretlow & Bartholomew, 2010), and social constructivist practices, which align with cognitive psychology (Knapp, 2019) and social psychology (Raskin, 2002). In this paper, the effects of these pedagogies are examined, with respect to the academic and non-academic benefits yielded when each approach is integrated into an inclusive classroom. A discussion regarding the complementary effects of using both DI/EI and cooperative learning in an inclusive classroom is included, along with practical examples of effectively implementing cooperative learning strategies.

The benefits of an inclusive classroom are not just restricted to academic achievement. Inclusive classrooms can also benefit students socially, as they foster peer acceptance. Peer acceptance is a protective factor against adverse outcomes such as behavioural problems and school avoidance (Garrote et al., 2020). Therefore, peer acceptance can positively contribute to the socio-emotional development of students. According to a qualitative study by Shogren et al. (2015), students with developmental disabilities had positive perceptions of their inclusive classroom, stating they had a greater opportunity to make friends and enjoyed the challenge of learning the same content as their neurotypical peers. Similarly, a qualitative investigation by Bunch and Valeo (2004) found that students without disabilities in an inclusive classroom reported having more friends with developmental disabilities compared to students without disabilities in a non-inclusive classroom.

Fisher and Meyer (2002) reported that students with developmental disabilities in an inclusive classroom made significantly greater gains on measures of social competence relative to their peers in a segregated learning environment. Since students with developmental disabilities are more likely to experience social isolation and bullying victimization than their neurotypical counterparts (Farmer et al., 2019), the increase in social competence and peer acceptance that stems from participation in an inclusive classroom may act as a preventive factor against adverse outcomes. Educators need to utilize evidence-based practices within their pedagogies for these social and academic benefits yielded by an inclusive classroom to be actualized.

Brock et al. (2020) claimed there is a research-practice gap in the field of inclusive education whereby teachers seldom use evidence-based practices in an inclusive classroom. This gap, according to Brock et al., may indicate that students with developmental disabilities who are not in the most optimal learning environment, such as where there is limited use of evidence-based practices, may not lead to superior academic or socio-emotional developmental outcomes. These authors also state that the research-practice gap could be lessened if evidence-based practices

focused on improving academic achievement rather than focusing on social development or mental health since, in their study, academic achievement was the highest priority for teachers. While academic achievement is a central goal of an education system, it is also worth acknowledging that other educational goals may hold equal importance. The development of educational goals such as social competence and pro-social behaviour (Ten Dam & Volman, 2007), critical thinking (Larsson, 2017), work ethic and physical well-being (Rothstein & Jacobsen, 2006), emotional intelligence (Low et al., 2004), and overall active citizenship (Jansen et al., 2006) should be given equal importance as academic goals. Attainment of these educational goals could improve one's quality of life and an individual who has sufficiently developed competencies across these numerous goals can contribute positively to the environment in which they are embedded.

An inclusive classroom aims to serve the needs of students with a range of different disabilities, suggesting that teachers may need to implement a diverse set of instructional approaches in order for their students to be successful. This article seeks to examine the effects of DI/EI in an inclusive classroom and to explore social constructivist practices, with a specific focus on cooperative learning in an inclusive classroom. Lastly, the complementary effects of the combination of DI/EI and cooperative learning are examined, and concrete methods of incorporating cooperative learning strategies are provided.

Direct/Explicit Instruction

Researchers have conceptualized DI/EI in numerous ways. Generally, DI/EI can be thought of as a teacher-led learning approach in which the content or problem-solving strategy being taught is explicitly explained (Gersten et al., 1986). Researchers have also characterized the steps of DI/EI differently, though similar themes appear. Common components in the steps of DI/EI include planning learning objectives (Lombardi, 2017), modelling and explicit direction, guided and independent practice (Gersten et al., 1986; Humphrey & Feez, 2016; Moore, 2007; Tobias & Duffy, 2009), and assessment (Lombardi, 2017). DI/EI is utilized in the classroom to construct a foundational knowledge base within students to enhance recall and promote generativity (Phillips et al., 2016; Slocum & Rolf, 2021). Teaching for generativity implies that learners will be able to apply knowledge to untrained activities (Slocum & Rolf, 2021). For example, if writing instruction allows students to spell untaught words, then the instruction is generative. Due to the structured nature of DI/EI, one key component of DI/EI programs involves the promotion of mastery learning (Engelmann, 2007). This strategy assumes that students must demonstrate adequate knowledge of the current subject material before engaging with new material (Kulik et al., 1990).

The Reading Mastery program (Engelmann et al., 1995) is a noteworthy program that is based upon DI/EI principles (Schieffer et al., 2002). This program focuses on developing requisite knowledge of receptive and expressive oral language, acquisition of phonetic awareness, letter-sound correspondence, and lastly, students are taught the skill of blending, which enables students to blend the sounds of words together. According to Schieffer et al. (2002), salient features of the Reading Mastery program include the provision of additional instruction to students who are struggling, modelling and guided practice, and immediate feedback and error correction. After the requisite knowledge of receptive and expressive knowledge is developed, the Reading Mastery program focuses on reading comprehension. Reading comprehension is augmented through the explicit teaching of various reading comprehension strategies. For example, one strategy involves teaching literal comprehension, in which students are given a passage to read and then prompted to answer questions based on the passage (Schieffer et al., 2002).

When teaching literal comprehension, teachers model behaviours such as underlining and highlighting important themes in a passage. As students' progression increases, the guidance provided by the teacher decreases, and more complex passages are introduced (Schieffer et al., 2002). The results obtained from an experiment by Goss and Brown-Chidsey (2012) support the notion that Reading Mastery is an effective program for promoting academic success. Similarly, findings from Stockard and Engelmann (2010) demonstrate that students who were subjected to Reading Mastery had more growth in nonsense word fluency scores and oral reading fluency relative to students who received whole language instruction or Open Court (SRA McGraw-Hill, 1996). Open Court is a specific direct instructional program that has been adopted by over 6,000 schools in the USA (Borman et al., 2008; Rosenshine, 2008). However, these results may not be surprising considering that nonsense word correspondence measures letter-sound correspondence capabilities (Vanderwood et al., 2008), and one component of Reading Mastery specifically focuses on letter-sound correspondence. The results from Stockard and Engelmann (2010) provide one example of a specific program that is based upon the principles of DI/EI. However, DI/EI is an effective instructional practice for various types of students across a range of subject materials (Przychodzin et al., 2004; Zepeda et al., 2015).

The Effects of Direct/Explicit Instruction in a Classroom Context

DI/EI has been rigorously researched, and one of the most well-known studies regarding such pedagogical practices is Project Follow Through, which was undertaken by the United States Office of Economic Opportunity during the late 1960s and early 1970s, according to Watkins (1997). The researchers' aim for Project Follow Through was to analyze the most effective teaching strategy for underachieving students with a low socioeconomic background, with the study encompassing over 70,000 students from 170 different districts between kindergarten and grade three (McMullen & Madelaine, 2014). Although more than 20 different teaching approaches were included in Project Follow Through, all of the approaches were either grounded in child-centred construction of knowledge or direct teaching of skills and content (Carnine, 2000). Results from the longitudinal study suggest that DI/EI is more effective than child-centred approaches based on scores in math, language, and spelling from the Metropolitan Achievement Test (Carnine, 2000). Interestingly, scores on the Coopersmith Self-Esteem Scale (Kim & Axelrod, 2005) were also higher for students who participated in the DI/EI condition. Since research on the Coopersmith Self-Esteem Scale (Coopersmith, 1967) is contradictory (Ahmed et al., 1985; Johnson et al., 1983), caution should be taken when determining the efficacy of DI/EI on measures of affect. Results from a meta-analysis by Körük (2017) suggested that a student's self-esteem is positively correlated to their academic achievement, and this finding holds true regardless of the student's cultural background and grade level. Therefore, the academic benefits obtained through participation in DI/EI may be attributed, in part, to an increase in self-esteem.

It was also found that students who were taught using DI/EI had higher scores relative to their peers in traditional educational settings on the Wide Range Achievement Test (Jastak & Jastak, 1976), which measures reading, math, and spelling (Becker & Gersten, 1982; Meyer, 1984). These results were consistent six years post-intervention, indicating that students retain the problem-solving skills that were taught using DI/EI (Becker & Gersten, 1982; Meyer, 1984). One of the most rigorous meta-analyses exploring the effects of DI/EI was conducted by Stockard et al. (2018). These authors concluded that students exposed to DI/EI programs had significant academic gains across various domains such as reading, language, math, and spelling. Approximately one-quarter of the primary studies in the meta-analysis by Stockard et al. (2018)

stated that the sample contained students from high-poverty backgrounds. Therefore, DI/EI has been shown to be a very strong teaching method for young students who come from low socioeconomic status (SES) backgrounds as a means of developing cognitive and affective domains. Since Wagner et al. (2006) claim that low SES is particularly detrimental to the academic achievement of students with disabilities, perhaps the adoption of DI/EI can mitigate the adverse effects associated with the intersectionality of low SES and prevalence of a disability.

DI/EI has also been shown to enhance more than just academic achievement in young students. For example, Fielding et al. (1983) demonstrated that secondary school students who were taught complex concepts in the field of law using direct instruction performed better on a multiple-choice test and essay test examining knowledge of the law in comparison to students who were taught using an inquiry-based approach. Kousar (2010) found similar results in their study, stating, “The Direct Instructional model was found to be more effective than traditional instruction in immediate and delayed retention, as well as development of positive attitudes” (p. 102). This statement suggests the participants in the DI/EI condition were more likely to encode stimuli relative to the traditional instruction control condition. The notion that DI/EI increases academic achievement can be explained due to the role of feedback and student motivation. As previously stated, feedback and error correction are inherent components of the DI/EI model. Corrective feedback has consistently been shown to increase student motivation and confidence, subjective vitality, and the satisfaction of the psychological need for competence and relatedness (Kilic et al., 2021; Vergara-Torres et al., 2020) and is generally preferred by students (Gamlem & Smith, 2013). While DI/EI seems to be effective for a wide range of students, as previously discussed, it is worth reviewing whether these same positive academic and non-academic effects can be materialized specifically for students with developmental disabilities in an inclusive classroom.

Direct/Explicit Instruction and Students with Developmental Disabilities

The American Psychological Association defines a developmental disorder as a cognitive or physical impairment that leads to limited functioning (American Psychological Association, n.d.). Although this definition may seem to encompass emotional-behavioural disorders (EBDs), they are in fact distinct constructs, so the effects of DI/EI on students with EBDs will not be explored in this paper.

A study by Flores and Ganz (2007) found that the DI/EI program entitled *Corrective Reading Thinking Basics: Comprehension Level A* (CRTB) was effective for increasing reading comprehension as measured by statement inferences and by an ability to use facts and analogies with elementary school students with a range of developmental disabilities. A similar study by Head et al. (2018) found comparable results, thus providing further support that teaching strategies utilizing DI/EI are effective for increasing reading comprehension in students with developmental disabilities.

In addition to reading comprehension, mathematical knowledge acquisition and overall cognitive development can be augmented using DI/EI. McKenzie et al. (2004) conducted one of the most robust studies that supports this notion. These researchers used the DI/EI program *Connecting Math Concepts* (Engelmann & Becker, 1995) Level K (CMC-K) to teach mathematics concepts to students aged three to five. In this cohort of students, five of sixteen had developmental disabilities. The CMC-K program consisted of 30 lessons taught over six and a half weeks. The goals of the CMC-K program were to teach basic mathematical skills such as counting, number recognition, the concept of greater than and less than, and so on. During the delivery of this

program, the instructor modelled skills, led the class through guided practice and then provided time for individual practice. The instructors also used error correction and a reinforcement system to reduce time-off-task behaviours and increase motivation. The authors used a pretest-posttest design to measure outcomes using both the cognitive domain of the Battelle Development Inventory (Newborg et al., 1984) (BDI) and a CMC-K curriculum test. According to Berls and McEwen (1999), the BDI has strong content, construct, concurrent, and predictive validity, and high interrater reliability. This alignment suggests researchers agree that the BDI is a consistent measure, it truly measures development, it correlates with other scales of development, and it can predict future behaviour (Berls & McEwen, 1999). Similarly, McKenzie et al. (2004) assessed students on the cognitive domain of the BDI which consists of four subdomains: perceptual discrimination, memory, reasoning and academic skills, and conceptual development. These authors reported that students with developmental disabilities had large gains across all subdomains of the cognitive domain of the BDI. What is particularly noteworthy is that the lowest effect size was 0.38 and the largest was 1.59, whereas McKenzie et al. (2004) state that an effect size greater than 0.25 is significant in educational research, and an effect size above 0.5 is quite rare in educational research. The obtained effect sizes provide support that DI/EI is incredibly effective at enhancing cognitive development in students with developmental disabilities. Students with developmental disabilities had significantly increased their scores on the CMC-K curriculum test post-intervention, suggesting that the CMC-K was successful at developing skills in mathematics. These researchers also found a significant increase in the skills of typically developing students in mathematics, DI/EI programs such as CMC-K could be an invaluable component of an inclusive classroom.

It is also worth mentioning that DI/EI can increase skills in mathematics in older students. For example, Hayter et al. (2007) used a DI/EI strategy with flashcards to teach mathematical skills to high school students with developmental disabilities for four weeks. From their study, these authors concluded that the implementation of the DI/EI flashcard system increased students' motivation towards learning mathematics, as well as their performance in the memorization of mathematical facts.

While the previous articles discussed highlight the effectiveness of DI/EI for improving language and mathematic skills for students with developmental disabilities, it is also noteworthy how DI/EI impacts science-based courses. One example comes from a study by Knight et al. (2012), who used a DI/EI intervention to teach science descriptors to elementary school children with developmental disabilities. The intervention followed a typical DI/EI format: Instructors began lessons with explicit teaching of science descriptors, followed by modelling correct answers and leading the students through guided practice. The final stage was a test phase in which participants showed their knowledge of science descriptors. Knight et al. (2012) demonstrated that DI/EI is an effective intervention in teaching science descriptors to students with developmental disabilities, as all students increased their content knowledge post-intervention.

While research has consistently shown that DI/EI is a successful teaching strategy for students with developmental disabilities, it is also worth exploring the benefits that constructivist approaches have when employed in an inclusive classroom.

Constructivist Approaches

Constructivist adherents posit that knowledge is constructed or created by the learner, while the classroom teacher acts as a facilitator rather than a director, imposing knowledge onto the students (Fernando & Marikar, 2017; McMullen & Madelaine, 2014). It is important to acknowledge the distinction between social constructivism and cognitive constructivism. Social constructivism denotes knowledge that is constructed through the interaction of members within a group, whereby students construct knowledge through interactions, particularly if guidance is provided. Social constructivism proponents also believe that learning in the classroom should mimic real-world scenarios (Schreiber & Valle, 2013). Conversely, personal or cognitive constructivism emphasizes that knowledge is constructed by the individual learner through their own experiences and focuses less on group interaction relative to social constructivism (Garrison, 1993; Kumar & Gupta, 2009).

Although there are various approaches to constructivist teaching practices, such as cognitive apprenticeships and learning communities, one pedagogical practice that is rooted in social constructivism is cooperative learning. Cooperative learning methods refer to students working together in groups to achieve a specific educational outcome (Erbil, 2020). Cooperative learning involves several pertinent factors, including positive interdependence, accountability, interpersonal and group skills, promotive interaction, and group processing (Laal & Laal, 2012). Firstly, positive interdependence refers to group interconnectedness, where the success of one member is reliant on the success of all members within the group (Laal, 2013). Johnson and Johnson (2008) suggest that groups with positive interdependence are successful because, when members are cognizant that their contribution affects the entire group, their relative effort is enhanced. Therefore, groups need to be structured in a way that allows each member to make a valuable contribution to their group and, in turn, to perceive their contribution as valuable (Collazos et al., 2003). The second factor, accountability, has two components: group and individual accountability. Group accountability exists when the group receives an overall score, and individual accountability is present when the group receives an overall score and a student also receives an individual score for their contribution to the group (Johnson & Johnson, 2008). Individual accountability is an important component in the development of knowledge construction because a lack of individual accountability may create social loafing; that is, the tendency to apply less effort to a task when in a group setting than when completing a task individually (Piezon & Donaldson, 2005), consequently hindering mastery of subject material (Slavin, 2014).

The third factor in Laal and Laal's (2012) depiction of cooperative learning, group social skills, includes many different facets such as effective communication and conflict resolution, which can enhance group productivity and subsequently influence group achievement (Johnson & Johnson, 2008). In the Tuckman Model of Group Stages (Tuckman, 1965), it is suggested that all groups go through a stage in which conflicts begin to surface (McKibben, 2017). This surfacing of conflicts makes it necessary that group members possess conflict resolution skills, or desired group outcomes may not be satisfied. The fourth factor, promotive interaction, occurs when students encourage and motivate each other, and provide each other with feedback and assistance (Johnson & Johnson, 2008). Promotive interaction is beneficial in groups when members employ helping behaviours, have past experiences with peer groups, are able to provide support through feedback and modelling, and when students are adequately prepared for the task and teachers can monitor student interactions (Kristiansen et al., 2019). The final factor in cooperative learning, group processing, entails a reflection upon the group's interactions with a focus on what actions

were beneficial and how the group can improve its effectiveness and efficiency (Yager et al., 1986). Results from many studies (see, for example, Bertucci et al., 2012; Strahm, 2000) have confirmed that cooperative groups with group processing had greater achievement relative to cooperative groups without group processing. In reference to Laal and Laal's (2012) and Tran's (2013) work, the factors that contribute to successful cooperative learning seem to have strong theoretical underpinnings. Therefore, it is worth investigating how cooperative learning translates into the practical setting of an inclusive classroom.

Social Constructivist Approaches and Cooperative Learning

Cooperative learning can benefit students in many ways, especially in the context of academic achievement. For example, Zakaria et al. (2013) conducted a quantitative study examining the effects of cooperative learning practices in comparison to traditional learning practices on measures of academic achievement in math. The authors determined there was a statistically significant difference between students in the cooperative learning environment ($M = 55.19, SD = 11.62$) and students in the traditional learning environment ($M = 47.47, SD = 15.10$), providing some evidence that cooperative learning is a more effective teaching method for enhancing academic achievement in math. According to Zakaria et al. (2013), these results were obtained because the provision and reception of knowledge within groups led to a deeper understanding of content. Similar results were obtained by Aziz and Hossain (2010), who reported that gains in mathematics achievement were greater when students experienced cooperative learning as opposed to traditional teaching, which the authors refer to as standard lecture. It is also worth noting that in these studies, the researchers, Aziz and Hossain (2010) and Zakaria et al. (2013), used different methods of cooperative learning; the former used Learning Together (Johnson & Johnson, 1987) and the latter used Jigsaw (Aronson, 1978). The Jigsaw method will be further elaborated on when discussing cooperative learning in an inclusive classroom. The Jigsaw method is particularly noteworthy based on results from a study by Gambari and Yusuf (2017), who suggest that the Jigsaw method may yield the greatest academic benefits relative to alternative cooperative learning strategies such as team-assisted individualization (Slavin, 1985) and student teams-achievement division (Slavin, 1994). Therefore, it seems that cooperative learning is an effective practice for increasing academic achievement regardless of the specific method, such as Jigsaw, group investigation, or any other cooperative learning method.

Research into cooperative learning strategies has also shown benefits in subjects other than mathematics. For example, Rojas-Drummond et al. (2014) examined the effects of cooperative learning using the Test of Textual Integration (TTI), which is a test that measures written communication and reading comprehension. Out of the two schools examined in their study, the students in the experimental school who used cooperative learning scored higher on the TTI in comparison to students in the control school, suggesting that cooperative learning is an effective method for developing written communication and reading comprehension skills (Rojas-Drummond et al., 2014). It is evident that cooperative learning, like DI/EI, can support literacy development in students with developmental disabilities since, as previously discussed, students with developmental disabilities may benefit from the less ambiguous and sequential instruction that DI/EI provides (Shillingsburg et al., 2015). However, like many students in an inclusive classroom, those with developmental disabilities also benefit from cooperative learning for a variety of reasons. For example, Rojas-Drummond et al. (2014) surmised that the experimental group had superior scores on the TTI due to the use of exploratory talk that occurred within the groups. The desired outcomes for educators in inclusive classrooms may entail augmenting their

students' social skills while promoting literacy development. Therefore, research indicates that a combination of DI/EI and cooperative learning in an inclusive classroom could be effective, simultaneously improving academic achievement while improving peer relations and reducing bullying victimization (Van Ryzin & Roseth, 2018).

Similar to the findings obtained by Rojas-Drummond et al. (2014), students in cooperative learning groups were found to produce higher scores on reading tests that assess higher-order reading ability compared to students in teacher-led approaches (Law, 2011). The scores were noticeably different. Students in the cooperative learning group also perceived this approach as more beneficial than students in the control group. Law (2011) explained that the cooperative learning strategy was able to produce stronger scores because group discussion enhanced intrinsic motivation. While both of these studies used cooperative learning strategies, the study by Rojas-Drummond (2014) used the Learning Together strategy, and the study by Law (2011) used the Jigsaw strategy. The results from Rojas-Drummond (2014) and Law (2011) provide additional evidence for cooperative learning strategies being beneficial regardless of the specific method used, as long as the key factors of cooperative learning (positive interdependence, accountability, interpersonal and group skills, promotive interaction, and group processing) are in place.

Given that social interaction is an inherent part of cooperative learning, a key aspect of cooperative learning includes training students in the social skills of, for example, conflict management and group decision-making (Gillies & Boyle, 2010; Laal & Laal, 2012). Students generally appreciate the opportunity to interact with their peers as it can improve relationships and allow all students to contribute, which may be particularly valuable for students who tend to feel isolated in the classroom (Baker & Clark, 2010; Igel & Urquhart, 2012). By practicing social skills, under cooperative learning conditions, important educational goals such as the development of social skills and active citizenship can be promoted.

Social Constructivist Approaches and Students with Developmental Disabilities

Hart and Whalon (2011) and Ugwuegbulam et al. (2020) suggest that cooperative learning is an effective teaching method for increasing development in both academic and non-academic domains for students with developmental disabilities. Ugwuegbulam et al. (2020) found that students with developmental disabilities who participated in cooperative learning strategies have statistically significant differences ($F(2,78) = 127.29, p < .05$) on the Woodcock-Johnson III Mathematics Fluency Achievement Tests Scale (Woodcock et al., 2001) in comparison to students in the control group, indicating that cooperative learning is an effective method for enhancing academic achievement in mathematics. It is worth noting that students in the control group also had developmental disabilities. Similar results were obtained by Dugan et al. (1995), who explored the effects of cooperative learning on various social studies curricula in an inclusive classroom using an ABAB single-subject design. Based on their results, Dugan et al. (1995) suggested that students obtained the highest scores on the social studies test while in the treatment condition. Students also had a substantially greater level of academic engagement and higher levels of peer interaction while in the treatment condition. Their study makes a valuable contribution to the field of inclusive education, as it demonstrates how inclusive classrooms utilizing cooperative learning strategies can benefit students with and without developmental disabilities. Since the baseline condition of Dugan et al.'s study included teacher-led approaches, their results also indicate that cooperative learning may be more beneficial than teacher-led approaches such as DI/EI when attempting to increase academic achievement. However, some students with developmental disabilities may have a specific learning style that results in them learning better under a structured

and repetitive pedagogy where specific and concrete instructions are provided, such as DI/EI (Kroeger et al., 2007). Perhaps a combination of cooperative learning and DI/EI is needed to adequately meet the diverse needs of an inclusive classroom.

Results similar to Dugan et al. (1995) were obtained by Grey et al. (2007), who found that students with developmental disabilities increase their social engagement under cooperative learning conditions to a greater extent than traditional teaching conditions, while task engagement was unaffected. The finding that task engagement does not increase for students with developmental disabilities under cooperative learning conditions is also supported by results from Murphy et al. (2004). Since a lack of task engagement contributes to academic dysfunction (Morsink et al., 2021), educators may wish to consider using DI/EI when attempting to increase academic achievement and cooperative learning when striving to develop social competencies.

Across a good selection of the research, there is a general consensus that teachers of inclusive classrooms have positive perceptions of cooperative learning (Jenkins et al., 2003; Saborit et al., 2016; Strogilos et al., 2016; Völlinger & Supanc, 2020). According to Cline (2020), teachers have a positive perception of implementing cooperative learning in an inclusive classroom because of the benefits it yields for students with disabilities. In Cline's (2020) study, teachers reported that cooperative learning is particularly valuable for students with disabilities since social engagement is increased and the opportunity to collaborate with high-ability students can augment the cognitive development of students with disabilities (Cline, 2020).

To this point, an examination of the literature has revealed several ideas. Firstly, cooperative learning yields academic benefits, across diverse curriculum areas, for students with disabilities and their neurotypical peers. Additionally, students with disabilities have been shown to improve their social skills when in cooperative learning conditions. The benefits of cooperative learning for students with disabilities are also noticed by teachers, who have reported that cooperative learning enhances cognitive development and social engagement. Lastly, it is worth investigating the future of cooperative learning for students with developmental disabilities, which may not include human interaction. A study by Jimenez et al. (2017) investigated the effects of robot-led collaborative learning on children who display symptoms of developmental disabilities. The researchers created three distinct groups. In the first group, a student and the robot learned content together. In group two, a student learned material on their own. In group three, two students learned together. Each participant in the study ($n = 4$) took turns being in each of the three groups. Results of the study suggested that when participants were in the student-robot group, the highest learning times, which the authors define as “the rate at which the robot learned the answer and solution method of a problem when taught by the gray scale child” (Jimenez et al., 2017, p. 3), were produced. High learning time suggests that students had the highest levels of on-task behaviour when learning cooperatively with the robot. Further, the student-robot group had the highest teaching rate, meaning the robot was effectively able to assist students in “learning-by-teaching” (Jimenez et al., 2017, p. 5), whereby the student learns by teaching the robot. Lastly, students preferred learning with the robot rather than learning with another student or by themselves (Jimenez et al., 2017). These results suggest that more research is warranted to adequately assess the impact of robot-led collaborative learning on students with developmental disabilities.

It is worth mentioning that future research in the fields of inclusive education and cooperative learning could explore the role of artificial intelligence (AI). While research exploring the use of AI for students with developmental disabilities is still emerging, several authors, such

as Marino et al. (2023), have claimed that AI has already begun to disrupt the field of inclusive education. For example, in a review by Chen et al. (2022), the authors advocate for more frequent use of AI in inclusive classrooms. They claim that the ability of AI to deliver instant, personalized feedback and reinforcement and reduce feelings of anxiety proves particularly beneficial for students with developmental disabilities. Asthana and Gupta (2019) found that AI was capable of enhancing social and communication skills among students with autism. Although research examining the effects of cooperative learning and AI is relatively scarce, some studies allow for an optimistic perspective to be adopted when examining AI in the context of cooperative learning. For example, Yang et al. (2021) reported that teachers would prefer AI to suggest classroom pairings when employing cooperative learning strategies. Additionally, some teachers believe that students should engage in cooperative learning with AI, as this can promote meaningful socio-emotional interaction (Kim et al., 2022). One teacher in the Kim et al. study stated: “AI should interact educationally meaningfully with students, encourage them to overcome their difficulties and achieve the task, and motivate students” (p. 6084). Since teachers seem to express positive attitudes towards the integration of AI in cooperative learning contexts, perhaps AI will be incorporated into inclusive classrooms at the same time as instructors utilize cooperative learning strategies. Before educators fully incorporate the use of AI into their pedagogy, however, more research should be conducted that explores the academic and non-academic effects of using AI and a cooperative learning strategy in an inclusive classroom.

While it does appear that cooperative learning alone has the ability to improve academic achievement (Ugwuegbulam et al., 2020) and social skills (Grey et al., 2007) for students with developmental disabilities, the combination of both DI/EI and cooperative learning strategies, such as Jigsaw, may have a positive synergistic effect on educational outcomes. Thus, further exploration into this combination of approaches in an inclusive classroom is warranted.

Combining Direct Instruction and Social Constructivist Approaches in Inclusive Classrooms

While DI/EI may be able to increase the academic achievement of students with developmental disabilities, the schooling experience and social acceptance of students with developmental disabilities are strengthened under cooperative learning conditions (Klang et al., 2020). Many researchers believe that certain elements of DI/EI need to be incorporated when educating students with developmental disabilities; however, educators may wish to consider integrating both approaches into their practices (Al-Shammari et al., 2019; King-Sears, 1997; Voltz et al., 2001). Perhaps achievement can be augmented through the combination of these practices. For example, in a study examining the effect of DI/EI and cooperative learning in comparison to a DI/EI group and a control group, scores on reading comprehension measurements were highest in the DI/EI and cooperative learning group (Stevens et al., 1991). The DI/EI and cooperative learning group likely produced greater scores because cooperative learning allows students to provide feedback, motivate each other, and facilitate interaction regarding the re-explanation of concepts (Stevens et al., 1991), which is analogous to learning from the justly knowledgeable other in the zone of proximal development, a key component of development under the Vygotskian lens (Doolittle, 1995). Some of the most pertinent components of an inclusive classroom include the assumption that all students should actively participate, meet the needs of all students, and have a sense of belonging. According to Mengduo and Xiaoling (2010), these principles can be actualized through cooperative learning, specifically the Jigsaw method. Particular significance is being attributed to the Jigsaw method because it often outperforms other cooperative learning techniques. According

to Adams (2013), the Jigsaw method consists of ten consecutive steps, including dividing students into groups, appointing a leader for each group, dividing the lesson into segments, assigning each student to a certain segment, allowing students to familiarize themselves with their segment, creating an expert group that is comprised of one member from each initial group, allowing students to return to their initial groups, allowing students from the expert group to teach their group, observing the process as a teacher, and creating a learning assessment based on the content (Adams, 2013, pp. 70-71). Gambari and Yusuf (2017) found that the Jigsaw method improved academic achievement in a physics course to a greater extent than team-assisted individualization (Slavin, 1985) and student teams-achievement division (Slavin, 1994), two alternative cooperative learning techniques. In an inclusive classroom, Quirey (2015) determined that the Jigsaw method increased student participation more than Think-Pair-Share, which is a cooperative learning strategy that has been previously shown to increase student participation (Mundelsee & Jurkowski, 2021).

The Jigsaw method can be easily adapted for an inclusive classroom. For example, if a teacher believes that a student with disabilities is experiencing difficulties learning their assigned segment, they can assign another neurotypical student to assist them by asking probing questions or filling in missing information (Aronson, 2002). Additionally, teachers can also take key steps when establishing groups to ensure social inclusion. Goor and Schwenn (1993) suggest that teachers use a sociogram method whereby students write down the names of four peers they would like to work with. Following this, the teacher can create a social score for students based on the frequency with which their name was written down, which helps determine which students are socially isolated. Goor and Schwenn (1993) suggested that students with low scores and high scores should be grouped together, as students with high scores can more easily influence group members to be compassionate towards one another. In addition, the teacher should consider which students were selected by the students with developmental disabilities since working with a desired peer can enhance group cohesiveness and confidence (Goor & Schween, 1993). One distinguishable benefit of heterogeneous cooperative learning groups is highlighted when exploring academic achievement. Authors such as Ghanbari and Abdolrezapour (2020) and Zamani (2016) claim that grouping low-ability learners with average and high-ability learners is the most impactful grouping structure for low-ability learners on measures of academic achievement. Zamani (2016) also found that high-ability students in heterogeneous groups perform equally as well as their high-ability counterparts in homogenous groups. Therefore, cooperative learning strategies that utilize heterogeneous grouping allow for greater academic gains for low-ability students while avoiding having a negative impact on high-ability students.

When students with disabilities work in cooperative learning groups with neurotypical peers, they receive higher social acceptance and popularity ratings than when they are not in a cooperative learning setting (Piercy et al., 2002). This finding might be explained by the fact that when students work in groups, positive interactions occur when each member can make a meaningful contribution to the group, members have high levels of interpersonal contact, and the teacher provides support (Piercy et al., 2002). Therefore, when using the Jigsaw method, it is imperative that essential criteria of effective groups, such as positive interdependence and promotive interaction, are met. When developing positive interdependence, the teacher can create different roles, such as leader, editor, or encourager of participation, and assign students to these roles accordingly (Roger & Johnson, 1994). If the group is assessed on the extent to which these roles were accurately executed, this process inevitably allows all members to feel as if they made a valuable contribution to the group. This description of the Jigsaw method and the adaptations for

utilizing the method in inclusive classrooms provide a concrete basis for teachers to use social constructivist approaches in their classrooms.

Conclusion

While DI/EI may provide benefits to students with developmental disabilities, in terms of gains in academic achievement, cooperative learning can be complementary to DI/EI as it can foster social inclusion and peer acceptance. The benefits yielded by DI/EI and cooperative learning align with some of the overall goals of education, such as the development of social competence and the promotion of prosocial behaviour. If teachers are striving to ensure all students achieve the larger goals of education, then a combination of DI/EI and social constructivist practices should be seriously considered. Some teachers have a negative perception of inclusive education, partly due to a lack of intrinsic motivation to teach students with disabilities (Hunter-Johnson et al., 2014) as well as the belief that students with disabilities will negatively impact the ability of neurotypical students to learn (Yilmaz & Yeganeh, 2021). Teachers' negative perceptions towards students with disabilities can be associated with lower learning outcomes for these students (Hunter-Johnson et al., 2014). However, if teachers become cognizant of the benefits derived from a combination of DI/EI and social constructivist practices, then any negative perceptions towards inclusive education may be altered, subsequently creating a healthy environment for students with disabilities to attain educational goals.

Furthermore, cooperative learning groups that are heterogeneous in nature are reported to not impair the learning ability of non-disabled students. The gains in academic achievement are equivalent in both heterogeneous and homogeneous learning groups (Wyman & Watson, 2020). Therefore, teachers should not be reluctant to use social constructivist learning strategies such as cooperative learning when educating students with diverse abilities. It is also worth repeating that students who are mainstreamed in heterogeneous cooperative learning groups tend to have stronger gains in reading comprehension and language expression relative to their counterparts in traditional classrooms (Fore III et al., 2006). The notion that cooperative learning is complementary to DI/EI has been consistently reinforced as researchers conclude that cooperative learning is at least as effective as DI/EI (Hänze & Berger, 2007) but produces additional benefits such as increased peer interaction and generalization of recently acquired skills (Gillies, 2003). If educators are interested in creating a classroom in which all students can be successful in academic and social domains, they should consider using both DI/EI and social constructivist approaches. However, further research is warranted to explore the effects of cooperative learning as well as cooperative learning along with DI/EI within an inclusive classroom. Within the past decade, there has been a scarcity of research studies specifically investigating how the combination of DI/EI and cooperative learning affects academic achievement and other non-academic measures such as social outcomes for students with developmental disabilities in inclusive classrooms.

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