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To cite this article: Zaytoon Amod, Deidré Heafield & Joseph Seabi (2017): Assessing a Remedial Intervention Programme in Developing the Planning Skills of Grade 4 and 5 Learners, International Journal of Disability, Development and Education, DOI: 10.1080/1034912X.2017.1406067

To link to this article: https://doi.org/10.1080/1034912X.2017.1406067
Assessing a Remedial Intervention Programme in Developing the Planning Skills of Grade 4 and 5 Learners

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ABSTRACT

The search for assessment procedures that are more fair and useful have led to the investigation of alternatives to traditional forms of intellectual assessment. This study explored an alternative which combined a dynamic assessment approach with the Planning, Attention, Simultaneous and Successive Processing (PASS) model of cognitive processing. The aim was to investigate the effectiveness of a planning intervention programme based on Feuerstein’s criteria for Mediated Learning Experience (MLE) with a group of Grade 4 and 5 remedial school learners who presented with a range of barriers to learning. Twenty six learners were assigned to the experimental group and 25 to the control group. The results showed that there was a significant improvement in the experimental group’s Planning Scale score on the Cognitive Assessment System, following the intervention. These results imply that children often have far greater potential than is realised and that intentional mediation can help to enhance cognitive functioning and assist in further developing children’s learning potential.

Introduction

Worldwide there is a search for cognitive assessment procedures that are non-discriminatory. There is controversy regarding the use of traditional (static/normative) intelligence tests when assessing children from sociocultural and linguistic groups which differ from those for whom these tests were normed. Cross-cultural studies reflect that prior exposure to information and quality of education, which are integrally related to socio-economic status, play a pivotal role in explaining the lowered test performance in particular groups of individuals (Fagan & Holland, 2007; Shuttleworth-Edwards, van der Merwe, van Tonder, & Radloff, 2013), not only on verbal tasks but also on relatively culture fair non-verbal tasks (Fagan & Holland, 2007; Skuy et al., 2002). Against the backdrop of South Africa’s past apartheid policy which left a legacy of educational inequalities between racial and ethnic groups, the country’s 11 official languages and the situation where no intellectual assessment measures for children have been developed since the early 1990s; theorists, practitioners and researchers are faced with the challenge of exploring assessment tools that are relevant within this context.
context. Moreover, inclusive education practices, which many countries such as South Africa have embraced, place an increasing demand for psycho-educational assessments to inform instructional and pre-referral intervention.

In response to the controversy related to traditional testing approaches, alternative approaches to the conceptualisation of intelligence and methods of assessment have been investigated. Dynamic assessment (DA) has been gaining popularity (Gustafson, Svensson, & Fälth, 2014; Haywood & Lidz, 2007; Lauchlan, 2012; Tzuriel & Shamir, 2010) and notable attention has been given to cognitive processes that underlie general cognitive ability (Luria, 1973; Naglieri & Das, 1997b; Otero, Gonzales, & Naglieri, 2013). Both the DA approach which embeds intervention within the assessment procedure (Feuerstein, Rand, & Hoffman, 1979) and the cognitive processing model embodied in the work of Das, Naglieri, and Kirby (1994) are based on the premise that human intelligence/cognitive processes are modifiable. These assessment approaches have been advocated as being more equitable as they are purportedly less reliant on prior acquired knowledge and environmental exposure (Das et al., 1994; Haywood, 2012). Consistent with previous research, albeit limited (Jepsen & Lidz, 2000; Kyrö-Ammalä & Mättä, 2011; Lidz & Greenberg, 1997; Lidz, Jepsen, & Miller, 1997), the current study explored the use of a DA and the Das et al. (1994) cognitive processing approaches to assessment.

**Dynamic Assessment (DA)/Mediated Learning Experience**

Dynamic Assessment (DA) is an interactive assessment procedure which most often involves a test-teach-test format of assessment. By introducing teaching/mediation of cognitive and metacognitive concepts as part of the assessment procedure, DA circumvents the limitations of making the assumption that learned knowledge and developed skills at the time of assessment are necessarily indicators and predictors of future learning (Haywood & Tzuriel, 2002). While there are a range of approaches to DA (Haywood & Lidz, 2007), the approach used in this study is based on Feuerstein’s (Feuerstein et al., 1979) theory of Structural Cognitive Modifiability. Feuerstein made the distinction between direct exposure to learning and learning through the assistance of a human mediator, which he termed Mediated Learning Experience (MLE). Parents, substitute adults and peers are amongst those conceived of as mediators playing a key role in influencing children’s learning and development (Tzuriel, 2001). According to Feuerstein less than optimal cognitive development can be related to inadequate exposure to MLE or to limitations experienced by the child which hinder his or her ability to benefit from MLE.

Feuerstein believed that certain interactive cognitive and metacognitive processes/functions and strategies form the essential building blocks of efficient thinking at the input, elaboration and output level (Feuerstein & Feuerstein, 1991). It is through the process of MLE that these cognitive functions can be acquired or enhanced. While these are not detailed in this article, they were essential in the current study as the facilitator had to be aware of and address the children’s deficiencies in the MLE intervention. Feuerstein, Feuerstein, Falik, and Rand (2002) suggested 13 criteria of MLE, three of which were defined as necessary and sufficient for an interaction to be classified as MLE. These three are intentionality and reciprocity (conveying to the child that the assessor intends to help him or her to improve), meaning (sharing the purpose of the activity) and transcendence (linking the activity to
other contexts in which the skill can be used). The remaining MLE criteria are thought to be culturally related and task dependent.

Research has shown the usefulness of MLE as a vehicle for the promotion of cognitive development in a number of countries, across different age ranges and in a variety of settings ranging from regular to special education populations (Boers, Janssen, Minnaert, & Ruijssenaars, 2013; Isman & Tzuriel, 2008; Lantolf & Poehner, 2010; Murphy & Maree, 2009; Russell, Amod, & Rosenthal, 2008; Seabi & Amod, 2009; Tzuriel, 2013). Based on his work within the South African context, Skuy (2002) affirms that the MLE approach is versatile and adaptable in that it can be applied within a range of contexts and programmes. Hence, in the current study the concept and principles of MLE were used in the remedial intervention programme that was designed to develop planning skills.

Despite the appeal of the DA approach, it is not widely applied by clinicians. This can be related to the amount of time it takes to administer the DA procedure as well as the cost involved (Sternberg & Grigorenko, 2002). It is also argued that further work is needed in relation to the transmission of DA assessment findings into appropriate classroom teaching practices (Haywood, 2012; Lauchlan, 2012). Ongoing empirical research is recommended to support the reliability and validity of DA (Haywood).

### Planning, Attention, Simultaneous and Successive (PASS) Model

Grounded in Luria’s (1973) neuropsychological work, Das and his colleagues (Das et al., 1994) developed the PASS theory of intelligence. According to Luria (1966), there are three functional units in the brain. The first unit regulates cortical arousal and attention; the second unit codes information using simultaneous and successive processes; and the third unit relates to the planning, self-monitoring and structuring of cognitive activity. The PASS information processing model is espoused as providing a broader conceptualisation of intelligence which aids in diagnosis and remedial intervention programming (Das & Abbott, 1995).

Guided by PASS theory, the Das–Naglieri Cognitive Assessment System (CAS; Naglieri & Das, 1997a) was developed as a norm referenced individually administered test. The CAS instrument is purportedly less influenced by differences between cultural and linguistic groups as the tasks are novel and there is a reduced reliance on expressive language and learned information (Naglieri, Rojahn, Matto, & Aquilino, 2005; Otero et al., 2013). In a study conducted by Naglieri et al., the CAS was individually administered to a sample of 298 Black students and 1692 White students, ranging in ages from 5 to 17 years old. The results showed that the Full-Scale score differences between the Black and White students were smaller using the PASS theory than with traditional IQ assessment. Studies have also been conducted which illustrate its usefulness in the assessment of children experiencing barriers to learning and in the development of intervention programmes based on PASS processes (Huang, Bardos, & D’Amato, 2010). There is a strong relation between PASS scores and academic performance (Otero et al.).

A number of research studies demonstrate that children benefit from instruction based on their CAS cognitive processing profile. Naglieri and Johnson (2000) and Haddad et al. (2003) found that children with a weakness in planning benefitted more from instruction matched to that weakness as compared to children who had weaknesses in other PASS processes or no planning weakness. More recently, Iseman and Naglieri (2011) also presented research findings that suggested that planning-based strategy instruction improved
children’s planning behaviour. Moreover, improved planning strategy use led to improved academic performance amongst children in both regular and remedial education settings. The researchers found that planning strategy instruction can be used in 10 min sessions integrated within a specific academic content area such as mathematics. They did however, acknowledge that a limitation of their study was the small sample size.

There is generally a dearth of published research on measures of cognitive assessment in South Africa (Amod, 2013). Nevertheless, a study conducted by Reid, Kok, and van der Merwe (2002) found that the Full-Scale score on the CAS was a good predictor of reading success or failure for a group of Black Grade 6 learners in an urban school in South Africa.

The factor structure of the CAS and its construct validity has been challenged (Kranzler & Keith, 1999). It has been argued that the Planning Scale of the CAS is more an assessment of perceptual speed than of planning and that there is insufficient factorial support for the PASS model (Carroll, 1995). Broad scale, well-designed studies on the CAS could further address the issues raised in the literature.

A novel CAS/Group Dynamic Modification (CAS/GDM) screening procedure developed by Lidz and her colleagues (Jepsen & Lidz, 2000; Lidz & Greenberg, 1997; Lidz et al., 1997), illustrated the potential usefulness of the CAS within a dynamic assessment procedure. The CAS/GDM was applied to adolescents with cognitive delays, those with multiple handicapping conditions as well as to regular education learners. Research findings suggested that the learners were responsive to group mediated intervention as shown by their post-test gain scores and that group dynamic assessment procedures using the CAS are useful in providing teachers with information regarding learners’ response to intervention and for screening learners who would benefit from more in-depth assessments (Jepsen & Lidz).

The overall aim of the current study was to explore the effectiveness of a MLE-based remedial intervention programme in developing the planning skills of Grade 4 and 5 learners as measured by the CAS. The following hypotheses were formulated:

1. The experimental group’s post-test scores on the Planning Scale of the CAS should improve after mediation has taken place.
2. The experimental group’s results and performance on the Planning Scale of the CAS should show greater improvement on the post-test results than the control group.

Methods

Research Setting and Participants

This research study was conducted at a private remedial school situated in Johannesburg, South Africa. The school accommodates learners from Grade 0 (reception year) up to Grade 7 (end of primary school). There are no more than 15 learners in a class. The school educates children experiencing a wide range of barriers to learning including specific learning disorders, Attention-Deficit/Hyperactivity Disorder (ADHD), receptive and expressive language disorders, autism spectrum disorders and reading and writing disorders. Barriers to learning also include children who have had insufficient mediation from their home and previous school backgrounds. By virtue of the relatively high fees paid at this school, the learners are predominantly from middle to upper socio-economic environments. A diverse range of language and cultural backgrounds exist within the school.
Out of the 60 children that were invited to participate, four parents did not give consent for their children to be tested but allowed them to take part in the intervention, and five children left the school before post-testing could be completed. The final sample, therefore, comprised of 51 children. The age range of the experimental group \((n = 26)\) was 9 years 3 months to 11 years 11 months \((M = 10\) years 5 months), while the age range of the control group \((n = 25)\) was 9 years 6 months to 12 years 1 month \((M = 10\) years 6 months). Table 1 reflects that these two groups were similar in terms of socio-demographic variables.

**Measures**

The CAS (Naglieri & Das, 1997a) which is normed for children aged 5 to 17 years was used in this study as the pre-testing which took place prior to the intervention had commenced before the publication of the revised CAS–Second Edition (CAS2). The Standard CAS Battery comprises the following levels of measurement: the Planning, Attention, Simultaneous and Successive (PASS) cognitive processing Scales; the Full Scale; and three subtests within each of the PASS Scales. The CAS provides a standard score for each PASS process as well as a Full-Scale standard score \((M = 100, SD = 15)\). For purposes of this study the Planning Scale which can be used independently (Das, personal communication, 03 September 2015) was employed to assess the effect of the MLE remedial intervention on the planning ability of children within the experimental group. The pre- and post-test scores of both the experimental group and the control group were obtained using the three Planning subtests of the CAS.

The Planning Scale of the CAS was chosen due to a large body of research supporting the importance of planning in many aspects of learning, especially for children experiencing learning difficulties. For instance, planning has been related to achievement in maths (Iseman & Naglieri, 2011) and reading comprehension (Haddad et al., 2003). Moreover, children taught to use planning strategies when engaging in academic tasks show an improvement in their level of performance (Iseman & Naglieri). The Planning subtests of the CAS consist of Matching Numbers, Planned Codes and Planned Connections (see Naglieri & Das, 1997b). The purpose of these timed subtests is to find, develop and use an effective strategy to solve the timed paper-and-pencil tasks. A Strategy Assessment Checklist has been developed by the test developers, for the assessor to record the observed or reported cognitive and metacognitive strategies that the testee uses to complete the subtests of the Planning Scale.

The reliability coefficients for the Standard Battery are: Planning = .88, Attention = .88, Simultaneous Processing = .93, Successive Processing = .93 and Full Scale = .96 (Naglieri & Das, 1997b). Naglieri and Das (1997b) and Naglieri (1999) report extensive research that provides construct-, criterion- and content-related validity evidence for the CAS.

**Table 1.** Socio-demographic variables.

<table>
<thead>
<tr>
<th></th>
<th>Experimental Group ((n = 26))</th>
<th>Control group ((n = 25))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Age</strong></td>
<td>10 years 5 months</td>
<td>10 years 6 months</td>
</tr>
<tr>
<td><strong>Gender: Male</strong></td>
<td>23 (88%)</td>
<td>20 (80%)</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>3 (12%)</td>
<td>5 (20%)</td>
</tr>
<tr>
<td><strong>Race: Black</strong></td>
<td>7 (27%)</td>
<td>7 (28%)</td>
</tr>
<tr>
<td><strong>Indian</strong></td>
<td>7 (27%)</td>
<td>6 (24%)</td>
</tr>
<tr>
<td><strong>White</strong></td>
<td>12 (46%)</td>
<td>12 (48%)</td>
</tr>
</tbody>
</table>
Procedure

A quasi-experimental pre–post-test control group design was adopted for the purpose of this research. A convenience sampling approach was used. In an effort not to disrupt the learning programme, a Grade 4 class and a Grade 5 class were randomly drawn to be included in the experimental group, while the other Grade 4 and 5 classes were assigned to the control group. All the participants in the study underwent an individual assessment of the Planning subtests of the CAS by a trained examiner, during the pre-test and post-test phase. The experimental group underwent a weekly one-hour MLE intervention programme for 10 weeks.

The experimental group was divided into smaller self-selected groups consisting of 3–4 participants each. The MLE intervention programme was tailored around the popular television series Survivor as part of the Life Orientation learning area. The focus of this learning area within the South African educational curriculum is on the holistic development of learners (personally, socially, intellectually, emotionally and physically). In each of the intervention sessions, participants were presented with different activities/challenges which were specifically designed to develop cognitive strategies in order to enhance their planning skills. A week-by-week break down of the activities used by the facilitator (the second author), is presented in the Appendix 1.

Central to the MLE construct is the distinctive interactional engagement between the mediator and the learner to facilitate optimal cognitive and socio-emotional learning (Feuerstein et al., 1979). Mediation was based on the criteria for mediated learning which included mediation for intentionality and reciprocity, meaning, transcendence, competence, self-regulation and control of behaviour, goal-setting and planning, sharing behaviour, as well as mediation of challenge (see Feuerstein et al., 2002). The first three criteria as defined by Feuerstein et al. (2002) and as applied to this study are elaborated upon below as they are essential for every interaction in order to be regarded as MLE. The same is done with two additional criteria, namely, self-regulation and control of behaviour as well as sharing behaviour as an illustration of the application of the group MLE intervention procedure.

Implementation of Criteria for MLE

Intentionality and Reciprocity entails that the mediator deliberately guides the child to focus and attend to the stimuli. The mediation process needed to be relevant and interesting enough to maintain the participants’ attention and provide them with motivation. The television show Survivor seemed to be a way of developing enthusiasm and interest. Providing new and stimulating challenges each week, which tapped the use of planning strategies, kept the attention of the participants.

Meaning is mediated when the mediator conveys the significance and purpose of the activity, shows interest and emotional involvement and elicits an understanding of what should be done. Prior to starting the weekly activities, the relevance and importance of planning was discussed. The participants were asked to generate ideas about how planning is important in their own lives; school life, home life and leisure activities. The participants considered how careful planning would enable them to complete the various activities and challenges.

Transcendence goes beyond the immediate experience so that concepts and strategies can be generalised. After each challenge the participants were asked to reflect on how the
planning strategies they had learnt could be applied to other aspects of their lives. At the beginning of each new challenge the participants were asked to reflect on what they had already learned.

**Self-regulation and control of behaviour** assists children to take responsibility for their learning and to develop their attention and metacognitive skills. This was an important strategy to mediate as several participants had attention and self-regulation difficulties. They had to be encouraged to be less impulsive; to stop and think before rushing through tasks. Groups were told that they could not begin a task until they had formulated a strategy and could explain how they planned to proceed. Disagreements and arguments within the groups provided an opportunity to mediate effective ways of problem-solving. Groups were encouraged to work co-operatively and to listen to each other. Participants were asked to evaluate their own performance after each challenge.

**Sharing of behaviour** occurs when the mediator helps the child to recognise the need for cooperation between people both on a cognitive and affective level. It was important to take into account the different temperaments of the participants. They were encouraged to learn to appreciate different points of view and how planning can vary from person to person as well as to be flexible in using different strategies and to explore various ways of solving problems effectively. Shared successes and failures helped to increase motivation and group support.

During the experiential group intervention sessions participants were asked to describe and discuss the planning strategies that they used as well as the strategies that they found to be most or least effective. **Qualitative observations** were made of the participants’ approach and use of strategies in relation to the group exercises and the planning tasks that they were presented with. Observations were also made of the group process and interaction.

**Ethical Considerations**

Ethical clearance to conduct the study was obtained from the Human Research Ethics Committee (HREC Non-Medical) of the University of the Witwatersrand. Once permission was granted by the school’s governing body and the principal, consent was obtained from parents or guardians and assent was obtained from the participants themselves. The invited participants were informed that non-participation would not disadvantage them in any way and that they could withdraw from the study at any point in time. The experimental group participants were requested to maintain confidentiality by not discussing the intervention sessions with their peers in other classes. The control group received the identical 10 week intervention programme once the post-testing was completed.

**Results**

Figure 1 below illustrates the distribution of scores from the pre-test to post-test phases within the experimental and control groups. The pre–post-test Planning Scale means for the control group ranged from 78.48 to 81.56, while the pre–post-test means for the experimental group ranged from 81.88 to 93.53. Given the higher pre-test means of the experimental group as compared to the control group, it was of interest to determine whether the same trend would be retained in the post-test following the intervention.

**Hypothesis One** suggested that the experimental group would indicate an improvement on the post-test Planning Scale after the remedial/mediated intervention programme. Table
2 demonstrates that both the experimental and control groups showed an improvement in post-test scores, probably due to maturation. However, the paired samples t-test result showed statistically significant improvement \( t(25) = -8.09, p < .05 \) only within the experimental group. Attempts were made to control potential confounders, including pre-test score differences. The result supports the hypothesis that the experimental group should show an improvement on the CAS Planning Scale after intervention has taken place.

**Hypothesis Two** postulated that the experimental group would demonstrate greater improvement on the Planning Scale of the CAS than the control group, following the remedial-mediated intervention programme. To test this hypothesis, Analysis of Covariance (ANCOVA) was conducted and the pre-test scores served as the covariates. The results of the ANCOVA yielded a statistically significant difference \( F(1) = 17.88, p < .05 \) between the experimental group and control group. This result supports the hypothesis that the experimental group would perform better on the post-test of the CAS Planning Scale, following the intervention programme.

A qualitative analysis of the results using the Strategy Assessment Checklist (Naglieri & Das, 1997a), showed that after mediation the experimental group showed a greater awareness of the importance of using planning strategies and they used more effective planning strategies as compared to the pre-intervention results and the results of the control group. Moreover, during the post-test phase those children who had previously demonstrated no use of strategies at all appeared to have adopted one or more strategies.

**Table 2.** Pre–post-test comparisons of experimental and control groups.

<table>
<thead>
<tr>
<th>Planning scale of the CAS</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Control Group</td>
<td>25</td>
<td>78.48</td>
</tr>
<tr>
<td>Experimental Group</td>
<td>26</td>
<td>81.88</td>
</tr>
</tbody>
</table>

*p < .05.
Looking more closely at some of the specific strategies, the Planned Codes subtest of the CAS requires the child to fill codes that match a legend at the top of the page (for example, A = OX, B = XX). The subtest score is based on a combination of time and the number of correct responses. Children are permitted to complete the test items on each page, using their own choice of strategies. In the pre-test participants in both the experimental and control groups tended to move from left to right and top to bottom across the page. This could possibly be attributed to the way children are taught to read. Through the process of the intervention the children in the experimental group were taught to be less impulsive, to stop and think and to self-reflect. They were also encouraged to flexibly apply different strategies and to share ideas and strategies that had proved to be effective. During the post-test a notable number of participants in the experimental group switched strategies. For example, in Planned Codes Item 1, instead of going across the page they went down the page and in Planned Codes Item 2 some of them proceeded to complete the codes in a diagonal fashion. These strategies tended to be more effective. Naglieri and Das (1997b) argue that some strategies are more efficient and the choice of strategy appears to be associated with the overall level of CAS performance.

Discussion

The objective of the study was to assess the effectiveness of a remedial intervention programme in developing the planning skills of Grade 4 and 5 learners. The intervention which used the concept and principles of MLE (Feuerstein & Feuerstein, 1991) was designed to enhance the planning skills of these remedial school learners, in their Life Orientation lessons. Hypothesis One suggested that the experimental group’s post-test scores on the Planning Scale of the CAS should improve after the mediation. Results of the matched paired t-test only revealed statistically significant improvement of scores from pre-test to post-test within the experimental group. Hypothesis Two postulated that the experimental group should show a greater improvement on the CAS Planning Scale in the post-test, than the control group. The results of the Analysis of Covariance (ANCOVA) demonstrated a statistically significant difference between the two groups in the post-test. These findings are consistent with previous studies which have demonstrated that deficiencies which may impede test performance are amenable to intervention as well as the use of MLE for the development of cognitive skills in children experiencing barriers to learning (Haywood & Tzuriel, 2002; Jepsen & Lidz, 2000; Seabi & Amod, 2009; Skuy, 2002). They also lend support to previous empirical research which has shown that children can benefit from planning strategy facilitation (Haddad et al., 2003; Huang et al., 2010; Iseman & Naglieri, 2011).

The use of the CAS in conjunction with a DA test-teach-test approach to assessment which utilises MLE-based intervention holds promise for psycho-educational practitioners as such an approach is geared to tap learning potential, to identify learning needs as well as to link assessment with instruction. An approach such as this can mitigate the limitations of over-relying on current functioning which is problematic when children’s test performance is hampered by factors such as barriers to learning, inequities in opportunity as well as linguistic and cultural differences.

The findings of the current study affirm the value of MLE-based principles and modes of interaction as a vehicle to promote cognitive skills. The individual differences of the pre- and post-test scores of the participants in this study, following MLE intervention, indicated that
while some of the participants showed fairly substantial differences in their pre- to post-test Planning Scale scores, others were more modest. This information would provide guidance on the amount and type of intervention that is needed for each child. In addition to this, observations regarding the types of cognitive deficiencies that were present and the level at which they were occurring, also provide information in terms of the type of intervention that is needed. For example, a child whose behaviour is impulsive and unsystematic during the input phase may require different intervention from a child who lacks communication tools during the output phase. Moreover, the information obtained from this type of assessment could be used to provide teachers with more practical advice and solutions in order to assist these children in the classroom.

The emphasis on strategy development was one of the key aspects of the mediated intervention. The mediation of sharing behaviour proved to be an important factor in the development of effective strategies. Participants were able to compare which strategies had worked effectively and which had not. The more aware children are of the types of strategies they can use to plan; the more likely they are to use them, apply them and generalise them to other situations (Iseman & Naglieri, 2011). Observations during the intervention also revealed that children with strengths in one area would often mediate to children with weaknesses in those areas. At times the participants were able to explain certain concepts to their peers more effectively than the facilitator could. These findings support research that shows that peer mediation can be beneficial in producing cognitive modifiability in children (Tzuriel, 2013). They also lend support to approaches that espouse the use of co-operative groups and a more constructivist approach to teaching and learning.

The mediation of self-regulation and control of behaviour facilitated the use of more effective planning strategies. Participants in the experimental group were taught to be less impulsive so that they could gain a clearer perception of the task and explore the task in a more systematic way.

Planning is integral to all activities that require elements of problem-solving, whether in the classroom or in everyday life (Naglieri & Das, 1997b). Training teachers in ways to facilitate their students’ use of planning processes could foreseeably provide beneficial effects in many areas of academic development. Furthermore, as advocated by a large body of work both internationally and in South Africa (Green, 2014; Haywood, 2001; Howie, 2011), integrating a cognitive education and thinking skills programme into curricula to develop children’s cognitive processes and metacognition would be a worthwhile endeavour to facilitate lifelong learning.

**Limitations of the Study and Suggestions for Further Research**

Although the authors have attempted to provide as much detail as possible, the replication of this study may be difficult due to the intricate design of some of the mediational tools. Furthermore, the generalisation of the findings of this study is limited as a convenience sampling procedure was used and the sample size was relatively small. Due to practical constraints, classes rather than individuals were randomly assigned to groups. This could pose a limitation because of pre-determined class groupings.

A similar study that makes use of larger groups, a more representative sample and individualised random assignment would increase generalisation of the results. This study looked specifically at the CAS Planning Scale. Further research could focus on other areas of the
PASS model (Attention, Simultaneous or Successive processing), in order to assess the effects of mediated learning in these areas. The transfer of learning through MLE intervention to academic functioning needs to be examined in future research.

**Conclusion**

Combining DA with the CAS cognitive processing approach to assessment may be a valuable alternative or at least an adjunct to more traditional approaches used to evaluate cognitive functioning. Knowing what a child is capable of with mediation and guidance gives psychologists, parents and teachers, a glimpse of what is possible and opens up new doors of opportunity and means of optimising children’s psycho-educational functioning. Ongoing theoretical- and practice-based contributions to the existing body of knowledge will continue to develop constructive and compassionate approaches to psycho-educational assessment and intervention.

**Acknowledgements**

We would like to thank the school’s governing body, principal and staff who granted us permission to work with the children and to use the school’s facilities. The children are also thanked for their willingness to participate in the study.

**Disclosure Statement**

The authors declare no potential conflicts of interest with respect to the research, authorship, and or publication of the article.

**References**


Appendix 1. Intervention Programme

Pre-Intervention

• Intervention process explained.
• Participants asked to imagine being taken to a secret location in South America. They were divided into teams.
• Participants asked to conduct research at home about the ancient civilisation of the Inca. Research strategies to fulfil this goal were provided.
• Use of a Survivor Strategy Book was explained. Before each session, 10 min would be provided to strategise and plan using their strategy book.
• After each weekly task, 10 min would be devoted to comparing and assessing the most effective strategies.
• 5 min would be used to allocate points for aspects such as time management, group participation and cooperation, effective planning and so forth.

Sessions 1 and 2

• Groups planned and designed a banner representing their tribe, using aspects of the information they had gathered about the Inca.
• Discussion on how planning is needed in everyday life.

Session 3

• Groups search for giant puzzle pieces to construct a puzzle of an Inca Sun.
• 10 min devoted at end of session to discuss team planning strategies and apply this type of problem-solving to everyday situations.
Session 4

- At the top of each of four large pages were the symbols clubs, diamonds, hearts and spades. Each symbol had a corresponding code/picture of kings or queens.
- Symbols without codes/pictures presented.
- Participants needed to quickly and accurately find and stick the picture cards under the corresponding symbols.

Session 5

- The challenge was identical to the previous week’s challenge except the symbols were arranged diagonally instead of vertically.
- After revising some of the planning strategies that were used in the previous session, participants were asked to develop a strategy for this challenge.
- They were asked to reflect on how patterns in their surroundings can help them. Patterns found in art, mathematics and in people’s behaviour were discussed.

Session 6

- Each group was given a sheet with rows of foreign ‘words’. Participants had to find pairs of identical words in each row.
- They then had to match the paired ‘words’ with English equivalents.
- Once they had six English words they had to combine them to form a sentence about the Inca civilisation.
- Participants were given a second chance to complete a different sheet in order to apply group planning strategies that had worked effectively.

Session 7

- Participants required to get their tribe and supplies across a ‘river’.
- The ‘boat’ provided could only carry one person and one box of supplies, or two people and no supplies during a single crossing. Participants had to devise a plan to get everyone across the river in the shortest amount of time.

Session 8

- Participants told that a curse has been placed on one of the team members which has caused him/her to shrink.
- A doll was used to represent the shrunken team member. The goal was to get the doll from one side of the ‘ravine’ to the other without physically touching it. By doing this they could retrieve the magic potion which would restore him/her to their previous size.
- Teams were given 10 Inca gold coins to buy items that could be used to move the doll from one side to the other.

Session 9

- One team member in each group was blindfolded. Other team members were required to devise plans to guide the ‘blind’ person across ‘boulders in a river’.
- Team members were not allowed to touch or speak to the blindfolded person.
- Time was given before the task to plan a non-verbal system of communication
- After the activity, ideas about one-to-one communication were bridged to everyday life.

Session 10

- The final session was used to reinforce, revise and consolidate what had been learned and to discuss the importance of planning.
- Groups were asked to reflect on their successes, failures as well as on their planning skills.
- The facilitator helped to bridge what had been learned to the participants’ everyday lives.
- An award ceremony was held for the group with the most points.