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Bystanders No More: Science Assessment Strategies for Students with a Profile of Dyslexia

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Abstract
Dyslexia is a learning difficulty that is associated with poor reading and writing skills. At the same time students with a profile of dyslexia have other talents such as being creative and good problem-solvers that enable them to excel in science subjects. However, when it comes to achievement in assessment tasks, students with a profile of dyslexia tend to perform worse than their non-dyslexic peers. This is an issue of fairness. A qualitative case study was carried out to explore how assessment practices can be made fairer for students with a profile of dyslexia. This involved a group of science teachers coming together to develop fairer assessment strategies to assess dyslexic students in science. The assessment strategies, which included the use of multiple forms of assessment tasks, more emphasis on practical work and an oral component, and more attention to formatting of examination papers were then implemented in a physics class that included two students with a profile of dyslexia. The outcomes of the study suggest that small changes in assessment practices can be beneficial for students with a profile of dyslexia, allowing them to show what they can do.

Keywords: dyslexia, fairness, assessment, science, teacher collaboration

Introduction

Dyslexia can be described as a learning difficulty that affects the reading and writing skills of students. However, students with a profile of dyslexia may

also experience difficulties with processing and remembering information, co-ordination, motor skills, concentration and personal organization (British Dyslexia Association, BDA, 2018; Crisp et al., 2012). On the positive side, students with a profile of dyslexia can also be creative thinkers and problem-solvers, have an instinctive understanding of how things work and possess exceptional visual spatial skills (BDA, 2018, para. 4). In the science classroom, the traditional difficulties associated with a dyslexic profile may create barriers to learning for students. The difficulties may be related to reading and understanding scientific text; sequencing and remembering numbers and mathematical formulae; attention challenges; and lack of motor co-ordination and clumsiness when carrying out experiments and practical work (Mortimore, 2008; Crisp et al., 2012). However, despite these difficulties, students with a profile of dyslexia can also excel in science subjects (Reid & Fawcett, 2004) due to their lateral thinking skills, their acute visual awareness; their ability to spot anomalies and big-picture thinking (British Science Association, 2021).

As science teachers we have experienced first-hand both the positive characteristics as well as the challenges faced by science learners with a profile of dyslexia. We have seen dyslexic students outshine their peers during science lessons that engaged them in practical inquiry-based work (Ross et al., 2010); involved them in orally debating a socio-scientific issue; or required them to come up with an original solution to a problem. Yet we have also seen them struggle, and show signs of anxiety and low self-esteem (Humphrey & Mullins, 2002; Alexander-Passe, 2015) when they: mis-read words, understood a text in a different way; were called out because of incorrect spelling and untidy handwriting; took a much longer time than their peers to complete a task; and were being assessed and examined.

As professionals working in education, we were concerned that despite the fact that students with a profile of dyslexia had the potential of developing excellent scientific skills that would be valuable for a successful career in science, engineering, and artificial intelligence to name but a few, they were being held back because they were not able to perform well on traditional high-stakes examinations that were the key for entry into further studies and professional careers (Whitelegg & Conway, 2013). As reported by a group of dyslexic youths in a study by Camilleri et al. (2019), the marks obtained in examinations did not reflect their true potential and put them at a

disadvantage in relation to their non-dyslexic peers. This lack of a level-playing-field for all science students (Elwood, 2013) is an issue of fairness.

These concerns led us to the research question that is explored in this paper, that is: how can science assessment practices be made fairer for students with a profile of dyslexia? Like Nisbet and Shaw (2020), we are aware that "no assessment can be completely fair", but we also believe that "assessments can be made fairer" (p. 158). Based on this premise, Marouska, one of the authors, worked with science teachers in her school to develop a fairer school assessment policy for students with a profile of dyslexia. She then implemented the strategies developed by the science teachers with one of her Physics classes, that included two students with a profile of dyslexia. The main aim was to try and ensure that students with a profile of dyslexia had "the opportunity to show what they can do in a relevant way" (Nisbet & Shaw, 2020, p. 159).

Assessing Students with a Profile of Dyslexia in the Physics Classroom

Assessment tasks are used by science teachers, to make a judgement about knowledge, skills and achievements based on evidence that can be collected in an informal or formal context and used both formatively and summatively (Nisbet & Shaw, 2020). They are an integral part of teaching and learning and cannot be eliminated, as without assessment the learning cycle is incomplete (Wiliam, 2013). What can be done is to ensure that assessments are made fairer for all students (Nisbet & Shaw, 2020).

Class based Formative Assessment

In the physics classroom, assessment can take the form of informal interactions between the teacher and students through questioning or class tasks set by the teacher (Elwood & Lundy, 2010). Assessment tasks can range from the use of handouts, fill-in-the-blanks activities, quizzes, notes, inquiry-based learning, and thinking problems, hands-on activities, portfolios, laboratory and practical work, think-pair-share, interactive whiteboard (IWB) activities, as well as homework (Briggs, 2018). Teachers can give students formative feedback to improve their learning and help them to move forward (Wiliam, 2013). For students with a profile of dyslexia, the type of feedback and support provided by the teacher is of utmost importance to enable students to recognise their skills and not only their difficulties (International Dyslexia Association, 2017).

Students with a profile of dyslexia can experience a number of difficulties when completing a class assessment task. These challenges can be due to the fact that most assessment tasks are presented in a written format and although students with a profile of dyslexia may fully understand what the teacher is saying orally, they are unable to follow written instructions to complete class assessment tasks. They might also take longer time than their classmates to complete assessment tasks and struggle with spelling and handwriting (Thompson, 2007). Therefore, when preparing assessment tasks, the teacher needs to take into consideration the needs of all students. In the case of dyslexic students more emphasis on diagrams, and visual tasks, investigation, drama and oral debates and multi-sensory tasks should be considered (Reid & Green, 2007). Using practical and oral tasks for example, tends to reduce the element of writing enabling dyslexic students to show a deeper understanding of scientific concepts (Reid & Fawcett, 2004; Huxham et al., 2012).

School-based Summative Assessment

Summative assessment usually provides an evaluation of a student's work at the end of the learning process. It can take the form of a class test, a school examination or a high-stakes examination at the end of secondary schooling (Elwood, 2013). At school level, school-based examinations held on a half-yearly or yearly basis can determine standards and achievement within the school context. The examinations are considered to be high-stakes since they can be used for promotion to the next level of schooling or for certification purposes. Research studies suggest that dyslexic students experience a number of difficulties with the processing of information in written examinations (Crisp et al.,2012), and as a result they tend to perform significantly worse than their non-dyslexic peers. End-of-school examinations have therefore been shown to create a great deal of anxiety for students with a profile of dyslexia (Antonelli et al., 2014).

Making School Assessment Practices Fairer

A number of strategies can be used to make assessment practices fairer for students with a profile of dyslexia. These can be employed both in the classroom and school context as well as in high-stakes examinations. A simple adaptation in assessment practices ensures that a variety of assessment tasks are used both in the class as well as school-based assessment

(Flint & Johnson, 2011). It can be argued that the sole use of written tests and examinations can be a disadvantage for students with dyslexia. However, the inclusion of tasks such as oral and practical assessment tasks that allow students "multiple opportunities to demonstrate learning outcomes" (Scott et al., 2014, p. 55), are fairer for all students. Other tools, such as PowerPoint presentations, can also enhance their ability to communicate their ideas with others and discuss what they are learning, thanks to visual representations of concepts related to the subject.

The Context

In Malta students can attend State and Independent schools that are co-educational and Church schools which are still single-gender, with some preparing for co-education. State schools cater for the majority of all students attending secondary schools in Malta, while students who attend Church schools are chosen through a lottery system that takes place either at the beginning of primary schooling or for entry into secondary school. Independent schools are fee-paying. The study was conducted in a Girls' Church secondary school which caters for girls between the ages of 11 and 16. The school, which for the purpose of this study will be referred to as St. Clemson secondary school, takes pride in being a Catholic school, and the school's vision statement indicates a commitment to the development of an inclusive and nurturing environment for all students.

Methodology

The research process was based on a qualitative approach guided by self-reflective inquiry (Carr & Kemmis, 1986) and was carried out by, one of the authors, Marouska, who will be referred to as the teacher. The choice of a qualitative approach reflected the teacher's desire to capture the complexity of assessment practices in a physics classroom and provide an authentic narrative of the development of a school assessment policy that was based on the lived experiences of colleagues and students. Using a qualitative methodology, it was ensured that throughout the research process there was attention to detail and comprehensiveness, fidelity to real life and context, specificity to the situation and authenticity and meaningfulness (Cohen et al., 2018).

The study was divided into two parts. In the first part, the teacher worked with a group of science teachers, the Senior Management Team (SMT) and a

dyslexia expert to develop a science assessment protocol taking into consideration the needs of students with a profile of dyslexia. In the second part of the study, this assessment protocol was implemented by the teacher in a physics classroom which included two students with a profile of dyslexia.

Developing an Assessment Protocol

The first part of the study involved the development of a science assessment protocol that was intended to make assessment practices fairer for students with a profile of dyslexia in St. Clemson's school. It involved a group of six science teachers, who taught Physics, Biology, Science or Chemistry and three members of the SMT. They were invited to participate in the study on a voluntary basis and they were given the possibility to opt out of the research at any time that they wished. The small group of teachers and administrators were all genuinely interested in improving the educational assessment of students with a profile of dyslexia. The assessment protocol developed by the teachers was discussed with a dyslexia expert from the University of Malta who had both the academic background as well as the practical expertise in the area of dyslexia. Two students with a profile of dyslexia and who were taught by the teacher were also interviewed in order to obtain their views regarding assessment practices in the school and the improvements they would like to see.

The teachers participated in three focus group sessions, during which they discussed their views about the challenges faced by students with a profile of dyslexia and ways in which dyslexic students could be supported in their science assessment, finally coming up with a set of physics assessment tasks. The teachers were given the opportunity to give voice to their opinions, discuss and debate their views regarding dyslexia, based on an element of collegial trust that ensured honesty and authenticity (Krueger & Casey, 2015). In one of the focus group sessions, the science teachers were joined by a dyslexia expert who was able to extend the discussion and offer insights into the assessment protocol that was being developed.

All the focus-group sessions were audio-recorded and later transcribed verbatim. Throughout the study, all ethical considerations such as fidelity, responsibility, respect for the rights of the participants, the possibility to opt out of the research, and confidentiality (APA, 2020) were adhered to. Furthermore, in line with the ethical requirements of the University of Malta,

approval to conduct the research was obtained from the UM Research Ethics Committee (UREC). An information letter and consent forms which included information about the study were provided for all teachers, SMT staff and students who participated in the study.

Implementing the Assessment Protocol

The second part of the study involved the actual implementation of the assessment tasks that had been developed as part of the school assessment protocol by the science teachers. This was done by the teacher who was teaching a Form 4 Physics class that included two students with a profile of dyslexia. In order to ensure transparency and reliability, a colleague was also asked to observe the teacher while she implemented the physics assessment tasks. Following the implementation phase, the two dyslexic students were interviewed to obtain their feedback regarding the newly designed tasks. The interview was conducted using open-ended questions that allowed the students to express themselves freely and the teacher to probe in greater depth when necessary (Cohen et al., 2018). While we acknowledge that only two students with a profile of dyslexia were interviewed, and that their views can in no way be generalised to all students with a profile of dyslexia, we believed that their feedback could provide valuable insights.

Throughout the implementation phase, the teacher adopted a reflexive attitude (Bolton, 2010). She kept a research journal (McNiff & Whitehead, 2008) in which she recorded her observations and reflections as she implemented the assessment tasks in her physics classroom. Her reflections in this journal allowed her to stand back and be more self-aware about both the research process as well as the outcomes of the study. As an insider-researcher (Merriam et al., 2001) the teacher was able to view the data through her own personal understandings of the context, and as a member of the school community.

Analysis of the Data

The data obtained from the focus groups with teachers, the student interviews, and the teacher's reflective journal were analysed using a thematic approach (Braun & Clarke, 2006). Following Boyatzis (1998), this involved organising the data into specific themes, based on recognising an important category that emerged from the data, encoding this data and finally interpreting the meaning of the data. The reading and re-reading of

the data, in order to establish the emergent themes (King & Horrocks, 2010) enabled familiarisation with the issues raised by the participants of the study. It paved the way for the development of the teacher's understanding of the issues regarding dyslexia faced by teachers in her school and to the resulting change and improvement of both class as well as school assessment practices.

Findings

Current Science Assessment Practices – Challenges Faced by Teachers and Students

Teachers who participated in the study mainly associated dyslexia with difficulties in copying, reading and writing which are manifested as numerous spelling mistakes, lack of confidence when speaking up, and slow reading. Kaylee, an Integrated-Science teacher, explained that dyslexic students "tend to respond to questions like any other student but they find it difficult to write and eventually fare poorly in exams". This difficulty with writing is also described by Petra, one of the students, who stated that "I know the answer, I simply do not know how to write it and if I do there is a chance that the teacher will not understand what I wrote because of my spelling". These views reflect a traditional definition of dyslexia as a language-based learning difficulty, with dyslexia being associated with difficulties related to reading, spelling and pronouncing words (International Dyslexia Association, 2020).

The literature (Reid & Fawcett, 2008) also suggests that students with a profile of dyslexia have specific strengths and skills that enable students to excel in science subjects. These strengths were acknowledged by the teachers, who argued that "despite the difficulties they encounter students with a profile of dyslexia have the same potential or even more in some circumstances than the rest of their peers" (Jack, a physics teacher).

The teachers also described dyslexic students as being creative, had the ability to 'think in pictures', could solve problems and were good in hands-on activities such as laboratory experiments. The students, however, did not seem to be aware of the strengths associated with dyslexia and, when interviewed they did not mention a single positive skill that they could associate with their dyslexic profile.

Based on their definition of dyslexia as a difficulty associated with reading and writing, the science teachers admitted that in their view, the main

challenges they experienced when assessing students with a profile of dyslexia were related to what Kaylee describes as "reading and writing skills". This created problems for the teachers who explained that:

> *when correcting classwork, homework or worksheets, you know that students know the answer, however you cannot give them the appropriate mark. You know that if that particular question was asked orally, they would have got it right. But ultimately you cannot give them the mark because it would be spelled incorrectly. (Lyla, a physics teacher)*

The strong emphasis on writing, also influenced the practical work of students. Even though students with a profile of dyslexia did well in hands-on experiments, they were still required to write a formal laboratory report at the end of the practical task. It was this written report, rather than their practical performance, that was formally assessed. This affected their achievement since, as pointed out by Luna, a Chemistry teacher, "…when the students come to write the report, they find it very difficult and so they lose a lot of marks. As a result, the exam mark will automatically decrease". Likewise, Kaia, one of the students explained that she liked: "doing experiments; hands-on experiments but I disliked the idea that each time a report must be written". The inclusion of written assessment tasks, even when associated with practical class-based activities, can still create problems for students with a profile of dyslexia (Alexander-Passe, 2008; Crisp et al., 2012).

The teacher-participants also expressed their frustration with the formal half-yearly and yearly examinations. These examinations were quite high-stakes in the school of the study, since they determined progress to the next year of studies. In order to ensure fairness and reliability, the science teachers had to use formal marking schemes that did not take into consideration the needs of dyslexic students. Luna was concerned that: "you know that they are capable of doing so much and yet you have to give them a mark that does not reflect what they really know". Likewise, Kaylee very emotionally asserted that: "an examination stresses nearly each and every individual, let alone students with a profile of dyslexia. It is unfair that students know the answer but they are not given the chance to show their true and maximum potential". The main issue here is that formal school examinations are designed for students who fit in a societal norm, can read and write, and can understand what is expected of them by examiners (Gardner et al., 2009). Students with a profile of dyslexia do not fit into this norm, and their experience with examinations

results in a great deal of emotional turmoil that can affect their wellbeing (Antonelli et al. 2014). The two student-participants very aptly described this experience:

> *If I sit the Form 5 examinations next year and I fail them, it means that I failed three years of my life, not to mention earlier years. (Kaia)*

> *When I am faced with the end-of-school examinations, I tend to panic… examinations give me chills…I do study… I truly do but when I see all the writing on the examination paper I panic and forget everything. (Petra)*

Through their discussions, the teachers identified the fact that the school assessment system focused solely on written tasks, including both class-based tasks as well as end of school examinations. This was problematic for students with a profile of dyslexia.

Making a Change: Towards Fairer Assessment Practices

Based on their experiences with the assessment practices of their school, the science teachers were very much in favour of change. They wanted to move away from a "one-size fits all" (Elwood, 2013) system of assessment that was based on reading and writing to one that allowed students to be assessed "using methods and procedures most appropriate to them" (Suskie, 2000, p. 1):

> *The assessment strategies should be implemented in a way that is 'fair', meaning that it should cater for the abilities of the student under your responsibility. Without doubt, each and every student has his/her potential regardless of the difficulties they encounter. (Jack, a Physics teacher)*

Making Use of Different Modes of Assessment and Assessment Tasks

The first change suggested by the teachers in order to make assessment fairer for students with a profile of dyslexia was to replace the annual written and practical examination, including different assessment tasks in the change. Luna summed up the views of the participant-teachers and explained the rationale behind this suggested change: "the system does not cater for all. The system prefers those who do well in written examinations. For the system to be fairer, students must be assessed throughout the whole academic year by using different types of assessment". This would allow the distribution of

marks across a variety of tasks rather than a single examination and practical task. This is aptly argued by Sosibo and Ivala (2021) where they state that "classroom teachers should recognize that learners have different learning styles" (p. 68). It would also allow "a range of different learning outcomes to be assessed" (Berry, 2008, p. 15), and cater to the different strengths and abilities of students (Scott et al., 2014).

The students were also in favour of this change since they believed that different forms of assessment would allow them to achieve better in science, and in Kaia's words: "if you do not do so well in the examinations, you will not give up as there are still some marks gained from, for example, practicals, quizzes and so on."

The teachers, therefore, proposed a system where students could obtain marks from different tasks (Table I), including the use of tasks based on diagrams, posters, power-point presentations and graphic organisers. Flash cards and game cards were also introduced, together with an IWB quiz activity. Emphasis in the design of these tasks was placed on visualization, which "is undoubtedly a powerful tool for learning… and also the preferred approach of many but not all, students with dyslexia" (Mortimore, 2008, p. 201). Students were also encouraged to participate in the lessons and marks were allocated for participation.

Table I: *Percentage of Marks Allotted to the Different Types of Assessment*

Assessment	**Percentage Mark**
Class based activities	15
Practical activity	30
Written test	30
Oral assessment	15
Participation	5
IWB quiz activity	5

More Emphasis on Practical Work

Prior to the current study, practical work was allotted 15% of the total marks given at the end of the scholastic year. This was in line with the protocol of the national Secondary Examination Certificate (SEC) Physics examinations. However, the science teachers participating in the study agreed that more emphasis should be given to practical work. As a result, the proposed assessment protocol allocated 30% of the marks for practical work, to be included in the students' final assessment at the end of the year. Like educators in other studies (Glazzard, 2010; Reid & Fawcett, 2004), the teachers believed that students with a profile of dyslexia enjoy themselves more when conducting experiments and tend to come up with creative and innovative ideas: "When students with a profile of dyslexia are asked to perform hands-on activities they tend to be happy and participate a lot. However, when it comes to writing, students tend to withdraw from the activity" (Luna, chemistry teacher).

The Introduction of an Oral Component

The participant-teachers suggested a real change to help dyslexic students feel more at ease during assessment, namely an oral component with an allotment of 15% of the marks. Including an oral component has many advantages for students with a profile of dyslexia. It allows them to communicate verbally their understanding of scientific concepts which they might have difficulty putting in writing (Huxham et al, 2012; Reid & Fawcett, 2004). The teachers were all in favour of this change:

> *When you ask them questions orally, students with a profile of dyslexia participate and they reply very well. But when it comes to writing, they literally blank and find it hard to concentrate. So, why not give them a chance to express themselves? (Sophia, teacher)*

The science teachers agreed that, as part of their science assessment the students: would be given pictures to orally explain scientific concepts; shown diagrams of experiments; asked to orally explain what was happening; and asked traditional questions orally. In order to reduce the stress and anxiety that can be caused for dyslexic students when having to speak in front of their peers (Huxham et al, 2012), the oral assessment was conducted in a private setting that involved only the student and the teacher.

Changing the Format of the Written Examination

The written test, which was allotted 30% of the final mark, followed the traditional approach. It assessed knowledge and understanding through writing. However, in light of the discussions held with the teachers, more attention was given to the actual formatting of the examination paper. Using the Dyslexia Style Guide, published by the British Dyslexia Association in 2018, Amelia, the dyslexia expert, suggested a number of good practices in order to make the written examination easier on the eye for dyslexic students:

> *Fonts like verdana, century gothic or antique all help some of the students with a profile of dyslexia. Also, the paper should not be white - it should be on the slightly beige side so as to account for the visual stress. The use of borderlines and highlighters, appropriate font, adequate line spacing, clear images as well as appropriate graph papers and coloured papers help students with a profile of dyslexia to read and write during examinations.*

Taking this advice into consideration, the examination paper was printed on non-white paper, some key words were printed in bold to make them stand out and the respective marks were put next to each question. The general layout of the text was also designed carefully and included diagrams and pictures to help students visualise the concepts that were featured and questions started and finished on the same page so as to avoid any turning over pages. The teachers believed that these small changes would "be beneficial for all students, let alone those with a profile of dyslexia" (Pearl, the Head of School).

Does it really work? Evaluating the new assessment protocol

In order to evaluate the implementation of the new assessment strategies, Marouska, one of the authors, made use of the different strategies suggested in the previous section, while covering the topic 'Newton's Laws of Motion', in a Form 4 physics class, which included two students with a profile of dyslexia. These students were interviewed to obtain their feedback about the new assessment protocol. Although we acknowledge that the views of two students do not allow for any generalised assumptions, we hoped that Kaia and Petra would provide us with some insights and act as a springboard for reflection on the suggested changes in assessment practices.

For Kaia and Petra, the newly-introduced oral component in the science assessment was the most effective strategy introduced by the teacher-researcher. They agreed that the oral component gave them the opportunity to express what they had studied, what they knew and it enabled them to show their true potential:

> *We had ample time to go through the pictures and oral assessment alone in a quiet place before entering the classroom. That helped me a lot to concentrate and distinguish the difference between the pictures. So apart from the fact that I had less pressure on me that I need to write the answer, I also had less pressure in how to read the question. (Petra)*

An important aspect of oral assessment is that it is carried out within a safe space where the students do not feel threatened (Reid & Fawcett, 2004). The students felt that in a friendly environment, they could be themselves and develop the confidence to show what they knew:

> *I really liked the idea of oral in Physics but the most important thing is that orals and presentations should be done in front of the teacher only – exactly as we did them and not in front of the whole class. (Kaia)*

The students also enjoyed the assigned practical tasks. Kaia explained that she especially enjoyed working with her peers and the fact that she was doing something hands-on and which did not involve much writing:

> *There were different kinds of assessments which I liked doing such as the orals, handouts - pack, small tests, quizzes but mostly the practical activity. I believe that marks related to experiments are all 'bonus' for me as I prefer doing things with my hand rather than giving me chunks of paragraphs and I have to always struggle with reading and writing them. (Kaia)*

The students also made positive comments about the different class activities that they were assigned. The use of activities using diagrams, games and technology enabled the students to see learning as fun:

> *I really enjoyed answering questions using diagrams or games. Computer games, bingo and snakes and ladders, apart from the fact that they were fun games, they also made it easier for me to participate and words on a computer tend to be seen clearer than printed on a piece of paper. (Kaia)*

They appreciated that the format of the class activities was very student-friendly and, following suggestions made by the British Dyslexia Association (2018), included specific fonts, yellowish paper, concise instructions, proper spacing and the use of visual images. These small adaptations do not take a great deal of effort on the teacher's part, but can make a big difference in the achievement of students with a profile of dyslexia.

The students' feedback was shared with the science-teacher participants who had contributed to the development of the assessment tasks. Faced with the positive feedback provided by Kaia and Petra, the science teachers agreed that at least within their school they should attempt to change their assessment practices: "Why let the students suffer by the current assessment tasks? We can change the school assessment policy of science subjects and it will surely help students with a profile of dyslexia" (Lyla, a physics teacher). However, although the teachers were all in favour of making changes, they had one major concern, that the school changes would not be reflected in the high-stakes SEC examinations, and that this would place all students, including those with a profile of dyslexia, at a disadvantage:

> *I think that throughout the scholastic year, we as teachers can do so much practice to help students with a profile of dyslexia. We can do oral examinations, concept maps, games and many more. But at the end of the day students are faced with MATSEC examinations so if MATSEC does not change its assessments, the practice performed in class is useless. If the things we do were to be reflected by MATSEC, it would be a totally different story.*

This points to the need for more discussion and more collaboration between teachers in schools and examination boards, in order to ensure consistency and at the end of the day fairer examinations for all students.

Final Reflections and conclusions

The findings indicate that students with a profile of dyslexia stand to benefit when assessment practices in science are varied, include practical and oral tasks, and examination papers are formatted in a way that makes it easier for them to understand. Making science assessments more multi-sensory and dyslexia-friendly enables students with a profile of dyslexia to overcome their problems and allows them to celebrate their talents (Hudson, 2021). While it might be easy for teachers to stick to what they are familiar with and emulate the high-stakes SEC examinations by focusing on written assessment tasks,

this study shows that there "are many minor changes and adjustments that could be easily implemented and these have a significant impact on the learning success and achievement of children who experience challenges" (Scott et. al., 2014, p. 63). As highlighted in this study, these changes can be brought about by teacher dialogue, collaboration, and a willingness to change (Elwood et al., 2015).

The study also raises questions about fairness and the consequences of introducing fairer assessment practices in schools, without considering them within the wider context of national assessment practices and policies. We started off the study on the premise that science assessment practices in the school under study were not allowing students with a profile of dyslexia to show what they could do – and that as educators we could strive to make assessment practices fairer. The (science teacher) participants, however, raised the question of whether implementing such changes only within the school context would, in itself, be unfair for students with a profile of dyslexia. The SEC examinations follow rigid rules and regulations, focus on reading and writing and do not use the recommended formatting for students with a profile of dyslexia (Camilleri et al., 2019). Therefore, as argued by the science teachers, students who have been allowed to celebrate their success in school science assessments might end up being disillusioned by their performance on SEC science examinations. Further work is needed in our thinking about the consequences of fairer assessment, and a dialogue needs to be established between all stakeholders in education in order to ensure that assessment practices can be made fairer.

We would like to make three suggestions that can ensure fairer assessment practices for students with a profile of dyslexia. First, assessment practices should ensure that each student is provided with the opportunity to show what they know and can do (Nisbet & Shaw, 2020). Second, teachers and schools should evaluate the impact of their assessment practices within their specific context but also engage in dialogue with other stakeholders in education such as the national examination board, MATSEC (Camilleri et al., 2019). Third, allowing all students, including those with a profile of dyslexia, to participate meaningfully in the decision-making process regarding school assessment practices (Elwood et al., 2015). Following these suggestions, science teachers ensure that students with a profile of dyslexia feel more valued, and are not left behind in the educational 'achievement race' (sic). Through reflection, a positive attitude towards change, and dialogue with

other stakeholders in education, science teachers can help students with a profile of dyslexia believe in themselves, develop their talents, and become the scientists of tomorrow. Then, can we, as educators, truly say that we are bystanders no more.

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