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Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention

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Reflections on the Study's Research Question

While the initial research question of, "What can be learned by incorporating visual supports, as a Tier 1 intervention, for both neuromajority and neurodivergent students, in a kindergarten classroom?" was proposed, permission from the McDowell Foundation was gained to shift the grade-level focus of the study from kindergarten to Grades 1 and 2, given that expressions of interest to participate came from three schools (four teachers) at these grade levels while no expressions of interest had been received from kindergarten teachers. (See Project Design Change note.)

I am pleased to report that *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* had positive outcomes for both neuromajority and neurodivergent students; for teachers who undertook the challenge of reflecting upon, and of intentionally adding, visual supports to their classroom environments; for support staff in classrooms; and for adults visiting classrooms (such as division-based professionals, learning resource/co-teachers, administrators, coaches, consultants, and guest/substitute teachers).

Positive Outcomes for Neurodiverse Students (All Learners)

For neurodiverse students (both neuromajority and neurodivergent learners) – Having visual supports available, and having use and value of the supports being explicitly taught, resulted in:

- Increase in student **independence and problem solving** (reduction in individualized questions to teachers or of individualized pre-teaching and re-teaching/individualized direction or individualized prompting given to students):
    - Increase in **individual problem-solving abilities** (as students could refer to and use the supports available in the classroom to determine their next step in a multi-step process or task, to see how to write a word/sound/letter/number/name/date, et cetera without needing to ask an adult, to understand when, and to where, they would be transitioning next, and so on.
    - Increase in **peer prompting** by referencing a fellow student who asked a question back to a visual support that would answer their question. (The supporting peer, with visual support present, would not only tell the peer what to do next, but often reminded their classmate of how to use available tools in the classroom, thus supporting peer learning and problem solving.) For some anxious learners who may be more comfortable approaching a peer than an adult, to pose questions, because peers referred classmates back to visual supports, the questioner received a more thorough response and often knew what to do next and carried on independently. It should be noted that peer prompting was used within expected limits in classrooms, not as an additional expectation, or burden, on peer learners.
- High degree of **engagement** when tasks were visual (or were visual with movement, interaction, with creative/building/making and/or physical component to the task and/or when paired with low-floor high-ceiling tasks (Liljedahl, https://www.gscsmath.ca/instruction/thinking-classroom, retrieved 2023). In one classroom, manipulating various representations of numbers 11-20 (bulletin board interactive activity) led to a higher

degree of engagement than time on classroom iPads for fellow learners during a station's rotation activity (see Numbers 11-20, from Observation 3).

- High degrees of student **pride** in co-creation of visual supports in the classroom.
- High degrees of **confidence** in explaining the tools available in the classroom and how they can be used, especially when visuals have been co-constructed and/or explicitly taught to learners. This confidence suggests a reduction in anxiety/anxious feelings from learners in the classroom.
- It was exciting to see that use of visual supports could begin to positively impact a shift of power dynamics in a classroom to allow for more **student independence**, contribution to visual supports used in classrooms, and successful peer prompting (a step toward decolonization).
- See also The Benefits of Using Visual Supports for Learners with Explanation and The Benefits of Using Visual Supports for Learners – short list form.

In relation to support for an English-language learner:

When individualized communication (receptive and expressive) tools were created in one participating classroom for an English language learner, and teacher modelled their use to communicate with the student, other students observed this and, without prompting, began to use those visual supports to also communicate with their peer. A future study could examine the benefits of teaching communication visual supports and/or augmentative and alternative communication systems class wide. It is likely with peers using and modelling a communication system, alongside adults, a learner in need of communication supports could begin to use their communication system more quickly than a control peer who is taught using current methods.

See also data within the following links (Student Triangulation Data, Observation Number: Classroom 1, Classroom 2, Classroom 3, Classroom 4).

Positive Outcomes for Teachers

When teachers carefully considered what visuals were created/posted, co-created visuals with their students, critically considered what visuals were displayed and where they were placed in the room, and explicitly taught how and why the visuals are created/displayed, during the course of *Supporting Neurodiverse Learners by Incorporating Visual Supports as a Tier 1 Intervention*, the use of visual supports was shown (as benefits to teachers) to:

- **Reduce the pre-lesson preparation work** of creating a visual to present to learners (as the visual will be co-created as a part of the lesson).
- Reduce the **financial cost** to teachers who may be purchasing materials online or commercially made visual supports.
- **Reduce the individualized prompting** and pre-teaching/re-teaching required for learners to independently follow instructions or procedures. When individual learners were taught how to effectively, and individually, engage with a support created for all learners in the class, fewer individualized supports needed to be created (reduction in preparation time); do note that the need for individualized supports was not completely alleviated. *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*, however, revealed that the need for individualization of visual supports can be reduced by encouraging neurodivergent learners/individual students to interact with whole class visual supports, by teaching the visual support explicitly, and/or by giving an individual student a role that promotes individualized interaction with the whole class visual supports and tools in the classroom. See also *The Continued Need for Some Individualized Visual Supports*.
- **Reduce planning time** for when guest/substitute teachers enter the classroom. Visual supports give a **strong understanding of student expectations** and procedures used by the classroom teacher which reduces planning and descriptions that a classroom teacher must leave for a substitute teacher.

See also Full Study Academic Report – *The Continued Need for Some Individualized Visual Supports*.

Positive Outcomes for Other Adults Working in or Entering the Space

Adults working in, supporting in, collaborating within or visiting classrooms using visual supports as a Tier 1 strategy reported being able to enter the room, look at the visual materials the teacher was using to teach/that were being created with learners, and to feel confident that they **understood student general expectations** and the **expectations of learners in the immediate moment**. They easily understood the tools available with which to prompt a student. They understood the language the teacher was using to teach a concept so that they could easily match/echo/interpret the teacher's directives.

Teachers regularly using Tier 1 visual supports can be assured that adults entering their rooms to support, to co-teach, or to observe will also have a strong sense of the vocabulary/terminology being used and taught in the room. Teachers can be assured that other adults will use **consistent language** when answering student questions, when giving instructions or individualized instructions, and that other adults have been given tools to help learners to be **independent and to problem solve** and so will not need to over-prompt learners. (The time to engage in conversation about and to explain procedures or current tasks when another adult enters the room is reduced.) If it is not possible for adults to talk to each other, in the moment, classroom teachers can feel confident that other adults will have the information they need (because the students do).

Adults working within classrooms participating in this grant project reported noticing students independently referencing visual supports and felt that the presence of these materials was **reducing the need for individualized repetition** of directives and was increasing student independence. These individuals, like me, observed peers referring other peers to the visual supports available and found themselves providing **less direct answers to student questions** and directing students to find a tool in the room that could help them to solve their question.

Although I did not get to talk with any **guest/substitute teachers** during this study, classroom teachers and support persons working in the classrooms reported that guest teachers could reference visual supports to ensure they were using the same procedures and vocabulary that the classroom teacher would have been using. Comments left on

teacher lesson plans by guest teachers, who covered for grant participant teachers during my time with them, commented on the visuals available. Guest teachers mentioned that students knew how to use the visual supports and that they, as teachers, appreciated them because they understood clearly **what to teach and how**. Investigating whether there are other specific benefits of visual supports as a Tier 1 intervention for guest/substitute teachers (and/or barriers) could be a strong followup to this study.

See also the handouts:

How can Visual Supports be Helpful to Other Adults Entering/Working Within the Classroom.

Tips for Consultants and Coaches Based on *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*.

Positive Unanticipated or Collateral Gains/Learnings

Some additional findings, over this study, included discovering the value of teachers of similar grade ranges having the chance for **collegial collaboration and problem solving**, and the value of collegial sharing. Teachers participating in this study had three opportunities to "**see**" (through display of photos of the visual supports in each other's classrooms) what other teachers were doing, and what visuals they were using, to support the teaching of curricular outcomes. This sharing was reported by all teachers in the study to be one of the most valuable aspects of participating in the study. This finding has implications for **professional development opportunities** offered to teachers by school divisions. It urges the inclusion of opportunities for grade alike/similar teachers from different schools (perhaps even different divisions) to **spend time collaborating**. As a followup to this study, investigating formats that can allow such collegial collaboration in cost-effective and efficient ways is an excellent research question.

It was exciting to see that use of visual supports could begin to positively impact a shift of power dynamics in a classroom to allow for more student independence, contribute to visual supports used in classrooms, and successful peer prompting (a step toward decolonization).

Investigating whether the same benefit of collegial collaboration is seen through virtual collaboration as the in-person discussion is another strong research topic and will be examined by this researcher through feedback on the website The Power of Visuals where virtual, self-guided, asynchronous, professional development offerings (refined from those prepared for participating teachers in this research project) will be hosted to share the findings of this research. Contents and visuals of each other's classrooms were presented digitally during *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* with success, though there were in-person collaborative opportunities for participants in this study as well. It should be noted that two teachers in this study worked in the same school, thus having the benefit of spending time in each other's classrooms regularly. These two teachers reported supporting and giving feedback to each other in considering visuals use in their classrooms based on what they were learning over the course of the study.

The vulnerability of study participants was appreciated. Participating teachers were courageous to share, to explain their thinking in how their classroom visual supports and physical settings were structured, and to be open to peer commentary in response during the *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*. (These conversations occurred face to face, and over several weeks of connecting with each other for this study's purposes.)

A Reminder to Consider Environmental Print

When triangulated evidence was collected from students in the grant study classrooms, student interviews revealed that students were aware of environmental print in their classrooms and started to use all available visual supports for a variety of purposes, even if this was not the intent of the environmental print being posted. For example, name tags intended to help students know which locker was theirs were also used to write student names in writing tasks, or teacher labelling of months of the year on stored materials was used to write months in journaling/writing tasks.

Some Identified Barriers/Challenges

The Continued Need for Some Individualized Visual Supports

Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention determined that even when teachers implement whole class visual supports, there is likely to still be a need for some **individualized visual supports** to be created and used with some individual learners in the classroom. **Explicit teaching of how and why to use a visual support** to the whole class, encouraging certain individual students who will benefit from individually **interacting** with a particular visual support (e.g., by showing the class where in the daily schedule the group is by moving an arrow/magnet/symbol, or by turning over or removing completed items in the schedule) does increase interaction with a whole-class visual support for some individual learners. By individualizing ways in which individual learners interact with a whole-class visual support, the need for individualized visual supports can be reduced. (Findings of this study were consistent, for individual learners, with statements within a variety of the references noted on page 31 of this document, including Kay, H. (March 2009), *The Down Syndrome Centre of Dublin Visual Supports for Children with Down Syndrome*; Rutherford, M. et al. (August 26, 2019), *Visual Supports at Home and in the Community for Individuals with Autism Spectrum Disorders: A Scoping Review; Autism: The International Journal of Research and Practice.* 2020 Feb.; 24(2):447-469; Simmons, K.D., Hinton, V., and Padgett, A. (April 2020). *Using Visuals to Promote On-Task Behavior and Independence for Students with Autism Spectrum Disorder*, International Journal of Humanities and Social Science. Vol 10, Number 4.)

Preparation time and material resources, as well as time to access colleagues to debrief and collaboratively problem solve around visual supports being implemented, if a teacher or a school intends to set a professional goal of increasing visual supports and/or using them with a high degree of intentionality and explicit teaching, can be barriers to overcome. I wrote earlier on the value of co-creation of visual supports (see pp. 4-6 of this document). The following materials have been created to support students/schools/school administrators supporting teachers and teachers who wish to undertake adding/becoming more intentional in their use of visual supports. These resources, along with the offering of a visuals bank that can be easily adapted to the aesthetic of particular classrooms, are available on The Power of Visuals, alongside other supportive materials created during this project. It is my hope that this becomes a virtual community

where individual teachers can learn more about the utility of visual supports and will be empowered to begin using, or to refine use of, visual supports efficiently and effectively. Resources created to support overcoming barriers to implementation and use include:

Visuals to Adapt to be Your Own:

Power of Visuals: Visuals Bank

Successful Implementation of Visual Supports as a Tier 1 Intervention:

Power of Visuals: Planning for Success

Intentional, Co-Created, Explicitly Taught Visual Explanation

The Top Three Keys to Visual Support Success – ICE (written)

Top Three Keys to Visual Support Success – ICE (simplified)

Keys to Successful Implementation and Use of Visual Supports as a Tier 1 Strategy

Successful Implementation and Use of Visual Supports as a Tier 1 Strategy – Key Words Summary

Available Reflection/Feedback Tools:

Review/Observation – Visual Supports (Tier 1) Checklist – Sectioned

Review/Observation – Visual Supports (Tier 1) Checklist

Visual Supports (Tier 1) Teacher Reflection Checklist (Teacher self-reflection tool.)

Tips for Consultants and Coaches Based on *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* (Teachers/classroom staff teams or co-teachers can also use in peer pairs to observe each other.)

For Quick Reference or Staff Background Knowledge:

Top Three Keys (Poster with detail on keys to using visual supports successfully.)

Key Reminders for Using Visual Supports Graphic

Benefits to Teachers When Visual Supports are Used Class-Wide

Benefits to Learners of Using Visual Supports – Short List Form (See also Key Reminders for Using Visual Supports Graphic for a shortened visual poster.)

Benefits to Learners of Use of Visual Supports With Explanation

Other Considerations/ Learnings

While this study presented compelling evidence and findings in many areas, many additional questions have arisen that could be strong complements, and followup, to this study. McDowell Foundation has been provided with a list of Potential Followup Research Questions. If you are a researcher interested in collaborating on future research based on this paper/topic, please reach out to Mary Barrow at powerofvisuals@outlook.com. Please also see Intersection of Use of Visual Supports with Other Evidence Based and Promising Practices.

A Reflection on the Purpose, Scope, and Objectives of the Study

Original Study Purpose: To examine what can be learned by incorporating visual supports, as a Tier 1 intervention for both neurotypical and neurodivergent students, in a kindergarten classroom.

Study Purpose Reflection – As has already been stated on page 3 of this document, and is further explained in Project Design Change Note, McDowell Foundation gave permission to shift the original focus of this study from kindergarten to Grades 1 and 2.

Original Purpose (continued): Study will examine impacts of using visual supports with students, taking into account considerations which could include, but that are not limited to, how student engagement, performance/task initiation, classroom interactions, independence, classroom procedures and routines, teacher/staff member workload, and other pedagogical, curriculum implantation, social interaction, emotional regulation and classroom structure factors are impacted by the introduction of visual supports in the kindergarten (revised to Grade 1 or 1-2) environment.

Refer also to comments on pages 3-10 above, which summarized findings toward research question, as there is overlap which is not always replicated below.

Student Engagement – When paired with teacher clarity, clear expectations, exemplars, modelling, opportunities to collaborate or to share ideas and thinking with peers, and/or to create/make visuals while collaborating, the use of interactive visuals and use of visually structured and/or visually supported tasks, in the Tier 1 context, led to **high degrees of student engagement** (even higher than participating at an interactive iPad station in one classroom).

Performance/task initiation – During the course of this study, visual supports were seen to **support comprehension, independence and problem solving** when completing **tasks** independently, and to support **clear explanations and directions by peers** when another student posed a question about what to do next. (Peers referenced visual supports.) Visual supports were helpful in **direction giving, comprehension, content teaching**/tasks, and especially in **multi-step tasks**. When teacher clarity of verbal directions was paired with a visual support, students **got to their tasks quickly**. Peer prompting with available

visual supports was observed by researcher, educational assistants, and participating teachers. And, if adults gave **wait time** to allow individual students to problem solve before prompting, **independent reference** to the visual supports as a problem-solving strategy was seen. (As such, a conclusion is that visual supports paired with wait time or subtle prompting and prompt fading is an effective Tier 1 strategy is reasonable.)

Classroom interactions – Use of visual supports helped **group work** to run smoothly during observations for this study. When visual supports were used to help with receptive and expressive communication for one English language learner, peers started to use visual supports to communicate more effectively with a peer (when the teacher had modelled doing so). Peers prompted each other/responded to each other's questions using visual supports after a teacher had modelled/explained a concept or task with a visual support. (This would add to clarity of responses from peers to each other.)

Independence – Students were able to refer back to concrete visual supports to guide them through **multiple step** processes. This was helpful if a learner left the room and returned, or if a student had simply forgotten the task expectation. If educational assistants or teachers waited, or gave an only minimal, **non-invasive prompt** (that could be **faded** to promote independence), such as a gesture or eye gaze prompt toward the visual support, when students asked the next step in a process, the need for prompting was reduced. Pairing of **wait time**, or minor prompting and prompt fading, seemed to be successful strategies when paired with visual supports as a Tier 1 strategy. It is possible that prompt dependence could be reduced by visual supports being incorporated at the Tier 1 level into classrooms.

Classroom procedures and routines – Visual supports helped to clarify and remind students of expectations and routines. Especially when **new station/rotation procedures** were introduced, or when **movement from classroom to classroom procedures** were happening, students referred often to visual supports to guide their **transitions**. It was noted that the use of a line drawing or colour drawing support, paired with written words, was often helpful in the early years classrooms involved in this study (and, therefore, potentially also in higher grades) due to variation in student independent reading levels/ vocabulary knowledge. (Line drawings or colour drawings, or photographs, aid with **comprehension when the visual supports** are at the developmental level of learners.)

A **visual schedule** was present in each classroom in this study, and in each room during my observations, I saw students either looking at or going up and pointing to the schedule showing the universal applicability of this visual support in classrooms. (For some learners, a review of the daily schedule is helpful; if there are changes to the **general schedule, a review of the daily schedule** will be necessary for some learners, will be useful to many learners, and will not be harmful to any learners.) One classroom teacher noted, during this study, that simply adding an arrow, to show students were in the daily schedule, was supportive to many learners (see Arrow photo 1.HEIC and Arrow photo 2.HEIC). Some learners will need to have an individualized way to interact with the schedule (e.g., being the student who moves the arrow). It is possible that some learners will need different (individualized) schedules or mini-schedules (task strips, activity schedules) to meet their individualized needs. Some learners need an individualized schedule because their schedule differs from that of their peers in the classroom. But, using the classroom schedule as a Tier 1 intervention, and reviewing it daily, or in the morning and in the afternoon, as well as by individually teaching some learners and/or

by motivating some individuals to interact with the schedule, the need for individualized supports will be reduced.

Teacher/staff member workload – By co-creating visual supports with the learners, teacher/staff member preparation, in advance of a lesson, can be reduced. While some time is added to lessons themselves in order to create, and to teach the use of visual supports, because student independence is gained, teachers can spend less time on individualized direction giving and individualized prompting or redirection, and so will recover this time while also teaching independence. Financial output by teachers is also reduced if they are not purchasing (as many/any) pre-made electronic materials or commercialized materials. Related, it was exciting to see that use of visual supports could begin to positively impact a shift of power dynamics in a classroom to allow for more student independence, contribution to visual supports used in classrooms, and successful peer prompting (a step toward decolonization).

Other pedagogical/curriculum implementation factors – It is possible that return of visual supports that had been faded in the classroom can help learners to connect prior learning to current content. *The Science of Learning* tells us that learners need to start forgetting in order to remember (https://cogx.info/).

Social interaction impacts – It was observed in this study that both adults and peers can use visual symbols relating to vocabulary to **communicate** with English language learners. More research in this area (or a collation of research) could be useful. A related followup research question, relating to Alternative and Augmentative Communication, could be, "What could the benefits and challenges of teaching functionality of an Augmentative and Alternative Communication system (that is present in the room because one or more learners is using it) to the entire class?"

Visual supports in **multi-step projects** allowed group members to confirm with each other where the group was, and what to do next, and so helped to focus the work of small groups. Once adults modelled expectations with visual supports, peers **independently** referred peers back to the visual support if the peer asked a question or what to do next. Visual supports incorporated into station/rotation activities led to a high degree of **independence and engagement** with the task (more engagement was seen in a Velcro bulletin board matching numbers to tally marks, dot patterns, and so on, than when students were paired to play math games on iPads – see Numbers 11-20, from Observation 3).

Another benefit of visuals arises in terms of **self-advocacy**. When peers can easily help each other with questions that arise, students get a level of support they require to carry on **independently** during **multi-step tasks**. Students seeking peer support can progress even if they cannot, or are too anxious to, ask an adult or teacher.

Emotional regulation impacts – During this study, students referred to visual supports independently. It can be hypothesized that these supports helped with **comprehension** (and this was witnessed in at least three individual cases) and, therefore, may have **prevented some dysregulation** for students (though this was not definitively proven as a part of this study). It was observed in one of the classrooms that when asked about visual supports available, students referenced a regulation space that had been placed in the room for one particular learner. They described the visual supports (like

breathing and calming supports) in detail even though that area was created for one learner. This suggests there could be merit in introducing and using visual supports to teach **emotional regulation strategies** for all learners in the classroom – if students have interest in what is provided for one learner, it is likely because it could benefit them too. Some of the classrooms participating in this study did have some visual supports around regulation strategies and students could talk about these strategies in detail. A future research question could be, "In what circumstances do students independently apply emotional regulation strategies that were explicitly taught using visual supports?" Students referenced individual calming/regulating visuals for peers, and if they had noticed these, likely could also benefit from having access themselves.

Classroom structure factors – visual supports proved most useful when they were taught with **intent, co-created** with learners, and supported by verbal/additional explicit instruction. **Visual clutter of too many visual supports** meant that learners started to ignore some/all of the supports (sensory overwhelm). However, when visuals are moved or taken away and returned, students pay a higher degree of attention to them. Visuals that are out of sight can be out of mind. So it is important to **review, refresh, and move** visual supports within the room on occasion so that students remember to attend to and use them. The question was raised by teachers participating in this study of what to do if most learners had mastered content of a visual support but one individual, or a few students, were still using it. While *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* revealed that students, even when they were using visual supports less, found **comfort in their presence** (in case the visuals were needed), that visual clutter also prevented learners from using some visual supports (when there was too much visual input, all was tuned out). So, teachers and I discussed taking photos of some of the visual supports and putting them into small **photo albums** (or if a larger version is needed, into a **binder**) for individual or small group use as one potential solution. This could also be a useful solution for learners who need close models to use the visual support at their desk without having to reference up and down.

Key Sources of Data

Key sources of data for this study included:

Observations – see Observation Summaries as well as the observation notes and data from each classroom visit. Each time I visited a classroom, I observed for 60 minutes (or averaged time frame in one case when this was not possible) and noted the number of visual supports seen, visuals referred to directly/explicitly taught and referred to (whole class or individual levels) by adults in the room. I noted when it was apparent a learner was independently accessing a visual. I also collected a list of visual supports noted in each environment each visit (See List of Visual Supports subfolders within each classroom folder below):

Classroom 1

Classroom 2

Classroom 3

Classroom 4

Interview, Survey, and Data Collection Instruments

Pre-Implementation interview and survey data (before I had worked with the participating teachers on rationale for use of visual supports, on what visual supports they might like to add, et cetera). (November and December 2022.)

Mid-Implementation interview and survey data (after teachers had had the initial information and session to create visuals); this data was collected when our group came together a second time, reviewed how things were going, reviewed photographs of visuals in each classroom and discussed next steps for each classroom; teachers invited a collaborative discussion, together, where they felt comfortable to share their thoughts with each other. (Late January 2023.)

Post-Implementation interviews, survey data (when teachers had finished working with me and their other three colleagues from this study). (March-April 2023.)

Within each folder linked above, when administrators, educational assistants or other professionals supporting classrooms gave information or data, I also included and coded this data in the folders. (You will also note that if teachers shared lists of visual supports they were aware of creating, these are also shared in the folders linked below.)

Lists of Visual Supports Reported to have been Created by Participating Teachers:

Teacher list of visuals – Classroom 1

Teacher list of visuals – Classroom 2

Teacher list of visuals – Classroom 3

List of visual supports – Classroom 4 (Teacher of Classroom 4, to accommodate this teacher's schedule, reviewed the list I had kept; teacher had no additions but gave comments in a summary interview.)

Student Data (for Triangulation Purposes)

Up to five students (whose families had signed consent forms and who themselves were willing to talk with me about the visual supports available to them within their classroom) were interviewed during each of my visits. See the folders Student Triangulation Observation 1, 2 and 3 for each classroom.

Classroom 1

Classroom 2

Classroom 3

Classroom 4

Photographic Evidence

During my three visits to each of the four participating classrooms, I collected photographic evidence of each visual support in each classroom. This proved very useful for professional development of participating teachers. (During the course of the study, teachers came together twice – early in the study, as a group to learn about visual supports, their value, and to create visual supports for their classrooms; teachers each had one additional day to prepare visual supports and fill out post-implementation paperwork related to this study, as well as to conduct their final interview with the researcher. For their final day, two teachers worked within their own schools and two teachers came together at our school division's central office.) Teachers found it helpful to see each other's visual supports, and were inspired by what similar grade level teachers were doing and using to teach curricular outcomes in their classes/to support classroom management. It was useful that the teachers got to talk with each other about the photos that were shown at each of our sessions together. Photographic evidence reveals the transition from commercial visual supports to **co-created, intentionally taught visual supports** in some rooms, the reduction in visual supports (visual clutter) in some classrooms, added definition of areas for particular classrooms, or movement of visual supports in classrooms. Collecting these tools was highly valuable and I am grateful to participating teachers for allowing their ongoing use. These photos will be de-identified and are shared at Power of Visuals (categorized).

As a next step in this research it will be helpful to see whether a **virtual community** can be formed with the same (or similar) results where teachers share visuals and have a short, voluntary virtual discussions around a certain topic (including but not limited to literacy visuals, classroom management visuals, numeracy visuals, writing process visuals, and so on). Mary Barrow will be collecting data on this topic through metrics and insights regarding access to The Power of Visuals.

See *Classroom Photos* (© 2022-24 Mary Barrow, *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* and *Power of Visuals*):

Classroom 1

Classroom 2

Classroom 3

Classroom 4

A Review of Research Design

Original Study Scope: Proposed sample size was three kindergarten classrooms selected from Regina Public Schools. Elementary schools that would likely include three teachers and likely three educational assistants; there was potential for involvement of the learning resource teacher if school schedule allowed.

Actual Design – Grade levels of participating classrooms shifted to Grades 1 and 1-2 classrooms, in three Regina Public Schools – but four classrooms were able to participate (two from one school). Expression of interest had been distributed to school administrators of all Regina Public Schools elementary schools looking from expressions of interest from kindergarten classrooms; no kindergarten classrooms expressed interest but four Grade 1 and Grade 1-2 classrooms had, stating that if there were not enough kindergarten classrooms interested, that they were. So, all four classrooms from these expressions were chosen to participate (voluntary participation).

Originally Proposed Duration: Study's original proposed span was between September 2022 and January 2023, followed by time for data analysis, conclusion, and study publication after January. Research phases was proposed to last 10 weeks.

Actual Duration: I am grateful for the McDowell Foundation's flexibility as timelines for consent for research to occur in Regina Public Schools, and the expression of interest process, meant that our research began in November 2022 with my last interviews with participating schools happening late April 2023. Personal medical and family needs, and job role changes delayed my data analysis and this summary report to December 2023. After this phase, in consultation with McDowell Foundation, a decision was made to create The Power of Visuals website.

With this extended timeline, I believe I have been able to present strong findings and strong products because of the McDowell funding and support of Regina Public Schools. All participating teachers also reported that the professional development and support they received was strong. And, as can be seen in Positive Collateral Gains, other school staff members of participating schools, alongside neurodiverse students (both neuromajority and neurodivergent learners) all benefited.

Original Inclusion and Exclusion Criteria (Including Geographical Constraints): Classrooms were selected based on the criteria of having a class that includes a neurodiverse group of learners (some students with neurodivergent diagnoses and neuromajority peers). All participating classrooms had neurodivergent and neuromajority learners within them. Classroom teachers and educational assistants working in the classroom had to be willing to voluntarily participate in the research (this was upheld). School administration (and caregivers of students being interviewed by researcher for triangulation) had to be willing to allow their staff and students to participate in the research. This was upheld. Participant schools were to be elementary schools in Regina Public Schools. Randomized selection will occur from amongst those schools (classrooms) who meet criteria and have volunteered to participate. Classrooms were to be selected from three different schools based on the criteria outlined and expressions of interest.

Comments On Inclusion and Exclusion Criteria Changes: As mentioned above, four teachers teaching Grade 1 or 1-2 put their names forward for selection, so we were able to include all. This meant there was representation from three different schools (with two classrooms being in the same school). It was helpful to see what the benefits of including colleagues from both the same and different schools could be (and this was something that would not have been possible in the original design). Teachers from the same school could provide feedback and support to each other/talk about common visual supports that might benefit learners. One teacher, from the school where two teachers participated, even raised the strong future research question of what could happen if common visual supports were used in primary grade classrooms within all classrooms in their school. But having teachers from a variety of schools, though across similar grade levels, proved incredibly useful for collaborative professionalism and ideas sharing – the teachers helped to develop and guide each other in a variety of areas within and beyond the use of visual supports in the classroom. The informal nature of the time set aside for creation of visuals allowed discussions about literacy, numeracy, curriculum outcomes, dealing with challenging behaviours (and how visual supports might help), whole classroom procedures and classroom management, as well as other topics. Teacher discussions affirmed that their roles and needs, despite being in different schools, were more alike than different. (Liljedahl, P. (retrieved November 27, 2023 https://www.gscsmath.ca/instruction/thinking-classroom.)

Monetary Constraints (Original Design) – Study will be conducted within the budget agreed upon with the McDowell Foundation. Please note that since submission of the first draft of a research proposal on February 7, 2023, Regina Public Schools had agreed to cover the costs of materials and supplies for the research proposal.

Monetary Constraints (Necessary Materials) Comments: Between our original grant draft, when McDowell let us know they preferred not to provide monies for materials that should be readily available in schools, and our final submission of the grant application for this study, a survey and some interviews with Regina Public Schools' kindergarten teachers was used to determine if the materials recommended for this study would be readily available. Teacher responses varied, but schools did not all have access to laminate at all times, to card stock, to coloured paper, to Velcro, or to helpful materials like photo albums, lanyards, wrist key chains, and student floor-markers. McDowell Foundation awarded the amount for materials as requested without Regina Public Schools needing to cover any costs for this study. As a result of the material needs for successful implementation of use of visual supports as a Tier 1 intervention, School-Wide or Administrator Planning Checklist was created.

Initial Study Objectives

- Determine what might be learned by incorporating visual supports, as a Tier 1 intervention, for both neuromajority and neurodivergent students (as gathered through the adult viewpoint). This may include, but not be limited to, challenges, barriers (and possible solutions) as well as benefits, successes, factors for future generalization and success. There could be information to be gained around student independence, teaching factors/requirements for success, social interaction amongst students or other factors, around classroom routines, in terms of curriculum implementation, in terms of pedagogy and in other areas.
- Determine what might be learned by incorporating visual supports, as a Tier 1 intervention, in a kindergarten classroom for adults (teacher, educational assistants, possibly learning resource teacher). There could be information to be gained around factors/requirements for successful use of visual supports, around intensification of workload in relation to use of visual supports (and, if so, perhaps this study can propose solutions to this challenge), around increased student independence, around how and when visual supports are most naturally incorporated into classroom routines, classroom environment, and teaching practices. There could be implications related to pedagogy, curriculum implementation, and in a range of other educational action research areas based on this study's findings.

Summary Comments about Study Objectives: As can be found on pages 4-14 above, and as can be seen in Benefits to Learners of Using Visual Supports – Short List Form and Benefits to Learners of use of Visual Supports with Explanation there were many positive outcomes for all learners (both neuromajority and neurodivergent) in classrooms. Maximum benefit was seen when visual supports were included in classrooms alongside intentionality, co-creation of the visual supports and explicit teaching (the content of the visual and how to use or reference the visual and when a student might do so).

As can be seen in Benefits to Teachers when Visual Supports are Used Class-Wide and Tips for Consultants and Coaches there were positive outcomes for a variety of adults – classroom teachers (**reduction in preparation work** for lessons when visuals were co-created), a **freeing of time** to work with learners individually because students were more independent when they could refer to visual supports, and a reduction in out-of-pocket expenses to purchase electronic or commercialized products if visual supports are co-created. Adults visiting the classrooms (administrators, division-based professionals, educational assistants, coaches and consultants, and guest/substitute teachers) felt confident that they were answering questions that students posed with the same

procedures and vocabulary as the classroom teacher. When adults dropped in and out of rooms or were only in rooms for a short time, they could quickly **understand expectations in terms of the activity or lesson** because of the visual supports being presented. (This consistency, of course, benefits students as well.) Because these successes were noted by supporting adults in classrooms beyond the classroom teacher, and because the teacher of Classroom 1 in this study asked the same thing, there can be benefit in examining what would happen if the same visual supports were used across a span of grades (to support this consistency and common language).

This project did not examine whether there was benefit to families/caregivers because of the use of visual supports, and an excellent followup study could involve visual supports being used and pre-taught in school with students then these supports being sent home. The research could look at whether learning is better generalized, whether increase in conversations about learning at home is revealed, and/or whether caregiver confidence in supporting learner homework is impacted when visual supports are provided to caregivers (and with what instructions).

The background and relevance of the research to teaching and learning adapted to include findings from *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*:

(McDowell Foundation Research Grant application, April 20, 2022, contains original background without the addition of evidence from this study.)

In her recent article, *How the COVID-19 Pandemic Impacts Students' Working Memory and Executive Functioning*, Margaret Foster explained "greater recent life stress exposure was associated with worse performance on measures of long-term and working memory, as well as more self-reported memory problems" (Psycom Pro, November 2021). Haig Kouyoumdjian (July 2012) revealed that for all learners, "words are abstract and rather difficult for the brain to retain, whereas visuals are concrete and, as such, more easily remembered" indicating that especially in times of stress, when processing a lot of verbal information may be challenging, that visuals will be easier to process, and to retain. In November 2020, The United Kingdom Office for Standards in Education, Children's Services and Skills (Ofsted) reported "some children, of all ages and backgrounds, have lost some basic skills and learning because of school closures and restrictions on movement."

At the time of this McDowell Foundation grant application, during fall and winter 2021-22, Regina Public School teachers would agree with the Ofstead and Psycom reports. Schools were reaching out for support for many young learners, and this was reflected in requests for occupational therapist and/or autism consultant support in mainstream classrooms. At that time, over 50 percent of all requests for mainstream autism consultant support, and over 37 percent for all requests for occupational therapy support, were in kindergarten (in Regina Public Schools). Commonly, occupational therapists and autism consultants recommend the use of visual supports. But why not use the same support as a class-wide, Tier 1 intervention, and support anxiety reduction, memory, and independence for all learners (as a Universal Design for Learning in kindergarten (primary) classrooms)?

Comments Following Research Conducted During *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*

Although the grade level of study changed, it remained in the primary range, where there were positive outcomes for neurodiverse (all) learners. Use of visual supports as a Tier 1 strategy was shown to be manageable, and useful, for teachers when teachers were provided with the right supports. Pages 4-10 of this document explain the positive outcomes for youth and adults when visual supports and strategies are used as a Tier 1 intervention and linked documents on pages 12 and 13 can support overcoming barriers to use of visual supports.

Comments Regarding the Relevance of this Research:

While research around the use of visual supports as an evidence-based (evidence-informed) practice for individual learners (as a Tier 2 and/or Tier 3) support was easy to locate, studies looking at what could be learned by using visual supports as a Tier 1 intervention was lacking. *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* affirms that use of visual supports classroom-wide had **positive influences on working memory and executive functioning** (especially time management, problem solving, task initiation and task persistence) for all learners. This study also confirmed Haig Kouyoumdjian's (July 2012) comments about the permanence of visual supports while verbal words are fleeting and so of the benefits of using visuals to support concrete learning (for all learners).

Each of the teachers in this study commented about classroom complexity and the varied skills of learners. The United Kingdom Office for Standards in Education, Children's Services and Skills (Ofsted), in 2020, reported that varying skills and, as a result, increased complexity in classrooms, may have been due to pandemic impacts. Regardless, use of visual supports as a Tier 1 strategy can support learner needs, independence, problem solving, executive functioning, comprehension, and peer-to-peer interactions to help make management in complex classrooms easier for teachers and supporting adults.

While the research was carried out in Grade 1 and 1-2 classrooms, the findings of *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* are likely still **supportive in kindergarten and likely into middle years grades**. One upper elementary classroom used visual strategies and supports under the guidance of one of our study participants with success. As such, a strong followup study could investigate these benefits at higher grade levels too.

Summary Comments Relating to Additional Background, Literature Review, and Citations

(Updated below from original McDowell Foundation Grant Proposal to include the findings from *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*):

The use of visual supports is an established, evidence-based strategy for autistic learners recommended by both National Professional Development Center on Autism Spectrum Disorder (https://autismpdc.fpg.unc.edu/) and National Standards Project, National Autism Center (https://www.nationalautismcenter.org/national-standards-project/). The National Professional Development Center on Autism Spectrum Disorders, by 2010, had found that "visual supports can be implemented with individuals across the age range, beginning in preschool and extending through middle school age." This research project found that using visual supports as a Tier 1 strategy was supportive not only of neurodivergent learners, but also of neurodiverse learners. Learners benefited from the visual supports to support problem solving, transition support, comprehension, executive functioning needs, if they were out of the room during a direction, to increase independence in classroom structures and routines, to support peers who asked questions of them, and to reduce the number of questions posed to teachers. There was promise that visual supports, when taught with intention, and co-created with learners, could support regulation for learners as well.

Effective visual supports in early childhood settings include visual schedules to increase task engagement, visual scripts to encourage social interaction, and picture cues to support play skill development (National Professional Development Center on Autism Spectrum Disorders, 2010 cites Krantz & McClannahan, 1998; Massey & Wheeler, 2000; Morrison, Sainato, Ben, Chaaban, & Endo, 2002). In elementary and middle school, visual supports such as schedules and picture cues have proven effective in reducing transition time, increasing on-task behavior, and in completing self-help in the home (National Professional Development Center on Autism Spectrum Disorders, 2010 cites Bryan & Gast, 2000; Dettmer, Simpson, Myles, & Ganz, 2000; MacDuff, Krantz, &

McClannahan, 1993). Similarly, use of visual supports is a long-standing evidence-based practice for learners with developmental disabilities including Down Syndrome (Kay, 2011). And there has been evidence that using visual supports in early childhood settings can have a positive impact on social/emotional learning, problem solving and (pre) literacy learning for both neurotypical and neurodiverse learners (*National Professional Development Center on Autism Spectrum Disorders, 2010* cites Whitmore et al., 2019, Edwards and Willis, 2000). Use of written directives, visual models, graphic organizers, and demonstrations have been shown to improve comprehension by students as to classroom and/or task expectations and to support problem solving for learners with intellectual disability, autism, learning disabilities, visual or hearing impairment, and ADHD (Mrachka, 2020). Mrachka found that use of visual supports was particularly helpful in helping learners to comprehend new concepts and information so advocates for visual supports as a part of a teacher's Universal Design for Learning in the classroom (2020).

All the above-mentioned visual strategies and supports were used with diverse learners, during *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*, in the classroom to support individual needs or challenges. However, in general, the visuals supported clarity, comprehension of structure and expectations, routine and consistency which helped many learners to be productive and to use their time well in classrooms. Teachers often report, and reported in this study, that meeting the needs of a diverse group could feel overwhelming. If teachers approached the various interventions that individual learners may need as individual add-ons to their work or lessons, this would be overwhelming. However, when **visual supports were part of the planning for lessons and units**, and when they were co-created with learners as a part of the lessons and teaching/learning, there were fewer individualized items to create. And, because all learners understood how the visual tools could be used, if the adults in the room explicitly taught this, peers could support each other easily as well, reducing the need for adult intervention for problem solving.

Teachers have been reporting, and did report in this study, that Covid did impact emotional regulation, social interaction/social skills, independence, and readiness skills for learners in these early years of school (who had less group learning experiences than students who entered Grade 1 and 2 classrooms pre-Covid). As such, use of visual supports is worth the investment given visuals will not only support the neurodivergent learners, who, whether diagnosed or not during the primary grades, will comprise between seven and 20 percent of students in the class (University of North Texas, 2018). Neurodivergent learners often require visual supports to succeed to their full capability. But visual supports were also shown to benefit many other learners within the classroom. There was **no risk of reliance or overuse** of visual supports for those who did not/no longer required the support – these students (as revealed in triangulation interviews) simply were aware the support was there if they ever did need it (and were comforted by this). Students reported not using visual supports for which they had mastered the content. Therefore, the availability of visual supports was harmful to no learner.

While focused on changing nursing practice, Kuney et al. (2015) found "internal forces that drive change included institutional avenues to receive direct staff nurse] input and empowerment to review and implement EBP, clear and open communication with administrative levels, and the recognition of working toward change for the benefit of the patient." The same was proven by *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* to be true in education – as a teacher or classroom

staff member grows in confidence, and sees success for their students from adding one evidence-based practice to their teaching, there is a **higher likelihood that the teacher will either maintain and/or grow the use of this strategy into future teaching years**, or to incorporate other evidence-based or evidence-informed practices into their teaching. Specifically, regarding the use of visual supports, the payoff for adults supporting their use in cost and time savings (if the right supports are in place in schools to support the creation and use of visual supports) is well worth the investments teachers made to incorporate their use.

Please note that *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* did not specifically examine literacy development or the impact visual supports could have on development of reading and writing in the primary grades. This would be an excellent followup project. **Literacy and numeracy support visuals, followed by directive visuals, were the most commonly seen** in the primary grades classrooms that participated in this study. Use of written directives, visual models, graphic organizers and demonstrations were shown, over the course of the research phase of *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention*, to improve **comprehension** by students with regard to classroom and/or task expectations and to support problem solving for English language learners and newcomer students, learners with mild intellectual disability, autism, ADHD, oppositional behaviours, anxiety or anxiousness, and, indeed, all learners in the four classrooms who participated.

Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention revealed that just as use of visual supports can **reduce anxiety/anxiousness** (specifically concerns about what work, how much work, how to know a learner is done and what to do next) (*Division TEACCH*, retrieved Dec. 6, 2023, https://teacch.com/), schedules, mini schedules/task strips, visual tasks and visual directives will **increase task engagement** for learners with neurodivergent diagnoses and neuromajority learners alike. Visuals/visual scripts encourage social interaction, and picture cues support play skill development (*National Professional Development Center on Autism Spectrum Disorders, 2010* cites Krantz & McClannahan, 1998; Massey & Wheeler, 2000; Morrison, Sainato, Ben, Chaaban, & Endo, 2002). *Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention* revealed that the same was true for a variety of learners in classrooms, not just for neurodivergent learners.

In summary, to succeed in the use of visual supports, **teachers need time and materials** to create these. Teachers benefit from time to **collaborate with colleagues teaching the same curricular outcomes** as them. But when this time is given and visuals are produced, they are most successful used with the acronym of ICE in mind. **ICE – Intentionality, Co-creation and Explicit Teaching –** will lead to the success of using visual supports as a Tier 1 intervention for all learners, and for all adults supporting and teaching in classrooms.

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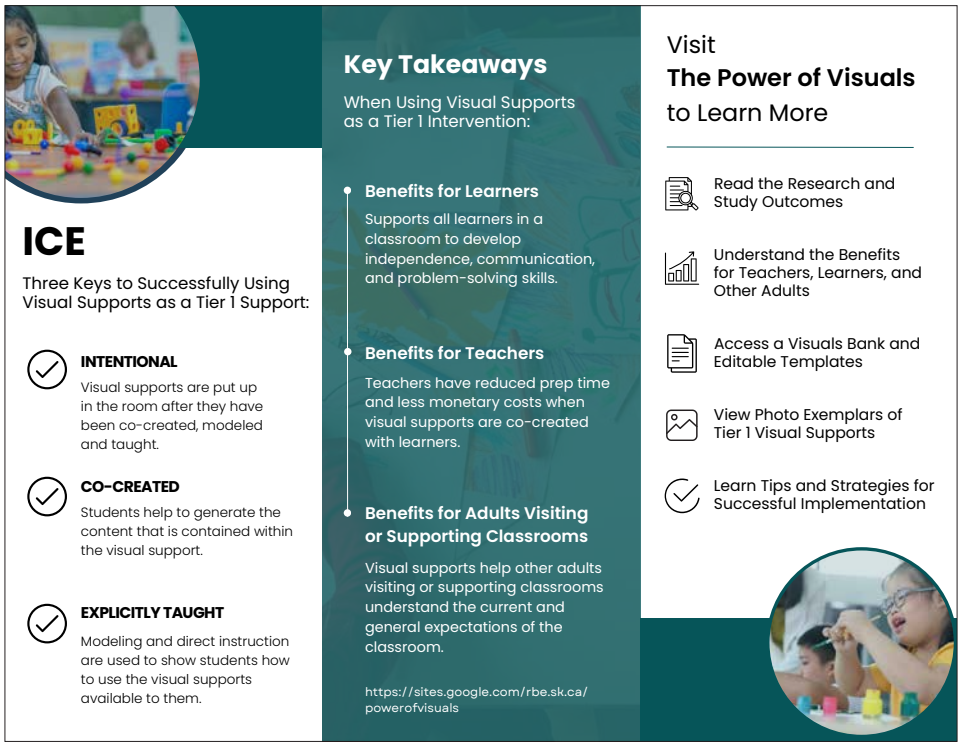
Appendix 1


ABOUT THE POWER OF VISUALS
Supporting Neurodiverse Learners by Using Visual Supports as a Tier 1 Intervention was a McDowell Foundation funded, Regina Public Schools supported, examination of what could be learned by using visual supports as a whole-class support in grade 1, grade 2 and grade 1-2 classrooms.
The study revealed benefits to:
- independence
- problem-solving
- peer prompting
- focus during group work tasks
- reduced teacher questioning
- reduced need for teacher prompting or re-teaching of directions or concepts
The Power of Visuals
https://sites.google.com/rbe.sk.ca/powerofvisuals
"What can be learned by incorporating visual supports, as a Tier 1 intervention, for both neuro-majority and neurodivergent students, in primary classrooms?"
Contact Information
Email
powerofvisuals@outlook.com
Website
https://sites.google.com/rbe.sk.ca/powerofvisuals
To submit additional exemplars contact powerofvisuals@outlook.com
The Power of Visuals
Supporting Neurodiverse Learners Using Visual Supports as a Tier 1 Intervention
Intentional | Co-Created | Explicitly Taught
A McDowell Foundation Funded and Regina Public Schools Supported Project
McDowell FOUNDATION


ICE
Three Keys to Successfully Using Visual Supports as a Tier 1 Support:
INTENTIONAL
Visual supports are put up in the room after they have been co-created, modeled and taught.
CO-CREATED
Students help to generate the content that is contained within the visual support.
EXPLICITLY TAUGHT
Modeling and direct instruction are used to show students how to use the visual supports available to them.
Key Takeaways
When Using Visual Supports as a Tier 1 Intervention:
Benefits for Learners
Supports all learners in a classroom to develop independence, communication, and problem-solving skills.
Benefits for Teachers
Teachers have reduced prep time and less monetary costs when visual supports are co-created with learners.
Benefits for Adults Visiting or Supporting Classrooms
Visual supports help other adults visiting or supporting classrooms understand the current and general expectations of the classroom.
https://sites.google.com/rbe.sk.ca/powerofvisuals
Visit
The Power of Visuals
to Learn More
Read the Research and Study Outcomes
Understand the Benefits for Teachers, Learners, and Other Adults
Access a Visuals Bank and Editable Templates
View Photo Exemplars of Tier 1 Visual Supports
Learn Tips and Strategies for Successful Implementation

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