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Developing Letter-name Knowledge in Low-achieving Adolescents – The Effect of Alphabet-only Intervention

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Abstract

The purpose of this study was to investigate the efficacy of using alphabet-only intervention on developing the acquisition of letter-name knowledge in 14-year olds who have been streamed into the vocational education track in Singapore based on outcomes of the national Primary School Leaving Examination (PSLE). The quantitative and qualitative findings point to a pattern of mixed results.

Introduction

Low-achieving Adolescents in Singapore

Education poses high demands on the competency of students' reading and writing skills. In Singapore, adolescents with limited literacy skills in the English language may face huge challenges in their education and are at risk of failing the national PSLE taken at the sixth year of their primary school education. Low-achieving adolescents, who have failed the nation-wide assessment represent the lowest 0.5 percentile of the Singapore student population, would substantially benefit from improvement in their reading and writing skills.

Up till now, academic studies on literacy have been directed towards younger students, student populations with specific learning or behavioural difficulties, heterogeneous groups of adolescents, while research on the reading and writing skills of low-achieving students has been rather scarce (Trapman, 2015, p. 2). This study focuses on a sample of low-achieving adolescents enrolled in a Singapore secondary school that specialises in vocational curricula and examines the effect of an alphabet-focused literacy intervention on letter-name knowledge (LNK).

Role of LNK in Literacy Acquisition

The mastery of letter-name knowledge is a landmark accomplishment for successful alphabetic literacy acquisition (Paige, Rupley, Smith, Olinger, & Leslie, 2018, p. 2). This learning requires students to be familiar with identities associated with each letter: (i) its graphic shapes, namely the upper case and lower case forms of each of the 26 graphemes of the English alphabet; (ii) its name (Piasta & Wagner, 2010, p. 8), including speed in naming letters accurately as it denotes efficient access to foundational knowledge that is important for orchestrating higher order reading processes (Clemens, Lai, Burke, & Wu, 2017, p. 273). Additionally, familiarity with tasks in which letters are identified on a serial basis share similar characteristics to reading text in which words are processed in serial fashion

and may serve as proxies for an ability to process symbols and information in a serial manner (Clemens et al., 2017, p. 273).

In a comprehensive review of the research on how letter-name knowledge (LNK) intervenes in early and formal reading development, Foulin (2005) highlighted two main contentious issues. Firstly, most studies on the predictive relationship between pre-school letter naming skills and school reading skills have combined LNK and letter-sound knowledge (LSK) into a composite measure of letter knowledge (Foulin, 2005, p. 131). While this composite measure is relevant to emergent literacy skills, Foulin (2005) argued that the two kinds of knowledge need to be distinguished as LNK and LSK each has a specific predictiveness of reading achievement along long-term literacy development (p. 131).

Secondly, there is limited research on the nature of the predictive relationship between LNK and literacy achievement (Foulin, 2005, p. 132). In response to the second contentious issue on why LNK predicts literacy acquisition, Foulin (2005) suggested that besides the well-established evidence that letter-shape knowledge improves visual word recognition at the logographic developmental stage of reading acquisition, the role of letter recognition influences major pre-cursors of reading (p. 130) by facilitating the development of LSK at the alphabetic stage (Clemens et al., 2017, p. 273).

In particular, an embryonic knowledge of letters can precede, and possibly, underpin the embryonic phonological awareness required at the pre-alphabetic stage (Byrne, 2011, p. 173) to make the connection that printed letters represent the sounds in speech. At the emergent literacy phase, the speed of letter-name recognition is associated with the speed of students' growth in letter-sound identification (Clemens et al., 2017, p. 280) and contributes to a more rapid reading of sounds associated with letters and letter combinations (Paige et al., 2018, p. 2) and ultimately to adding words to a child's vocabulary (Clemens et al., 2017, p. 273).

Alphabet-only, Small-group Literacy Intervention

Research syntheses also found that: (i) pure alphabet instruction (Piasta & Wagner, 2010, p. 17) focusing on letter identity, letter naming and the writing of letters (Paige et al., 2018, p. 2) produced positive effects on alphabet outcomes (Piasta & Wagner, 2010, p. 16); (ii) small-group instruction was more effective in promoting letter name knowledge (Piasta & Wagner, 2010, p. 19); (iii) explicit instruction was required for successful early literacy acquisition (Paige et al., 2018, p. 2); and (iv) a structured routine was highlighted as an instructional element demonstrating positive effects for adolescent literacy interventions (Gillies, 2016, p. 4).

Following the Dyslexia Institute Learning Programme or DILP (Walker & Brooks, 1993), the alphabet skills are taught: (i) explicitly using three-dimensional wooden letters where the learner can look at the letter, pick it up, feel it and say its name, thereby harnessing all visual, tactile-kinaesthetic and auditory learning pathways (Reid, 2011, p. 56); and (ii) using a structured, step-by-step, predictable sequence of instructional routines (Gilles, 2016, p. 4) to match the letter in print to both its graphic shape and phonological name by arranging the 26 graphemes alphabetically into an arc shape within a target time of one minute.

The benefit of small-group instruction was repeatedly recognised within the early literacy literature as a hallmark of effective literacy instruction (Piasta & Wagner, 2010, p. 19). For adolescent literacy interventions that included the instructional element of cooperative learning where students are assigned a learning task in small groups or pairs (Gilles, 2016, p. 4), studies found that cooperative structures were strongly associated with adolescents' achievement and positive peer relationships (Gilles, 2016, p. 40).

Research Gap

Figure 1 is a representation of the literature pertaining to the three interacting fields of the role of LNK in literacy development, an alphabet-only instructional strategy and a cooperative learning strategy. The white triangle in the centre represents the gap in the literature regarding exploring the effectiveness of a pure alphabet intervention on the LNK of 42 low-achieving adolescents that represent a sample of the lowest 0.5 percentile student population in Singapore, delivered as a small-group intervention in a general classroom.

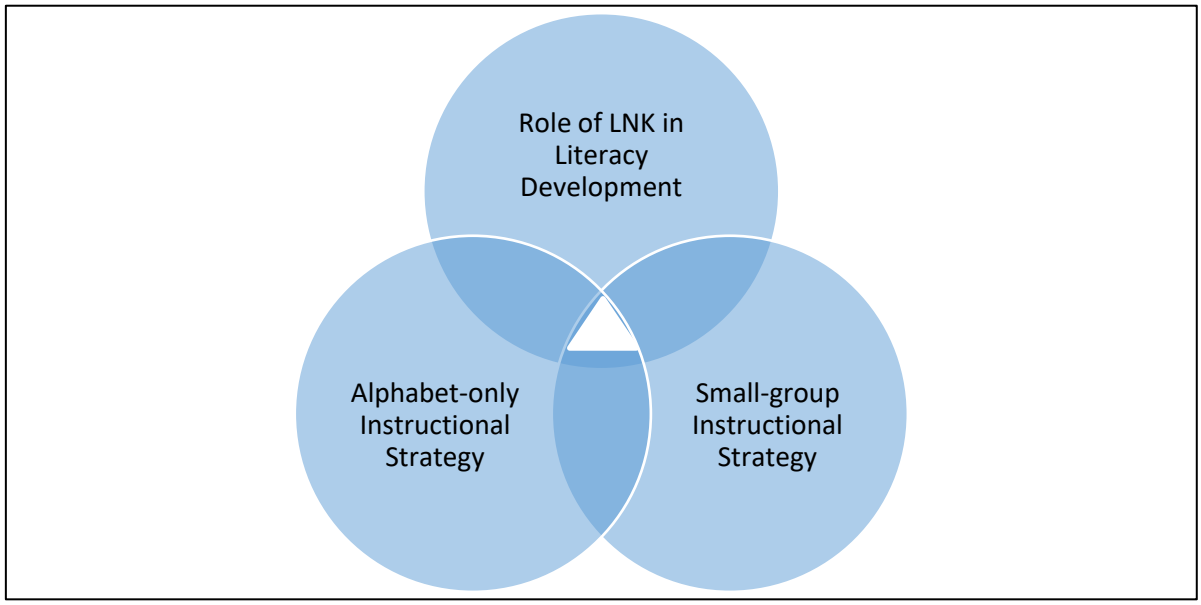

Figure 1. A Gap in Literacy Interventions: Exploring Alphabet-only, Small-group Instructional Strategies with Low-achieving Adolescents in Singapore

The research question for this project is:

> *To what extent does the alphabet-focused instructional strategy, delivered as a small-group intervention in a general education classroom, increase the LNK of low-achieving adolescents in Singapore?*

The dependent variable in this study is the LNK of participants and the independent variable is the alphabet-only intervention.

Methodology

Research strategy

This research project selected the sequential mixed-method research strategy to investigate the research topic. It began with a quantitative approach utilizing a classical experimental design, which was followed by a qualitative survey interview.

The classical experimental research design used in this project is summarized by Neuman (2011, p. 286) as one which has "a pre-test and a post-test, an experimental group, and a control group" to control variables and eliminate alternative explanations that could undermine attempts to establish causality. Additionally, Moser and Kalton (as cited in Bell, 2005, p. 157) described the survey interview as "a conversation between interviewer and respondent with the purpose of eliciting certain

information from the respondent". Information is obtained in a structured conversation in which the interviewer asks pre-arranged questions and records answers, and the respondent answers (Neuman, 2011, p. 342).

Creswell (2009) stated that "sequential mixed-methods procedures are those in which the researcher seeks to elaborate on or expand on the findings of one method with another method" (p. 14). In addition, Neuman (2011) described the triangulation of method as a process of "mixing qualitative and quantitative styles of research and data" (p. 165), which improves reliability by observing phenomena from multiple points of view. Hence, the use of a sequential mixed-methods research design could strengthen the external validity of this study.

Figure 2 outlines the sequential mixed-methods research strategy and design (Creswell, 2009, p. 209) to be adopted in this study.

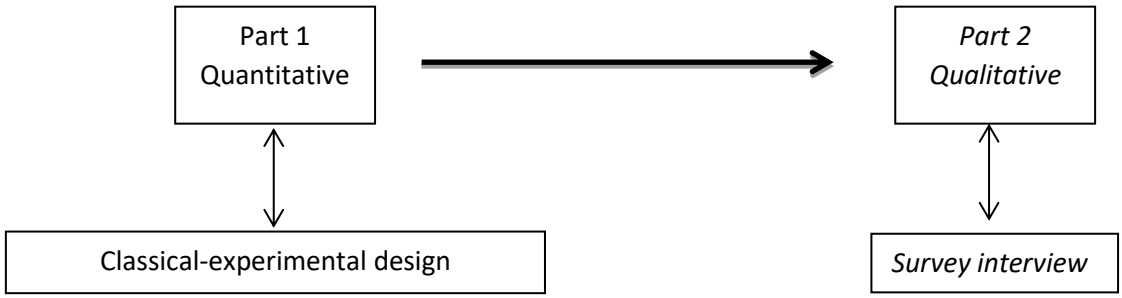

Figure 2. Outline of Sequential Mixed-method Research Strategy

Participants.

This study was conducted with 42 low-achieving 14-year old adolescents who were grouped according to their English Language ability based on the PSLE results and whether they had a formal diagnosis of having special needs. There were three experimental groups comprising 27 participants from a high ability (HA) class, low ability (LA) class and learning needs (LN) class, together with two control groups consisting of 15 participants from a HA class and LA class. As there was only one LN class for the whole level of 14-year olds in the school, a control group for the LN class was unavailable for this project.

Measurement tools.

The following instruments were used in collecting the quantitative pre-test and post-test data of the 42 participants on the effect of an alphabet-only intervention on the acquisition of LNK:

1. *Alphabet Accuracy and Time (AAT) is the time taken to arrange the upper case and lower case alphabet into an arc shape with accuracy, each within a target time of one-minute*. The upper case alphabet is arranged into an arc shape prior to arranging the lower case alphabet to avoid confusion of lower case letters whose graphic shapes may look identical. For some learners, the shapes of lowercase letters b, d, p and q, and n and u may be difficult to differentiate one from another (Walker, Goldup, & Lomas, 2005 p. 57).
2. *Letter Naming Fluency (LNF) [a subtest of Dynamic Indicators of Basic Early Literacy Skills (DIBELS) 6th Edition (University of Oregon Center on Teaching and Learning, 2017)].* The DIBELS LNF, a part of the Kindergarten Student Materials DIBELS Benchmark Assessment, is designed for "most children from fall of kindergarten through fall of first grade" (University of Oregon Center on Teaching and Learning, 2017). It is a standardized, individually administered test with a page of 110 letters (52 upper and 58 lower case letters) arranged in a random order. In this study, the benchmark is to name 110 letters correctly in one minute.

To collect qualitative data on the perceptions of the efficacy of the intervention, face-to-face interviews were conducted with 12 participants in groups or pairs from the experiment groups and, individually, two class teachers of the participants. Each student group interview was scheduled for ten minutes while each teacher interview was scheduled for half an hour.

Data collection

The data collection process for this study comprised two stages. They were (a) pre-test stage – quantitative data on the number of HA/ LA/ LN participants in the experimental and control groups meeting the target time for arranging a wooden alphabet and meeting the LNF benchmark; and (b) post-test stage – (i) quantitative data on the number of HA/ LA/ LN participants in the experimental and control groups meeting the target time for arranging a wooden alphabet and meeting the LNF benchmark, together with (ii) qualitative interview data on the perceptions of 12 participants and their teachers regarding the efficacy of the alphabet-only intervention.

Results

Conducted over six 30-minute English lessons, in groups of three or in pairs with assigned roles, within a general education classroom, the learning activities of the alphabet-focused intervention included: (a) using fingers to trace letter shapes that were confusing; (b) naming each letter in the alphabet accurately; (c) reciting the alphabet sequence orally; (d) positioning the shape of the letters and arranging the alphabet; and (d) self-checking the accuracy of the alphabet sequence (Reid, 2011, p. 56).

Quantitative Data

The effectiveness of the pure alphabet intervention will be established through analysing the quantitative pre-test and post-test data of meeting: (i) the AAT benchmark for arranging the upper case and lower case alphabet into an arc shape accurately, each within a target time of one minute; and (ii) the LNF benchmark for naming 110 letters correctly in one minute. Tables 1 and 2 show the quantitative pre-test and post-test results for the AAT and LNF benchmarks.

AAT results

An examination of the AAT pre-test data in Table 1 shows that pre-intervention none of the 42 students in either the experimental or control groups met the AAT benchmark for arranging the upper case or lower case alphabet into an arc shape accurately within one minute. Within the experimental

Table 1

AAT Benchmark – Quantitative Pre- and Post-test Results

		AAT Benchmark [Arranging the upper case or lower case alphabet into an arc shape accurately within 1 minute]											
		Met Upper Case BM		**Improvement in Upper case**				**Met Lower Case BM**		**Improvement in Lower Case**			
Profile	***No.***	**Pre**	**Post**	**T & A**	**T**	**A**	**No Imp**	**Pre**	**Post**	**T & A**	**T**	**A**	**No Imp**
HA EG	7	0	5	0	1	1	0	0	5	0	0	1	1
HA CG	6	0	0	1	3	2	0	0	0	2	3	1	0
LA EG	11	0	3	6	0	1	1	0	1	3	4	1	2
LA CG	9	0	0	2	5	2	0	0	0	1	4	1	3
LN EG	9	0	2	4	0	1	2	0	1	7	1	0	0

Notes. BM = benchmark; EG = Experimental group; CG = Control group; No. = Number of participants; Pre = Pre-test; Post = Post-test; T & A = Time and Accuracy; T = Time; A = Accuracy; No Imp = No Improvement

group, after six sessions of alphabet-only intervention, there was an improvement of five HA students, three LA students, two LN students meeting the post-test upper case AAT benchmark and five HA students, one LA student and one LN student meeting the post-test lower case AAT benchmark. The post-test results of both upper and lower case AAT benchmarks remained at zero for the control group. The comparison of post-test results for both experimental and control groups suggest that the alphabet-only intervention contributed to the improvement in AAT data for some students in the experimental group.

Further error analysis of the post-test upper and lower case AAT benchmark tests revealed: (i) six LA participants in the experimental group made some improvement in the time and accuracy in arranging the upper case alphabet; (ii) seven LN students in the experimental group made some improvement in the time and accuracy in arranging the lower case alphabet; (iii) one HA student, one LA student and two LN students in the experimental group did not make any progress in arranging either the upper or the lower case alphabet; and (iv) participants from the control group made the greatest improvement in the time needed to complete the upper case and lower case AAT benchmark tests while seven participants did not make any improvement.

LNF results

Comparing the LNF results of the experimental and control groups (Table 2) shows that one more HA, one more LA and four more LN participants met the benchmark during the post-test as a result of the six-session alphabet-only intervention but there were no increases in the number of participants from the control group who met the benchmark. It is interesting to note that there was a much higher number of LN participants meeting the LNF benchmark in the post-test. The comparison of LNF post-test results for both experimental and control groups suggest that the alphabet-focused intervention contributed to the improvement in LNF data for some students in the experimental group.

Table 2

LNF Benchmark Results – Pre- and Post-test Results

		LNF Benchmark [Naming 110 letters accurately within 1 minute]			
		On/above Benchmark		**Still below Benchmark**	
Profile	***No. of Participants***	**Pre-intervention**	**Post-intervention**	**Improvement in Naming Number of Letters**	**No Improvement**
HA EG	7	3	4	2	1
HA CG	6	2	2	1	3
LA EG	11	0	1	5	5
LA CG	9	0	0	5	4
LN EG	9	2	6	2	1

Further examination of the findings for the LNF show that two HA, five LA and two LN participants from the experimental group made progress during the study in the number of letters they named in one minute but without meeting the benchmark while one HA and five LA students from the control group made similar progress. It is noteworthy that a higher number of LA participants made progress in the number of letters they named in one minute during the post-test. One HA, five LA and one LN participants from the experimental group together with three HA and four LA participants from the control group did not make progress in LNF.

Qualitative Data

The analysis of qualitative findings was conducted by "organizing it [data] into categories on the basis of themes, concepts or similar features" (Neuman, 2011, p. 510). The survey interview data with four HA, four LA and four LN participants and two class teachers (Teacher A took HA and LN classes and Teacher B took the LA class) from the experimental group were analysed and organised according to two main conceptual categories: LNK and cooperative learning.

LNK

The analysis of the findings within the category of LNK showed that: (i) the participants' feelings about the six-session intervention were congruent with the participants' AAT results; (ii) the class teachers' observations of the participants' performance might explain the participants' AAT and LNF results; and (iii) the mastery of letter shape knowledge was challenging for the 12 participants.

Most students found the learning tasks of the alphabet-only intervention engaging and felt they had made improvements in arranging the alphabet. The HA students enjoyed 'beating their own record in matching the letters as it was challenging' and felt the activities 'helped with spelling'. By 'learning mistakes in ABC', the LA students found that their 'memory was a little bit better' and 'helped me [LA participant] how to read'. One LA student shared that the project inspired him to 'never give up and study everyday'. The student subsequently received a school-level award. The participants' perceptions of improved alphabet knowledge concurred with their improved AAT post-test results.

Despite enjoying 'the ABC project as it was fun', some LN students highlighted that the 'timing [of the alphabet] is frustrating and stressful' as they 'take some time to do it'. One HA student felt that she was slow in arranging the wooden alphabet in comparison to her peers. These perceptions of difficulty with timing tallied with the AAT results of participants that did not meet the benchmark during the post-test.

When Teacher A conducted the intervention with the HA and LN classes, all participants including an HA student who could not recite the alphabet sequence, wanted 'to have a good record of their own timing and progress and took it [arranging the wooden alphabet] quite seriously'. Teacher A's observations of the students' motivation to arrange the wooden alphabet might explain their improved AAT and LNF post-test results. However, the HA students 'questioned' the rationale of some learning tasks while the LN students 'complied' with the routines. This teacher observation might explain the higher number of LN participants meeting the LNF benchmark in the post-test.

Teacher B observed that LA students 'really enjoyed' arranging the wooden alphabet and were 'very very happy' when they met the AAT benchmark. Following their achievements, the students asked whether the AAT results would contribute to their overall English examination results and were 'quite disappointed' to find out that the AAT results was not a component of the formative assessment. A comparison of the English examination results in Semester 1 and Semester 2 of the LA experiment group showed that most of them had improved. Teacher B's observations of the learning behaviours of the LA experiment group might explain their improved AAT and LNF post-test results.

In addition, HA and LA participants from the control group repeatedly asked Teacher B when they would be taking the post-test 'to have a second try to improve their scores' when they met along the corridor in the school. These teacher observations of the students' interest in arranging the wooden alphabet might explain the improved AAT and LNF post-test results for some participants from the control groups.

All 12 students mentioned experiencing difficulty with figuring out the letter shapes of the alphabet (e.g. b and d, g and h, q, x) during the intervention. Teacher A also observed that the letter shapes of m and w, together with q were confusing for some students in the HA and LN classes. Teacher B observed that many students from both experimental and control groups were unable to identify 'L' and read it as '1'.

Cooperative learning

The analysis of the findings within the category of cooperative learning showed that: (i) the participants had mixed feelings about working in small groups or pairs; and (ii) the class teachers observed an increased confidence level among the participants.

Within each small group or pair, participants with better English results were mixed with participants who were weaker. In general, the weaker participants benefitted more from working in small groups or pairs. With peer support, an HA participant learnt to stay focused by 'controlling her mouth and sitting near to the teachers' table'. An LN participant was happy as her peer helped with alphabet sequencing 'by telling her the next letter' in the sequence. Another LA participant felt that the peers taught him 'how to read' by pointing out his mistakes.

On the other hand, an HA participant found pair work frustrating as the peer 'was not focused'. An LA participant found the peer 'annoying' because 'she like don't care' when asked to complete the task properly. Another LN participant felt that she should not intervene but give her partner 'time to let him do [arrange the wooden alphabet] by himself'.

A dimension of the intervention effectiveness that was not captured by the AAT and LNF measures was the confidence level of the participants in arranging the wooden alphabet. An LN student commented that the 'ABC project makes me more confident'. Two LA students gave a rating of eight out of 10 for their confidence level in achieving the AAT benchmark.

Besides the students who expressed increased confidence, Teacher A observed that the reading level of one LN student improved as he had the 'confidence to dare to open his mouth' to read words such as 'disappear' and 'disappointed'. The mother of the same student shared at the year-end Meet-the-Parent session that she was pleased to observe her child reading the signs 'when they go out to supermarket'.

In addition, Teacher B observed an 'increasing sense of achievement and growing confidence' among the LA participants when they met the ATT benchmark. It was observed that the confidence of the LA students in achieving the ATT benchmark rubbed off into their thoughts of how good they were in the English language. In particular, a weak student who disrupted typical English lessons took a leading role by being the one who gave instructions and guided another student during the alphabet-focused lessons. The intervention was affirming for him and he kept asking when the next session would be. His literacy coach also observed improvement in his reading skills and motivation to read. Nevertheless, the LA students became quite quarrelsome when changes were made to the deployment of groups and pairs whenever a member was absent.

Discussion

Despite its importance, alphabet knowledge is often overlooked as a specific outcome of interest compared with other aspects of literacy instruction such as phonological awareness or reading per se (Piasta & Wagner, 2010, p. 9). The learning of letter names may provide a referent with which to more easily associate new information (Clemens et al., 2017, p. 273). Studies with alphabet training as the lone instructional focus are especially interesting as they may speak to the causal direction of relations

between alphabet knowledge and reading and spelling skills, which has not been well established (Piasta & Wagner, 2010, p. 3). The research question in this study examined the extent to which the alphabet-focused instructional strategy, delivered as a small-group intervention in a general education classroom, increased the LNK of low-achieving adolescents in Singapore. The quantitative and qualitative findings point to a pattern of mixed results.

The AAT and LNF post-test results, participants' perceptions and teachers' observations suggest that there are generally positive effects from the pure alphabet, small-group and explicit literacy intervention on alphabet outcomes in terms of improvement in recognising letter shapes, matching the letter in print to both its graphic shape and phonological name for some low-achieving adolescents. These positive effects are expected and consistent with the findings of the reading intervention studies (Clemens et al., 2017; Gillies, 2016; Paige et al., 2018; Piasta & Wagner, 2010).

In addition, the qualitative findings based on the participants' perceptions and teachers' observations in this study suggest there are generally positive effects from the alphabet-focused, small-group and explicit literacy intervention on raising the confidence level of low-achieving adolescents placed on cooperative structures (Gilles, 2016; Piasta & Wagner, 2010), and mixed effects on the peer relationships of low-achieving adolescents.

Despite the mixed effects of the alphabet-focused, small-group and explicit literacy intervention on increasing the LNK of low-achieving adolescents in Singapore, it might be useful for teachers to use the wooden alphabet as an additional resource to identify students who might need further and individualised literacy support.

Conclusion

For low-achieving adolescents who have been enrolled in a Singapore secondary school that specialises in vocational curricula, identifying the sub-skills of literacy is pertinent to supporting their future years of education. Introducing an alphabet-focused, small-group and structured literacy intervention to increase the letter-name knowledge (LNK) and confidence level of some of these students might be the key to support them as they acquire long-term, higher-order literacy skills.

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