Academic Performance of Deaf and Hard-of-Hearing (DHH) Students in the Sign Bilingualism and Co-enrolment in Deaf Education (SLCO) Programme

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Outline of today’s presentation

1. Background of the study
   - Academic performance of DHH students in general and in HK
   - Factors affecting DHH students’ performance
   - Development of the SLCO Programme in HK

2. The studies regarding classroom participation and academic performance of DHH students in different levels of programmes

3. Discussion and Conclusion
Academic Performance of DHH Students

• Academic performance of DHH students continues to be lagging behind their hearing peers (Mertens, 1990; Moores & Sweet, 1990; Qi & Mitchell, 2011).

• Deafness not only constrains language development of DHH children, it also has significant impacts on DHH children’s development of cognitive functions, as well as academic development (Spencer & Marschark, 2010).
Background

• Academic failure is a long-standing problem facing DHH students in Hong Kong.

• DHH students are prone to information inaccessibility and nonparticipation in class especially when there are activities like rapid rate of discussion, rapid turn-taking and topic-change (Stinson & Antia, 1999).
Background

• Hong Kong has long been adopting the oral approach, with **very limited use of sign language in education**, no matter in mainstreamed or segregated settings.

• Hearing parents and deaf educators emphasize much on auditory and speech training.

• Even deaf parents may also **restrict their sign interactions with their children** and rely heavily on the support of hearing relatives or grandparents.

• General misconceptions about sign language still holds.
Misconceptions about Sign Language in HK

- Sign language deprives oral language development??
- Sign language is not a language??
- Technology brings back normal hearing ability??
- Ability to speak is consider as the most important attribute of DHH children
Deaf education: HK Situation

- Deaf education in Hong Kong was mainly conducted in special settings from the 1930s to the 1970s (Sze, Lo, Lo, & Chu, 2012). Sign language was used at that moment.

- >90% of DHH students with mild to profound hearing losses are integrated in mainstream schools, following the policy proposed in the White Paper “Integrating the Disabled into the Community” in 1977 (Hong Kong Government, 1977).
Deaf education: HK Situation

- Only 1 Special School for the Deaf in HK now
  - oral approach before, recently started to incorporate SL as one of the MOI in school

- >90% in Mainstream Education:
  - HA/CI + FM system + Speech therapy
  - No sign language support
Background

• Sign language input is always considered as a ‘last resort’, for those who fail in oral language development for whatever reasons.

• Many students started to learn sign language lately after the sensitive or critical period of language development.

• Many come to mainstream classrooms with severe language delay, and that severely creates barriers to communication and learning in class.
Oral Language Development (data collected from 2007-2010)

Language Abilities of 98 Mainstreamed P1-P6 DHH Students (using HKCOLAS)

- **Mild**: 3 (severe LD: 1), 16 (mild to moderate LD), 0% (age appropriate)
- **Mod**: 5 (severe LD: 4), 11 (mild to moderate LD), 80% (age appropriate)
- **MS**: 8 (severe LD: 3), 7 (mild to moderate LD), 60% (age appropriate)
- **Sev**: 11 (severe LD: 1), 4 (mild to moderate LD), 30% (age appropriate)
- **Pro**: 15 (severe LD: 7), 2 (mild to moderate LD), 0% (age appropriate)

26/40 (65%)

- **58 (59.2%)** were having different degrees of language delay.

- “… lack of official recognition of the status of significance of sign language by Hong Kong, China”
- “The Committee is troubled by the low number of students with disability in tertiary education….”

Census and Statistics Department, 2008

20.9% Deprived of learning opportunities...

5.8%
Academic Performance of DHH Students in HK

31% of 127 DHH (P1-P6) students in the mainstream schools failed in all 3 basic subjects (The Society for the Deaf, 2009)

Pass Percentage in 3 Major Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Mainstream DHH Students* (n=127)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese</td>
<td>58.3%</td>
</tr>
<tr>
<td>English</td>
<td>55.9%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>62.2%</td>
</tr>
</tbody>
</table>

*The findings were adopted from the report “A survey on the difficulties and challenges encountered by primary students with hearing impairment in integrated education” prepared by The Hong Kong Society for the Deaf (2009).
Development of Sign Bilingualism and Co-enrollment in Deaf Education Programme
(to re-introduce sign language in deaf education in Hong Kong in an inclusive education setting)

(2006-NOW)
Guiding Principles

Sign Bilingualism
- Sign and spoken language are having same status in class

All students are engaged in bimodal bilingual communication with each other

DHH students are socially and academically integrated with their hearing peers

DHH Students have the same access to mainstream curriculum
Building a “Trough-train” System in HK

Staring from 2006, enrolling the first cohort of 6 students to the Kindergarten (K3 only), every year, 5-6 DHH students join SLCO kindergarten (up to Secondary 4 in 2016-17)
## Children in SLCO Programmes (as at June 2017)

<table>
<thead>
<tr>
<th>Programmes</th>
<th>DHH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baby Crèches Programme</td>
<td>1</td>
</tr>
<tr>
<td>Baby Signing Programme</td>
<td>26</td>
</tr>
<tr>
<td>Sign Bilingual Reading Programme</td>
<td>16</td>
</tr>
<tr>
<td>Kindergarten SLCO Programme</td>
<td>14</td>
</tr>
<tr>
<td>Primary SLCO Programme</td>
<td>34</td>
</tr>
<tr>
<td>Secondary SLCO Programme</td>
<td>24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>115</strong></td>
</tr>
</tbody>
</table>
Key Components of SLCO Programme

Co-teaching of Deaf and Hearing teachers

Signed and Spoken Language as Medium of Instruction

Critical Mass of Deaf Children in a Mainstream Classroom 1:3 or 1:4
Programmes Features

Training for sign/spoken language development

- Deaf-Hearing Co-teaching
- Student-centered activities
- Visual learning materials
- Lesson preparation and remedial support
- Training for sign/spoken language development
Aim of Study

- The study aims:
  i. To review academic performance of the deaf and hard-of-hearing (DHH) students in the Sign Bilingualism and Co-enrolment in Deaf Education (SLCO) Programme in Hong Kong; and
  ii. To investigate factors affecting the students’ performance such as hearing status, degree of hearing loss, speech perception ability, age to learn sign language, presence of secondary disabilities or special needs.
Indicators for Quality Inclusive Education

Quality Inclusive Education for DHH Students

- Social Integration
- Academic Integration
- Academic Performance
- Classroom Participation

(Stinson & Antia 1999)
How to examine Academic Integration?

- Academic performance (AP) and classroom participation (CP) are indicators reflecting students’ academic integration in the mainstream settings.

(Stinson & Antia 1999)
In Qi and Mitchell (2011), based on normative data of 3569 DHH students by the standardized assessment “SAT” (the Stanford Achievement Test) from 1974-2003

3 major areas:
- Reading
- Mathematical Problem Solving
- Mathematical Procedures
Academic Performance of DHH Students in US (Reading)

Median scale scores: **about 4\textsuperscript{th} grade in 2003** (Qi & Mitchell, 2011)

Figure 1  Grade equivalents of median scaled scores on Stanford Achievement Test for Deaf and hard-of-hearing student norming samples in the United States, by age, 1974–2003: reading comprehension.
Academic Performance of DHH Students in US (Mathematical Problem Solving)

Median scaled scores: about 6th grade in 2003 (Qi & Mitchell, 2011)

Figure 2 Grade equivalents of median scaled scores on Stanford Achievement Test for Deaf and hard-of-hearing student norming samples in the United States, by age, 1974–2003: mathematical problem solving.
Academic Performance of DHH Students in US (Mathematical Procedures)

Median scaled scores: about 7.5<sup>th</sup> grade in 2003 (Qi & Mitchell, 2011)
Academic Performance of Mainstreamed DHH Students in US

Antia et al. (2009), in a 5-year study on 197 mainstreamed DHH in public schools, found that there are:

i. A 0.5 standard deviation below the hearing norm on average; and

ii. A positive growth in academic attainment.
Academic Performance of Mainstreamed DHH Students in UK

- Investigating educational outcomes of >700 Year 11 students in different areas of England.
- Collecting GCSE results in 1995 and 1996, and students’ background data through a teachers’ questionnaire.
- Typical > Mainstreamed DHH

<table>
<thead>
<tr>
<th></th>
<th>DHH Students in Deaf Schools (93/94)</th>
<th>Mainstreamed DHH Students (95/96)</th>
<th>All Schools in England (95/96)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass in ≥ 5 subjects</td>
<td>29%</td>
<td>70-75%</td>
<td>86%</td>
</tr>
<tr>
<td>Good pass in ≥ 5 subjects</td>
<td>8%</td>
<td>14-18%</td>
<td>44-45%</td>
</tr>
</tbody>
</table>
Factors Affected Academic Performance

Qi & Mitchell (2011) attributed the gaps to:

i. **Language acquisition delays**; and

ii. **Deficiency of curriculum and instruction**.

Antia et al. (2009) suggested that **communication-related factors** like hearing ability and communication skills were relatively more prominent.
Factors Affecting Academic Performance

• Powers (1999) stated that the followings are relatively strong predictors of examination success:

  • socioeconomic status;
  • age at onset of deafness;
  • parents' hearing status; and
  • presence of additional learning difficulty
Factors Affecting Academic Performance

• **Degree of hearing loss** did not appear to have an important effect on examination success (Powers, 1999).

• **Functional hearing ability** like aided speech perception seems to be a better predictor (Antia et al., 2009).
Speech Perception

- Functioning hearing ability can be represented by children’s aided speech perception ability.
- It is especially important for Cantonese-speaking DHH children, considered to have significantly long-term impacts on DHH children’s overall spoken language development (Lee, & van Hasselt, 2005).
What do they mean?

• /maa1//maa1/ (mother)

• /maa5//maa5/ (horse)

They sound similarly, but are having totally different meanings.
Diverse speech perception ability by CanTIT (Lee, 2012)

- 111 mainstreamed deaf or hard-of-hearing students
- Range of scores: from 23-100%
- Very diverse performance especially for those with severe to profound loss
Factors Affecting Academic Performance

• Some other possible factors affecting DHH students’ academic development include: socio-economic status of family, intellectual functioning, oral language ability, reading skills, cochlear implants, sign language proficiency, etc. (Mertens, 1990; Marschark, Rhoten, & Fabich, 2007; Spencer & Marschark, 2010).
Factor Affecting Academic Performance (CI)

In Australia, based on 151 completed survey by teachers and follow-up interviews, the study found that:

- **37.3%** of the children participated well in a regular class.
- **38.8%** of the children achieving at the expected level for their age.
- **Slightly less than half** reported to be independent like hearing children.
Factors Affecting Academic Performance

• Cochlear implants are able to help alleviate the barriers to learning and communication in class and enhance DHH students’ academic potential, but **the impact on their attainment still varies** (Marschark, Rhoten, & Fabich, 2007).

• A study by Spencer, Gantz, & Knutson (2004) on a group of 27 CI students who also receives sign interpretation in schools:
  • Their academic attainments are **comparable to the norm** (within 1 SD) based on hearing individuals
Factors Affecting Academic Performance

- **Proficient sign language skills** remains a consistent and effective predictor of reading comprehension for secondary DHH students in bilingual secondary schools (Scott & Hoffmeister, 2017).

- Based on students’ academic growth, Lange, Lane-Outlaw, Lange, & Sherwood (2013) suggested that bilingual approach to education has considered a **safety net for DHH students** with notably diverse hearing and speech perception ability.
Factors Affecting Academic Performance

• Classroom participation (CP) refers to students’ ability to participate in classroom activities and discussion, especially how they communicate and engage in daily classroom activities. (Long, Stinson, & Braeges, 1991; Antia, Sabers, & Stinson, 2007).

• DHH students’ classroom participation is considered as a significant factor affecting academic performance (see also Long, Stinson and Braeges, 1991; Antia, Sabers, & Stinson, 2007) and their quality of life (Hintermair, 2010).
Classroom Participation (CP)

- The construct of CP comprises of two dimensions, including:
  i) **the “cognitive” dimension (Cog)** which focuses on “students’ self-perception of the amount and quality of information received and expressed in the classroom” and
  ii) **the “affective” component (Aff)** which focuses on “students’ subjective communication experience in the classroom” (Long, Stinson, & Braeges, 1991, p.415)
Factor Affecting Academic Performance

- Co-enrolment programming has been well recognized in promoting social integration between DHH and hearing students (Yiu & Tang, 2014; see also other chapters in Marschark, Tang & Knoors, 2014).

- Its impact on academic performance of DHH students has not yet been confirmed. More research evidence is required (Marschark, Tang & Knoors, 2014).
STUDY 1:
CLASSROOM PARTICIPATION OF DHH STUDENTS IN SLCO CLASSROOMS
Research Questions:

• How well are DHH students’ participation in class when compared to their hearing peers?

• What are the preferred mode(s) of communication of the DHH and hearing students in the SLCO classroom?

• What are the relationships between DHH students’ classroom participation (CP) and their language skills including sign language, oral and inged language abilities
Subject

1) Subjects:
   • 17 DHH and 62 hearing students
   • studying in P4-P6

- Detailed information of DHH students:
  - Have been studying in the SLCO classes for 4-6 years
  - 14(82%) have severe (N=4) or profound (N=8) hearing loss
  - 8(47%) of them are using hearing aids
Methodology

- Classroom participation
  
  - The 28-item Classroom Participation Questionnaire (CPQ; Antia, Sabers & Stinson, 2007) was used after translating into Chinese

  - The Chinese version was verified by linguistically trained personnel through back-ward translation
## Dimensions and Subscales

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Subscales</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Cognitive</td>
<td>Understanding teachers (UT)</td>
</tr>
<tr>
<td></td>
<td>Understanding other students (US)</td>
</tr>
<tr>
<td>B) Affective</td>
<td>Positive affect (PA)</td>
</tr>
<tr>
<td></td>
<td>Negative affect (NA)</td>
</tr>
</tbody>
</table>
Sample Items

- **UT:**
  - My teachers understand me.

- **US:**
  - I understand other students during group discussion

- **PA:**
  - I feel good when I talk to other students

- **NA:**
  - I feel lonely because I cannot understand other students (negatively worded)
Language Assessments

- Students’ Cantonese, written Chinese and Hong Kong Sign Language were assessed using:
  - The Cantonese Grammar Subscale of the Hong Kong Cantonese Oral Language Assessment Scale (HKCOLAS-CG)(T’sou, Lee, Tung, Chan, Man & To, 2006)
  - The Hong Kong Sign Language Elicitation Tool (HKSL-ET)
  - The Assessment of Chinese Grammatical Knowledge (ACGK)
Results: Preferred mode of communication

• DHH students
  • >70% preferred a mixed code to communicate with hearing peers and teachers
  • Half of them preferred using sign language to communicate with their DHH peers (53% in RC; 65% in EC)

• Hearing students
  • 71% preferred using both sign and/or speech to express themselves
  • In RC, they accept different modes of communication: speech-only (26%), sign-only (32%) and the mixed code (34%)
Results

CPQ

The items of the CPQ were categorized into four subscales (Cronbach’s alpha = 0.85):

i) Understanding Teachers (UT)
ii) Understanding Students (US)
iii) Positive Affect (PA)
iv) Negative Affect (NA)

According to the correlations between subscales, UT/US/PA were grouped together (Cronbach’s alpha = 0.93) and NA seemed to be a separate component (results similar to Antia et al., 2007)
Results

DHH and H had similar extent of self-perceived classroom participation

Table 1. Comparing the perceived CPQ scores between DHH and hearing students

<table>
<thead>
<tr>
<th>CPQ</th>
<th>Hearing Students (N=62)</th>
<th>DHH Students (N=17)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>UT</td>
<td>3.35</td>
<td>0.45</td>
<td>3.13</td>
</tr>
<tr>
<td>US</td>
<td>3.33</td>
<td>0.47</td>
<td>3.01</td>
</tr>
<tr>
<td>PA</td>
<td>3.15</td>
<td>0.56</td>
<td>3.18</td>
</tr>
<tr>
<td>NA</td>
<td>3.52</td>
<td>0.45</td>
<td>3.86</td>
</tr>
<tr>
<td>UT/US/PA</td>
<td>3.28</td>
<td>0.44</td>
<td>3.11</td>
</tr>
</tbody>
</table>

@ Reverse scoring; *p<.01; **p<.001

1. No significant difference between H and DHH students;
2. H>DHH in US (Understanding Students);
3. DHH>H in NA (Negative Affect)
Relations between classroom participation and language abilities:

• **No correlations** were found between CPQ and the DHH students’ morphosyntactic knowledge in HKSL and Cantonese.

• **Significant associations** were found between DHH students’ grammatical knowledge in written Chinese (i.e. ACGK) and CPQ in UT/US/PA ($r=0.523$, $p<0.01$) and the subscales UT ($r=0.520$, $p<0.01$) and US ($r=0.506$, $p<0.01$).
Conclusions

• Both DHH students and hearing students communicate with each other with a flexible use of code choice according to the hearing status and language preference of the interlocutors.

• No significance difference can be found in terms of DHH and hearing students’ participation in class

• Literacy skills in the setting is important in supporting DHH students’ classroom communication.
STUDY 2:

ACADEMIC PERFORMANCE IN PRIMARY EDUCATION
A General Picture

- “A survey on the difficulties and challenges encountered by primary students with hearing impairment in integrated education” was conducted in 2009 (the Hong Kong Society for the Deaf, 2009)
- The passed percentages of 127 Mainstreamed DHH students in the 3 major subjects: Chinese, English and Math range from 55.9-62.2%.
Overall Passed Percentages Compared to Mainstreamed DHH Students

* 4 cohorts of DHH students who have completed their primary education from in the SLCO Programme (P1-P6)
Based on a Standardized Attainment Test “LAMK” developed by the Education Bureau

<table>
<thead>
<tr>
<th>Grade Level Achieved at Grade 6</th>
<th>Chinese (n=24)</th>
<th>English (n=24)</th>
<th>Math (n=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 4 or Above</td>
<td>22</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>&lt; Grade 4</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Median</td>
<td>Grade 5</td>
<td>Grade 6</td>
<td>Grade 6</td>
</tr>
</tbody>
</table>

Taking away results of 4 DHH+ cases, all students were graduated at ≥Grade 4.
The trend...

Chinese & Math were stable while English and G.E. seemed to have a downward trend.

<table>
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<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
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<tbody>
<tr>
<td>C_RW</td>
<td>95%</td>
<td>90%</td>
<td>90%</td>
<td>95%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>E_RW</td>
<td>100%</td>
<td>95%</td>
<td>95%</td>
<td>85%</td>
<td>80%</td>
<td>60%</td>
</tr>
<tr>
<td>Math</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>95%</td>
<td>95%</td>
<td>80%</td>
</tr>
<tr>
<td>G.E.</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>95%</td>
<td>100%</td>
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</table>
When compared to their hearing peers...

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<tr>
<th></th>
<th>P1</th>
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<th>P5</th>
<th>P6</th>
</tr>
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<tbody>
<tr>
<td>CR_W H (Non-SLCO)</td>
<td>95%</td>
<td>97%</td>
<td>98%</td>
<td>97%</td>
<td>99%</td>
<td>99%</td>
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<td>CR_W H (SLCO)</td>
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<td>97%</td>
<td>97%</td>
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<tr>
<td>CR_W DHH</td>
<td>95%</td>
<td>90%</td>
<td>90%</td>
<td>95%</td>
<td>100%</td>
<td>100%</td>
</tr>
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DHH students had a stable performance in Chinese.
When compared to their hearing peers...

A positive development in G.E. in general

<table>
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<tr>
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<th>P6</th>
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<tr>
<td>GE H (Non-SLCO)</td>
<td>98%</td>
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<td>95%</td>
<td>93%</td>
</tr>
<tr>
<td>GE DHH</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>95%</td>
<td>100%</td>
</tr>
</tbody>
</table>
When compared to their hearing peers…

A similar downward trend was observed.

<table>
<thead>
<tr>
<th></th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math H (Non-SLCO)</td>
<td>98%</td>
<td>97%</td>
<td>97%</td>
<td>96%</td>
<td>93%</td>
<td>92%</td>
</tr>
<tr>
<td>Math H (SLCO)</td>
<td>96%</td>
<td>95%</td>
<td>95%</td>
<td>93%</td>
<td>89%</td>
<td>83%</td>
</tr>
<tr>
<td>Math DHH</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>95%</td>
<td>95%</td>
<td>80%</td>
</tr>
</tbody>
</table>
When compared to their hearing peers…

English as a 2\textsuperscript{nd} or 3\textsuperscript{rd} language is relatively difficult for DHH students.

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<tbody>
<tr>
<td>E_RW H (Non-SLCO)</td>
<td>93%</td>
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<td>87%</td>
<td>87%</td>
<td>74%</td>
<td>78%</td>
</tr>
<tr>
<td>E_RW H (SLCO)</td>
<td>94%</td>
<td>86%</td>
<td>88%</td>
<td>83%</td>
<td>78%</td>
<td>78%</td>
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<td>95%</td>
<td>85%</td>
<td>80%</td>
<td>60%</td>
</tr>
</tbody>
</table>
Further investigations required

- Comparing passed percentages of DHH and hearing students can only provide a very general trend.
- To determine if hearing status is a factor, further statistical analysis was conducted.
- Other possible factors that may affect classroom academic status of DHH students was also explored based on longitudinal academic data.
Research questions:

• Do DHH and hearing students perform differently in their overall academic performance in school examinations?

• What is the effect of classroom participation on students academic performance?

• Is speech perception a better predictor of academic performance than their degree of hearing loss?
Subjects

- Academic data from **534 students** were collected from the school from 2007 to 2016.
- All of the students, no matter DHH or hearing, had **completed their 6-year primary education** at the school during the aforementioned period.
- **24 DHH students**, out of which:
  - 21 (87.5%) were having severe to profound loss.
  - 4 deaf students (16%) were born to deaf parents, others (n=14, 84%) born to hearing parents.
Subjects

• All, except 2 students, (n=22; 91.7%) were having severe to profound hearing loss: one was having mild-to-moderate loss and other unilateral hearing loss.
  • 13 (54.2%) students were using cochlear implants (all implanted at < aged 3 except one at aged 6.5);
  • 10 (41.7%) were using hearing aids.
• 4 students were having secondary disabilities or special educational needs like Attention Deficit and Hyperactivity Disorder (ADHD) or intellectual disability.
Subjects

• For the 510 hearing students:
  • 83 of them (16.2%) had at least four years of SLCO experience (SLCO-H).
  • Others (n=427; 83.8%) were mainly studying in the regular classrooms (Non-SLCO-H).

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Year of Study</th>
<th>Students (No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>DHH</td>
</tr>
<tr>
<td>Cohort 1</td>
<td>2007-2013</td>
<td>6</td>
</tr>
<tr>
<td>Cohort 2</td>
<td>2008-2014</td>
<td>6</td>
</tr>
<tr>
<td>Cohort 3</td>
<td>2009-2015</td>
<td>6</td>
</tr>
<tr>
<td>Cohort 4</td>
<td>2010-2016</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>
In order to examine the classroom academic status of DHH students in the SLCO Programme from P1-P6, school examination data for different subjects were collected.

The z-scores were calculated based on their school examination results and were used for statistical analysis.

A Confirmatory Factor Analysis (CFA) using MPlus Version 7.2 (Muthen & Muthen, 1988-2014) was then conducted - a one-factor model is adopted for AP. Scores of individual subjects were thus analyzed together as one variable.
Figure 1: Three possible models for AP of the students in the SLCO Programme.
Speech Perception (CANTIT)

• “In tone languages such as Cantonese, a change in tone denotes a change in lexical meaning” (Lee, van Hasselt, & Tong, 2010, p.1079).

• The 30-item Cantonese Tone Identification Test (CANTIT; Lee, 2012) was used to assess DHH students’ tone perception ability.

• Each item scored one mark, the maximum total is 30 and the minimum is 0.
Classroom Participation Questionnaire (CPQ-HK)

After reviewing the psychometric properties of the CPQ (Antia, Sabers, & Stinson, 2006), some modifications were done to enhance the reliability of the instrument for both DHH and hearing students in the mainstreamed settings.

• A 48-item 4-point rating scale, composed of 2 domains:
  a) Cognitive domain
  b) Affective domain

• The original questionnaire lacked more difficult items (that represent higher level participation of students). New items were included to provide a wider range of items.

• The scale was then re-assessed again on its psychometric properties through Rasch Analysis.
The degree of hearing loss was defined according to the assessment results from professional audiologists. There are 4 categories classified according to students’ hearing loss:

- 0 = normal (N);
- 1 = Hard-of-hearing (HH) (from mild to moderately-severe loss);
- 2 = Deaf (D) (from severe to profound loss);
- 4 = Deaf with secondary disability (D+)
Results: Is Hearing Status a factor?

One-way ANOVA result found that there were major group difference on overall academic scores among students with different hearing status ($F=31.78$, $df=3203$, $p<.005$).

Results of the Tuckey HSD post-hoc test indicate that there were differences in academic z-scores among the four sub-groups.
The difference was significant between H & D/D+, but not significant between H & HH.

<table>
<thead>
<tr>
<th></th>
<th>H</th>
<th>HH</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH</td>
<td>AP</td>
<td>-0.062</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0.0546</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>-0.313</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>0.302</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GE</td>
<td>-0.291</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>AP</td>
<td>0.324**</td>
<td>0.386</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0.497**</td>
<td>0.443</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>0.176</td>
<td>0.490</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>0.217**</td>
<td>-0.848</td>
</tr>
<tr>
<td></td>
<td>GE</td>
<td>0.406**</td>
<td>0.697</td>
</tr>
<tr>
<td>D+</td>
<td>AP</td>
<td>1.492**</td>
<td>1.554**</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>1.837**</td>
<td>1.783**</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>0.856**</td>
<td>1.170**</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>1.518**</td>
<td>1.217**</td>
</tr>
<tr>
<td></td>
<td>GE</td>
<td>1.758**</td>
<td>2.049**</td>
</tr>
</tbody>
</table>
Results: Does CP associate with AP?

- In order to test on the relationships between CP and AP, a MIMIC model was used to examine if “Hearing Status (HS)” and “Speech Perception (SP)” have any effects on either AP or CP.

- Results showed that CP was highly correlated with AP, indicating that better classroom participation of students may lead to better academic performance in school.
Results of Regression Analysis

When longitudinal data was considered, regression results indicated that Speech Perception (SP) and Hearing Status (HS) did not predict either AP or CP of the students.
Classroom Participation & AP

- Results indicated that:
  - Students’ self-perceived classroom participation associate well with their academic performance.
  - By reducing barriers of communication and participation through bimodal bilingual instructions in class, it helps promote more active involvement of DHH students in class – that may reduce the barriers arisen from deafness or their limited speech perception ability, and that may eventually bring to positive academic progress.
STUDY 3:

ACADEMIC PERFORMANCE IN JUNIOR SECONDARY EDUCATION
Academic Performance of DHH Students compared to their hearing peers (S1-S3)

• No standardized assessments available at the secondary level of education in HK.
• By using Item Response Analysis (Rasch, 1960), students’ responses to all individual items were considered in projecting students’ ability.
• The performance of DHH and hearing students in Chinese, English and Maths was compared with students at the same grade.
Subjects

• 17 DHH and 244 hearing students in the secondary SLCO Programme were included in the analysis.
• 14 students were having severe to profound hearing loss, out of them 9 were using cochlear implants, 5 were using hearing aids.
• 1 student is having unilateral hearing loss, another is having mild loss.
Analysis

- Examine the psychometric properties of the examination papers of the school using the Rasch model (Rasch, 1960)

- Evaluate the effectiveness of the papers in terms of reliability, dimensionality of the scale, and fitness of items.
<table>
<thead>
<tr>
<th>Items</th>
<th>Student A</th>
<th>Student B</th>
<th>Difficulty (0-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>✓</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Item 2</td>
<td>✓</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Item 3</td>
<td>✓</td>
<td>✓</td>
<td>5</td>
</tr>
<tr>
<td>Item 4</td>
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<td></td>
<td>✓</td>
<td>8</td>
</tr>
<tr>
<td>Item 6</td>
<td></td>
<td>✓</td>
<td>6</td>
</tr>
<tr>
<td>Item 7</td>
<td>✓</td>
<td>✓</td>
<td>2</td>
</tr>
<tr>
<td>Item 8</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>50%</td>
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</tbody>
</table>
## Academic Performance in Wright Map

<table>
<thead>
<tr>
<th>Item Difficulty</th>
<th>Person Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>M=MEAN</td>
<td>DHH</td>
</tr>
</tbody>
</table>

[Image of Wright Map diagram]

- **Item Difficulty**
- **Person Ability**

- **M=MEAN**

The Wright Map diagram illustrates the relationship between item difficulty and person ability, with M=MEAN indicating the mean values for both.
The reliability, dimensionality and item fitness of the exam papers were checked and confirmed that Rasch analysis was appropriate.
## Comparing Persons Ability of DHH & H

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade</th>
<th>H</th>
<th>DHH</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Chinese</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>74</td>
<td>5</td>
<td>-0.358</td>
<td>0.507</td>
</tr>
<tr>
<td>S2</td>
<td>82</td>
<td>6</td>
<td>-0.054</td>
<td>0.556</td>
</tr>
<tr>
<td>S3</td>
<td>88</td>
<td>6</td>
<td>0.428</td>
<td>0.530</td>
</tr>
<tr>
<td>English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>74</td>
<td>5</td>
<td>0.131</td>
<td>1.290</td>
</tr>
<tr>
<td>S2</td>
<td>82</td>
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<td>-0.321</td>
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<tr>
<td>S1</td>
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<td>0.184</td>
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<tr>
<td>S2</td>
<td>82</td>
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<td>-0.678</td>
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<tr>
<td>S3</td>
<td>88</td>
<td>6</td>
<td>0.050</td>
<td>1.154</td>
</tr>
</tbody>
</table>

* p<.05
Discussion

• DHH students’ academic performance were, in general, comparable to the hearing students in the school.

• Some may have lower attainment - possible reasons may rest on delayed signed or spoken language development, which in most of the cases, also affect their academic development.
Discussion

• Using normative assessment is a general practice to review DHH students’ academic performance, however, reliable assessment tools may not be available at some circumstances.

• By looking at their classroom academic status can also provide insights on their development as all students involved will be under the same or at least similar curriculum in school.
Discussion

• To raise the reliability of the results, Item Response Analysis may be a good choice for within-school performance measures and comparisons.

• It may also inform the school's teachers more detailed information about the development of the students for further interventions.
Aim of Inclusive education

• “One of the aims of integrated education is to help all students/teachers/parents recognize, accept and respect individual differences, and even celebrate differences. This serves as a driving force for personal growth and the development of an inclusive society.” (Education Bureau, 2008)

• How SLCO Programme may achieve this?
Accepting individual difference
接納差異

- There are different components in SLCO Programme that may foster active participation of DHH students in classroom and school activities at all times.

- It promotes *mutual acceptance and respect* of uniqueness and individual differences of each other.
Reducing individual difference

Both deaf and hearing children become bilinguals

**AND it also reduces barriers to communication**
Respecting individual difference

D & H teachers as models to D & H students

Students observe equal status between:
- D & H teacher
- SL and spoken language
Recognizing individual difference

A critical mass of DHH students facilitates mutual understanding and support.
Allowing development of full potential

- “...every student has unique potentials and the school should provide room for the students to fully develop their multiple intelligence.”
  (Education Bureau, 2008)
Junior Sign Interpreters:
As a Bridge between DHH and hearing persons

P2 – P6 hearing students were selected as Junior Sign Language Interpreters

Taiwan PTS Sign Language news on Junior Sign Language Interpreters
Conclusions

• By creating a language-rich environment that nurtures a community of bimodal bilingual users within a regular school environment, both DHH and hearing students make good use of the languages they possess to engage themselves in classroom learning and classroom interactions.

• The DHH students do not perform differently in their participation in classroom communication with their peers and teachers. Their communication is not limited by which mode(s) of communication they are using. And that eventually promote positive academic development.
Selected References


Thank you!

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