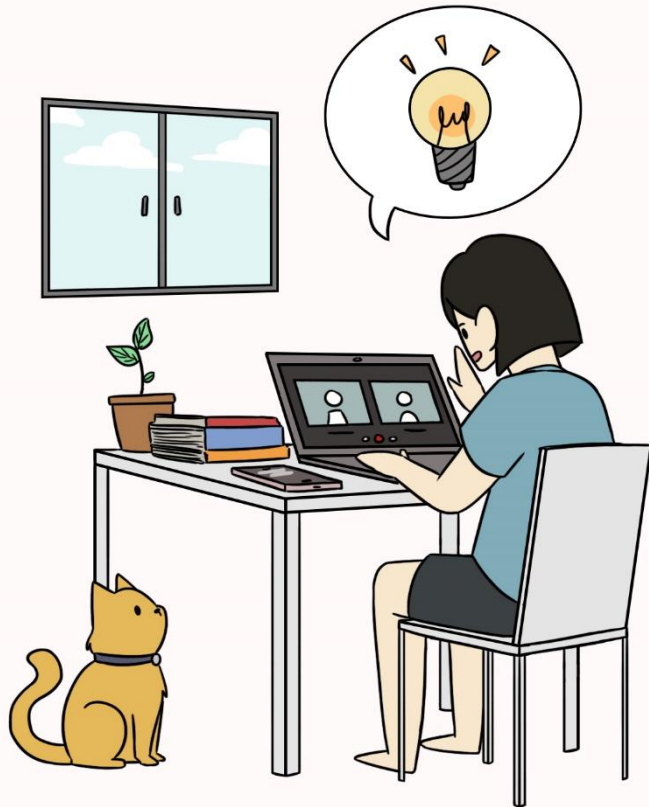# Editors' Foreword

In Issue 1 (2020) of *The Exchange*, we explored how technological disruptions led to the inevitable—a rethinking of our approach to education. As we enter into the "new normal" imposed by COVID-19, it is an opportune time to reflect on how the realities of social distancing and home-based learning have forced educators worldwide to learn, unlearn and relearn approaches to teaching and learning.

In this issue, we hear from Gifted Education teachers in our midst. **Andy Ng, Wang Zhi Yong, Jamay Loh, Tan Boon Tee, Usha Ram and Audrey Teo from St Hilda's Primary School (SHPS)** share how technology has transformed their classroom practices, and more significantly, their roles as educators. Let us consider how we too can renew our professional effectiveness, as we embrace challenges as opportunities to reinvent ourselves and emerge stronger. #SGUnited

Joani Lim and Cheak Ching Hui

A New Normal

Andy Ng

New Challenges

Circuit Breaker. Social distancing. Home-Based Learning. COVID-19 has thrown education a curveball, and the phrase 'VUCA' (the acronym for volatile, uncertain, complex and ambiguous) has never been a more fitting description of our world than today. In this time of uncertainty, **the need for our children to grow up to be adults who think critically about problems and actively solve them has become even more evident.**

The point was made in the last issue of *The Exchange* that good teaching is no longer just about imparting knowledge, but about transforming students into lifelong learners who are able to create new knowledge and understanding, on their own and with others. In adopting new pedagogies and technologies to promote knowledge creation, educators have encountered unfamiliar challenges posed by new patterns of learning and the innumerable interactions taking place between students.

To track and mine classroom data, we at SHPS adopted the Knowledge Building (KB) pedagogy, and Knowledge Forum (KF) online platform. Over four years, we explored how these tools could help us **analyse complex learning processes, and develop student-centric experiences** where students collaborate with

peers, regulate their own thinking, make collective decisions, and synthesise and develop new ideas to solve problems.

What are KB and KF?
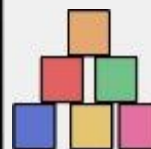
Knowledge Building pedagogy is a principle-based approach to learning that has a goal of co-creating "new" perspectives or understanding advanced knowledge beyond just the limit of an individual. It is a collective effort to explore and learn more about the topic. (Teo, C. & Arumugam, U. & Loh, J. & Ng, A., 2018)

Scan this QR code to find out more about Knowledge Building, KB Principles and the KB Classroom.
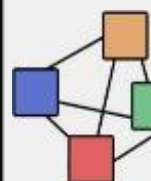
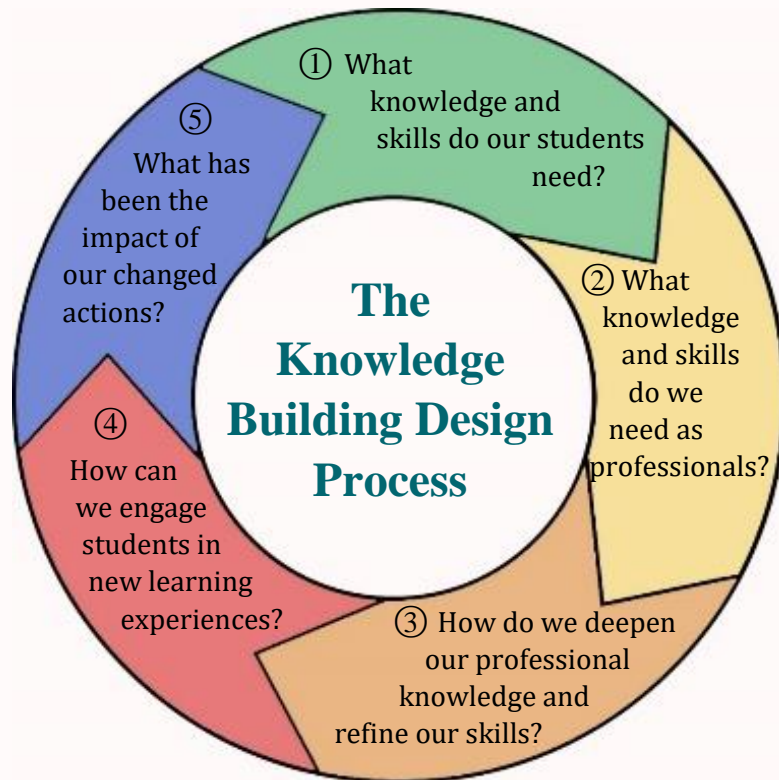**Knowledge Forum** is an online environment that supports KB. Students' and teachers' ideas are made visible to all users on the platform. It displays interconnections between ideas as a web. Each web represents a cluster of related ideas. It is also possible to trace the development of ideas over time. (Resendes & Dobbie, 2017)

Scan this QR code to find out more about the Knowledge Forum.

New Roles

As some of us who had to adopt new technologies for the recent HBL found out, **designing an online lesson is more than learning how to use technological tools and platforms. We also have to think hard about our pedagogy**. In our case, we needed to understand the KB Design Process (McNaughton, S. & Wilson, A. & Jesson, R. & Lai, M., 2013) before using KF.

① What knowledge and skills do our students need?

② What knowledge and skills do we need as professionals?

③ How do we deepen our professional knowledge and refine our skills?

④ How can we engage students in new learning experiences?

⑤ What has been the impact of our changed actions?

The Knowledge Building Design Process

We were not strangers to the first step in the KB Design Process, i.e. asking ①"What knowledge and skills do our students need?". However, the next two questions (②"What knowledge and skills do we need as professionals, and ③"How do we deepen our professional knowledge and refine our skills?") felt less familiar. Using KF called for new sets of skills so that we could design meaningful online learning experiences, capture the interactions, and analyse the data collected. Only with our new skillsets in place could we execute the next two stages meaningfully—④engaging students in new learning experiences, and ⑤assessing 'What has been the impact of our changed actions?'

New Visibility

As teachers, we want to know whether our students are learning, but have no sight of their internal thought processes. While we can design sentence starters that correspond to specific thinking skills, for example to scaffold students to generate creative solutions, KF records each student and teacher entry, and shows the frequency of each sentence starter as well as how it is used. This serves as a proxy to discern students' progress during a lesson, as well as how they are using the corresponding thinking skills.

The quantitative data generated on the platform, in the form of graphs for example, **make connections between students' ideas visible, allowing us to observe patterns in knowledge flows, identify misconceptions and even potential for lesson extensions.** We are then able to **make data-driven decisions rather than plan our interventions based on intuition.**

New Capabilities

In this issue of *The Exchange*, we reflect on a series of learning experiences that we curated in different subjects, starting with the use of intuitive functions, to leveraging more sophisticated algorithms which track the frequency and quality of interactions between students.

In Chinese Language, Mr Wang Zhi Yong uses the **'search' function to innovatively track the development of students' ideas and facilitate peer learning**.

Our Science team consisting of Mrs Jamay Loh, Mr Tan Boon Tee and Mrs Usha Ram demonstrates how **keyword analysis** can **support scientific inquiry**.

Finally, Mrs Audrey Teo shows us how **analytics** can help **track thought leaders**, **to advance class knowledge** with their ideas.

We hope our sharing encourages you to make use of the tools within reach to create more meaningful learning experiences for our students.

References

McNaughton, S. & Wilson, A. & Jesson, R. & Lai, M. (2013, April). *Research into the Implementation of the Secondary Literacy Project (SLP) in Schools*. The Hub. Retrieved May 5, 2020, from https://thehub.swa.govt.nz/assets/documents/40417_Research_into_the_Implementation_of_the_Secondary_Literacy_Project_SLP_0.pdf

Resendes, M. & Dobbie K. (2017). *Knowledge Building Gallery – Leading Student Achievement: Networks for Learning Project*. The Learning Exchange. Retrieved July 28, 2020, from http://thelearningexchange.ca/wp-content/uploads/2017/04/KB-Gallery-5-Knowledge-Forum-Accessible.pdf

Teo, C. & Arumugam, U. & Loh, J. & Ng, A. (2018, July). *A Practitioner's Insight on Grade 5 Pupils Developing and Improving Theory in the Topic of Cells*. Research Gate. Retrieved July 30, 2020, from https://www.researchgate.net/publication/326235084_A_Practitioner's_Insight_on_Grade_5_Pupils_developing_and_improving_theory_in_the_topic_of_cells

Tracking Ideas

Monitoring students' learning in real time
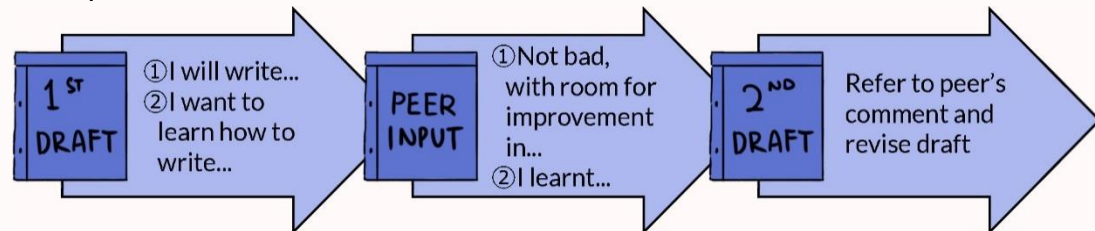
Wang Zhi Yong

The Challenge

To communicate effectively, students should be able to express their thoughts and opinions, and share information with others through oral and written interaction. With an emphasis on these skills in the Chinese Language (Primary) Syllabus, students are given more opportunities to engage in group work and collaborative learning during lessons, where numerous ideas are generated and refined.

As language teachers, we welcome the exchange and diversity of ideas. However, capturing students' learning is a challenge as multiple conversations are taking place simultaneously. **So, how might we track the development of students' ideas during a lesson to inform our teaching practice and lesson design?**

Making Learning Visible

For a picture description writing task, I gave students six pictures and asked them to write four descriptions (speech, actions, thoughts and environment) for each of the pictures. The students worked on their writing in three stages: (1) writing the first draft, (2) getting peer input, and (3) producing a second draft. To provide scaffolding, I customised sentence starters on KF for the first two stages. At each stage, students chose between two sentence starters depending on their readiness—one prompted them to start sharing and the other signalled to the teacher that they were still thinking. The process was repeated for every description.

1ST DRAFT → ①I will write… ②I want to learn how to write… → PEER INPUT → ①Not bad, with room for improvement in… ②I learnt… → 2ND DRAFT → Refer to peer's comment and revise draft

As lesson designer and facilitator, I was interested in how ideas surfaced during class discussion shaped each student's ideas, and how these evolved throughout the lesson. In sharp contrast to the partial access to information I had teaching and observing my students, **having sight of all the ideas generated, and being able to analyse them afterwards, helped paint a fuller and more objective picture of the lesson outcomes.** This was essential to inform future practices. For instance, by looking at which sentence starter was being used as well as its frequency, I was able to identify students who needed support and plan interventions for them.

'Search' and You Shall Find

The search function on KF is able to filter and categorise information captured on the platform, and thus facilitate assessment for learning.

Monitoring students' learning at different checkpoints

To get an overview of students' starting points at the beginning of the lesson, I studied their first drafts on the first picture by applying the search term "1A1", which refers to Picture 1—Description A—first draft. With the consolidated results (refer below), I was able to identify drafts that were lacking in content (e.g. Charlie's marked by the red box) and provide additional help to students. I could also generate results for any picture or description, check if the students concerned were struggling with it, and plan interventions accordingly.

1A1 Adrian	营火会刚刚结束。天气晴朗，一轮明亮的月亮挂在天上。有的同学在玩耍，有的在唱歌跳舞。
1A1 Bernice	营火会刚刚结束，微风轻拂，黑黑的天空漂浮着几个星星。
1A1 Charlie	月亮挂在夜空中。

A sample of results (using actual responses) consolidated on KF with the search term "1A1". Names of students are pseudonyms.

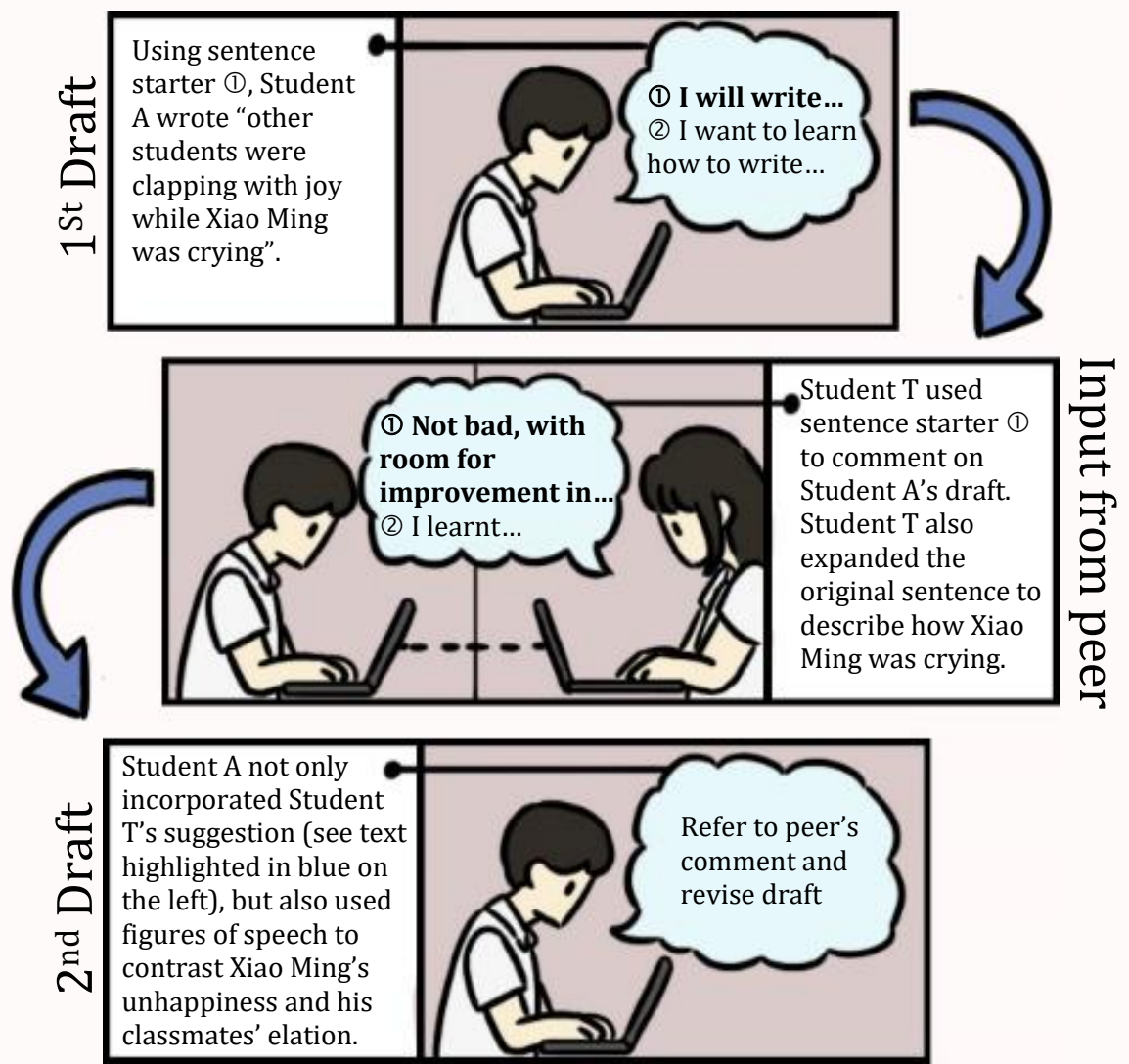## Monitoring changes in students' work over time

Language teachers use process writing and feedback to improve students' work iteratively. While drafts give us a sense of students' competencies before and after the writing process, why or how their ideas evolve is less clear.

In the example below, we see the first and second drafts that Student A submitted after having worked on his writing over the aforementioned three stages.

DRAFT 1

同学们开心极了，拍手叫好。可小明哭着。

The second draft expanded on the first draft to include descriptions, figures of speech and a monologue.

| Figures of speech |
| Suggestion from peer |
| Monologue |

DRAFT 2

一个风和日丽的星期四下午，天空中飘着朵朵白云，像雪白的羊群，老师把数学考卷分给了同学们。有的同学看了看考卷后，开心极了，只是少了两只翅膀，要不然早就飞到天上去了。课时，小明难过地低着头，坐在椅子上独自发呆，泪水像断了线的珍珠似的，一颗一颗地掉落下来。小明看到自己只考了34分，感到既惭愧又尴尬，心想："哎哟！只得到三十四分！妈妈看到了一定会狠狠地把我骂得狗血淋头！我这次真是惨了！我不应该贪玩，没有复习准备数学考试，而现在才后悔。真是早知今日，何必当初啊！"

1st Draft

Using sentence starter ①, Student A wrote "other students were clapping with joy while Xiao Ming was crying".

① **I will write...**
② I want to learn how to write...

Input from peer

① **Not bad, with room for improvement in...**
② I learnt...

Student T used sentence starter ① to comment on Student A's draft. Student T also expanded the original sentence to describe how Xiao Ming was crying.

2nd Draft

Student A not only incorporated Student T's suggestion (see text highlighted in blue on the left), but also used figures of speech to contrast Xiao Ming's unhappiness and his classmates' elation.

Refer to peer's comment and revise draft

The pictures on the previous page illustrate how Student A improved on his writing drafts with feedback from his classmate. I wanted to understand how an idea grew from simple sentences to a full paragraph. Using the 'search' function to display a student's entries and all related peer comments, I could analyse the relationship between the use of sentence starters, feedback given and the development of students' ideas.
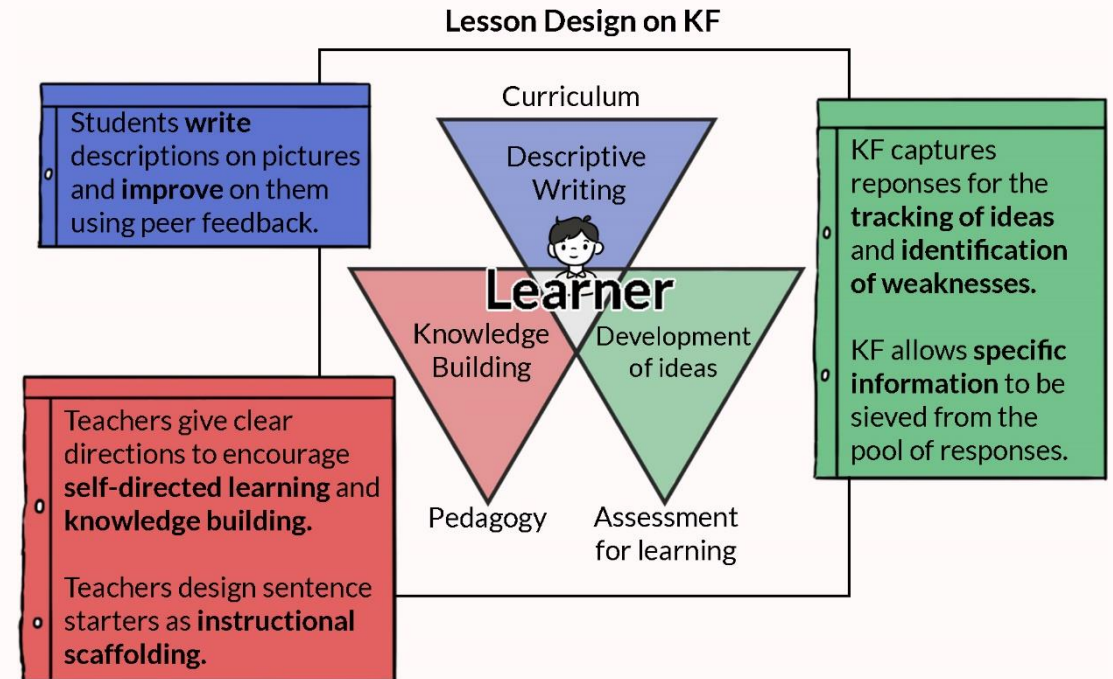
Supporting students in their learning

Students could keep track of all the ideas they had generated for the composition simply by searching for their own names on the platform. During the lesson, I also highlighted examples of good ideas and writing, and encouraged students to refer to and learn from their peers by searching for their names. Students could then refer to, organise and build on ideas to write a full composition.

A visual compilation of ideas is particularly useful for weaker students who may otherwise find it daunting to use descriptive writing in their compositions. This could also be an opportunity for students to develop awareness of their thought processes by examining how their ideas have developed.

Taking on New Roles and Responsibilities

In this lesson, I saw my role as a teacher evolving into that of a designer and facilitator. To build knowledge, I needed to give clear instructions and design sentence starters as instructional scaffolding to elicit different types of responses, raise the quality of students' work, and encourage collaboration. The diagram on the next page shows how the lesson design kept the learner in the centre while bringing together descriptive writing, knowledge building and the development of ideas.

Lesson Design on KF

Students **write** descriptions on pictures and **improve** on them using peer feedback.

Curriculum

Descriptive Writing

Learner

Knowledge Building

Development of ideas

Pedagogy

Assessment for learning

KF captures reponses for the **tracking of ideas** and **identification of weaknesses**.

KF allows **specific information** to be sieved from the pool of responses.

Teachers give clear directions to encourage **self-directed learning** and **knowledge building**.

Teachers design sentence starters as **instructional scaffolding**.

Tracking the data has helped me understand my students' competencies and needs better, and allowed me to address their learning gaps in a more timely manner. As a beginning practitioner of KB and KF who has benefitted from the platform, I hope others will come on board to use and develop it to benefit more students.

Learning how to Learn for Life

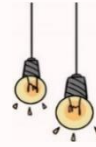## Facilitating and Sustaining Inquiry with Keyword Analysis

Jamay Loh, Usha Ram and Tan Boon Tee

Dealing with Discomfort

As Science teachers, we want to promote scientific inquiry where both students and teachers ask good questions. We also want students to approach that inquiry with scientific literacy: drawing evidence-based conclusions for understanding and decision-making in the learning process. Our objective is to prepare our students to learn for life as we equip them with skills to deal with "constant discomfort" in a world of rapid changes.

Scientific inquiry starts with curating experimental data to pique students' curiosity, in order to scaffold students to generate quality questions that guide their investigation. Teachers need to gain insights into students' thought processes at different stages of scientific inquiry. We have used technology to support scientific inquiry, engage students and gather data. However, while interesting to students, the IT tools do not make students' reasoning visible to teachers. How might we get such data?

Sparking Inquiry

In a lesson, the class formed two groups and shared what they knew about the respiratory system. Their responses were presented in two word clouds that showed the frequency of words used in each group—an unusual tool to be used in a Science lesson! The keywords were then used as stimuli to encourage students to ask questions about respiration on KF.

Allowing children to visualise their own ideas in an accessible manner like word clouds harnesses their natural curiosity and allows them to initiate their own inquiry. When students noticed words they did not associate with the respiratory system appearing in the other group's clouds, they raised questions on how these ideas were interconnected, spurring deeper inquiry into concepts. Hence, students were working on their own ideas instead of content provided by the teacher.

As teachers, we were interested in the thought processes behind students' choice of words. If we had information on why and how words were used by students, we could make decisions to sustain students' inquiry. The idea webs on KF helped us gain insights on the scientific concepts that students had already grasped, allowing teachers to identify possible extensions to sustain their inquiry.

Making Data-Driven Decisions

In a lesson on photosynthesis, students were given a scenario with four predictions (shown below). They discussed the scenario on KF and shared which prediction they agreed with, and why.

Four friends wondered how light affected the growth of plants. They decided to test their ideas using young bean plants. One set of plants was put in a dark closet, and another was put on a shelf near a sunny window. Both were left for the same period of time. The friends then measured the height of the plants after **three** days. This is what they had predicted:

I think the plants in the dark closet will be the tallest.

I think the plants by the sunny window will be the tallest.

I think the plants will be about the same height.

I think the plants in the closet will stop growing and die.

Instead of us ploughing through numerous responses and trying to draw links between them, the Network of Words tool on KF presents instantaneous data gathered during the discussion through a lexical analysis of keywords, and another of all responses. This enabled us to interpret the data in real time to make informed pedagogical decisions.

1. Lexical analysis of keywords

The **lexical analysis** of keywords shows how ideas in students' responses are interconnected through a diagram. Interpreting data from the diagram gives us better insight into how students are engaging in inquiry, and how and where to lead them from their existing understanding. This helps us decide if we should clarify problems in understanding or go further.

In this example, a lexical analysis on five keywords crucial to understanding photosynthesis gave us an idea of students' grasp of the concept. The diagram below shows that students understood the relationship between "plant", "food" and "sunlight". We could thus go further to introduce higher-order questions.
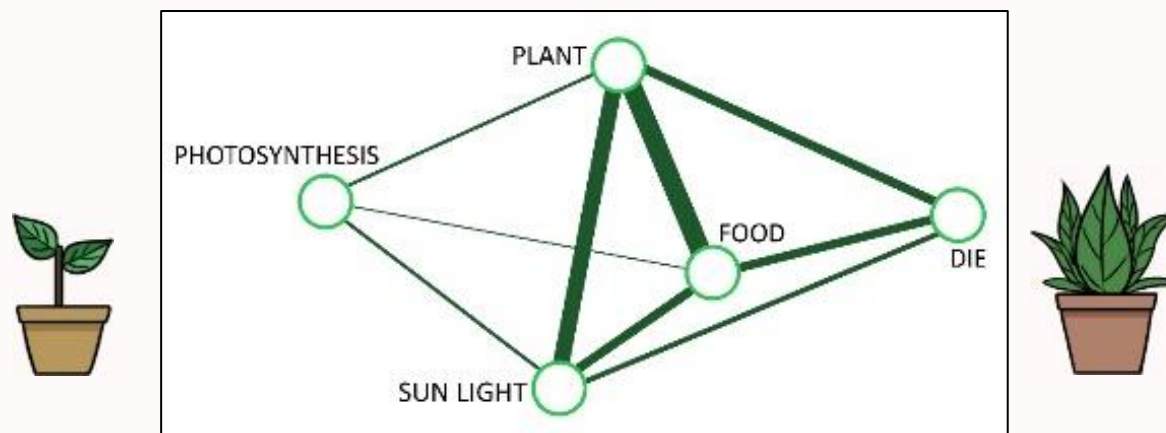

*The **thickness of the lines** represents the **degree of the relationship** between the keywords. This diagram is a simplified version for illustrative purposes.*
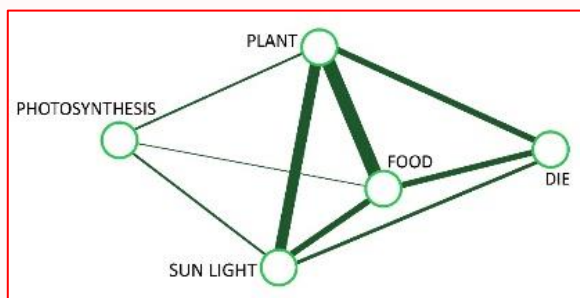
A diagram showing analytics from the Network of Words tool. Questions developed by teachers are in coloured boxes. This diagram is a simplified version for illustrative purposes.

Which plant will be taller? The one in the closet or the one by the window? (Concept: Etiolation)
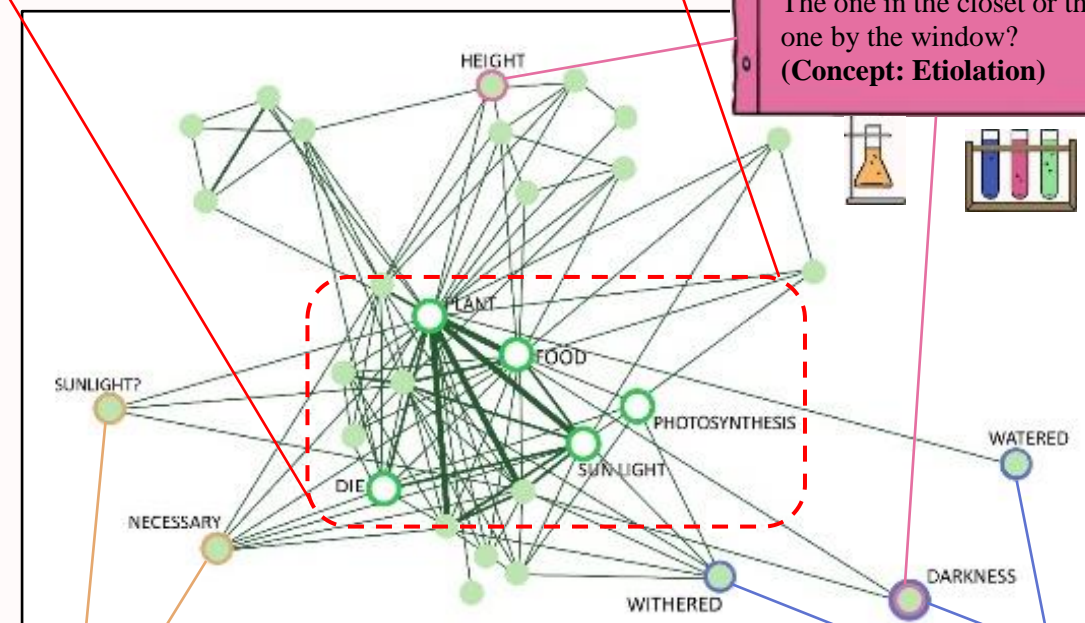
Do plants really need sunlight to make food? What about plants with no access to sunlight? e.g. in caves? (Concept: Adaptation)

How can we be sure that plants wither because of the lack of sunlight, instead of the lack of water? (Concept: Fair Test)

2. Lexical analysis of all responses

The tool can identify words used in the responses and present the links between them, thus giving a full picture of all the words generated during the discussion (refer to diagram on the left). This provides us with a data-backed sensing of the knowledge students already possess.

The network of words in the centre (represented in the red box) suggested that students had already grasped the concept of photosynthesis. The pedagogical move we employed was to consolidate their learning on photosynthesis and ensure all students were on the same page. We then moved on to use the peripheral words (circled) as stimuli to introduce questions (in coloured boxes) to spur higher-order thinking. **By facilitating and sustaining inquiry in this way, we can keep students in their zone of proximal development and develop their intellectual curiosity.**

The Greatest Gift

If we leverage data analytics to design learning experiences that encourage a learning culture driven by inquiry and ideas today, we would equip our students with skills needed to create knowledge and solve problems in their future. This might be the greatest gift we can give our students.

10

Giving a Voice to the Voiceless

Promoting an Inclusive, Idea-centric Classroom

Audrey Teo

Developing Thought Leaders in an Idea-centric World

The mission of English Language teaching in the next decade is for us to nurture students to be empathetic and effective communicators. Students need to be able to collaborate with others toward shared goals by listening actively to ideas and presenting their own with "impact, effect and affect" (EL Syllabus 2020). This emphasis will empower students to thrive in the future workplace where interpersonal and higher-order cognitive skills are valued. Essentially, we must prepare students to strive to be thought leaders in an idea-centric world.

In English Language classes, verbal discussion is the most common approach to attain this goal. However, there is a tendency for discussions to revolve around students who are more vocal. Two issues arise. Firstly, these students do not always give the best answers or represent the most accepted idea. The second is more critical. **Students with good ideas, but are more reflective and take longer to think, may end up not being heard.**

Our challenge is to adopt a more inclusive approach to discussions, while tracking patterns of thought leadership within the discourse. In this example, we leverage KB and KF to design learning experiences for students as they brainstorm on a continuous writing task.

Connecting a Diversity of Ideas

Misconceptions or misinterpretations of a given topic are common when students engage in brainstorming activities. **Typically, teachers close the gap by giving students an explanation. Inevitably, this leads to a single definition of the topic, poor diversity of ideas and lack of student autonomy.** It is little wonder why we groan about marking compositions cast in the same mould!

In this lesson on continuous writing, our objective was to decentralise the ideation process and empower students to learn inductively. Students were given the topic "A Secret". As students proposed definitions, gave examples of secrets, built on each other's ideas, and clarified misconceptions, KF allowed us to capture a network connecting diverse ideas.

In this online lesson, there is a **distributed effort in learning** as all students have equal 'airtime' to contribute to the discussion. Removing 'loudness' or quality of verbal articulation from the picture, student **contributions were recognised by quality of ideas, or resonance with other peers**.

The Real Difference

The biggest change for educators who adopt technology in the classroom is the access to learning analytics. The learning analytics tools in KF can analyse the content of student ideas qualitatively. Data can be generated to show which students are providing thought leadership, i.e. students posting ideas that other students gravitate towards.

Below is an example of analytics from the brainstorming lesson, 'A Secret'. In the chart below, the y-axis represents the 'centrality' of each student, while the x-axis reflects the discussion across time. Students with high centrality hold an important position in the social network at that point in time, i.e. they post ideas which their peers gravitate toward and build on.
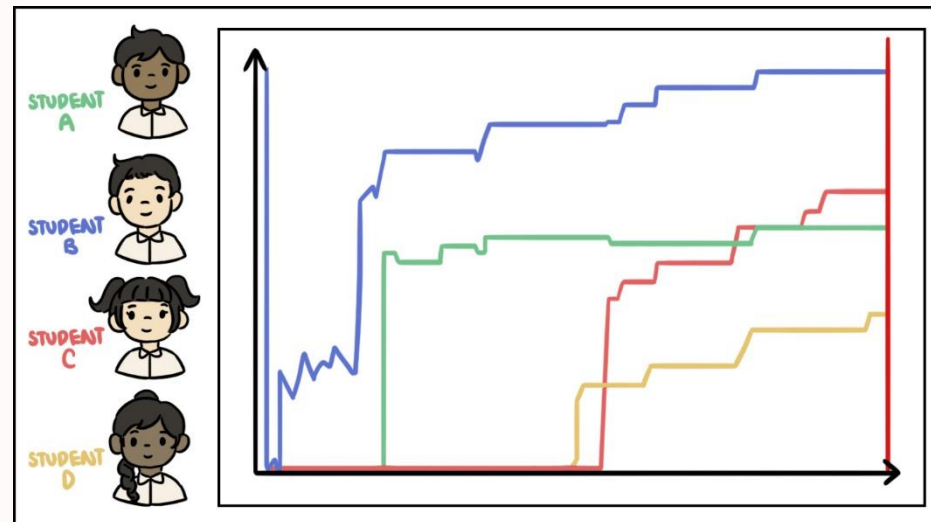
Student B (in blue) had highest centrality for most of the discussion. This is a simplified version for illustrative purposes.

Student B was found to be a thought leader as he had the highest centrality value for most of the online discussion. Yet, in real life, Student B was often quiet and hardly participated as he was afraid to voice his opinions for fear of being ridiculed. Student B's experience shows that **technology can be leveraged to create safe learning environments and create opportunities for quieter students to lead discussions.**

Democratising Learning

As an English teacher of 38 years, I have always encouraged students to voice their opinions in class discussions. This pedagogy and platform have helped to give a voice to the voiceless in my class, because it takes away their fear and gives them confidence to express their ideas freely. **Regardless of personality or confidence level, all students can advance the whole class' knowledge.** Thus, the use of KF **enables everyone to have a voice in class**, and **allows for thought leadership to become visible and be recognised.**

Acknowledgements