

# Enhancing Inquiry-Based Learning in the Social Studies Classroom using Knowledge Building Pedagogy and Technology

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**Abstract:** This study examined the use Knowledge Building (KB) approach and Knowledge Forum (KF) technology to drive Inquiry-Based Learning in Upper Secondary Social Studies (SS) lessons. Lessons were designed based on KB's principle that allowed students to play a leading role in the construction of a core knowledge (Socio-Economic Status as a factor in shaping one's identity) and in the discourse on a related societal issue (identifying one way to help those who struggles to have their basic needs met) through active negotiation, dialogue and appropriate scaffolding with each other and with their teacher on the KF platform. We analysed the impact of the KB approach by examining students' final theories and explanations in terms of the levels of response and thinking. Results suggest that the KB approach, despite the constrain of time, provided an excellent platform for students to collaborate with each other and dialogue with their teacher in correcting misconceptions, in ideas development and make improvements on constructing explanations. Future considerations in the integrative use of KB and its technological affordances are required that can further develop students' ability to construct explanations that qualify as high levels of response based on a standard SS Level of Response Mark Scheme (LORMS).

## Introduction

The revised Upper Secondary Social Studies (SS) syllabus highlighted that engaging students in discourse on societal issue is a complicated task and made the recommendation of using Inquiry-Based Learning (IBL) pedagogy to actively engage students in knowledge construction and meaningful learning through the Inquiry Process (MOE, 2016). The SS Inquiry Process can be described via four elements – mainly Sparking Curiosity, Gathering Data, Exercising Reasoning and Reflective. Figure 1 shows how the Inquiry Process looks like in the Social Studies classroom:

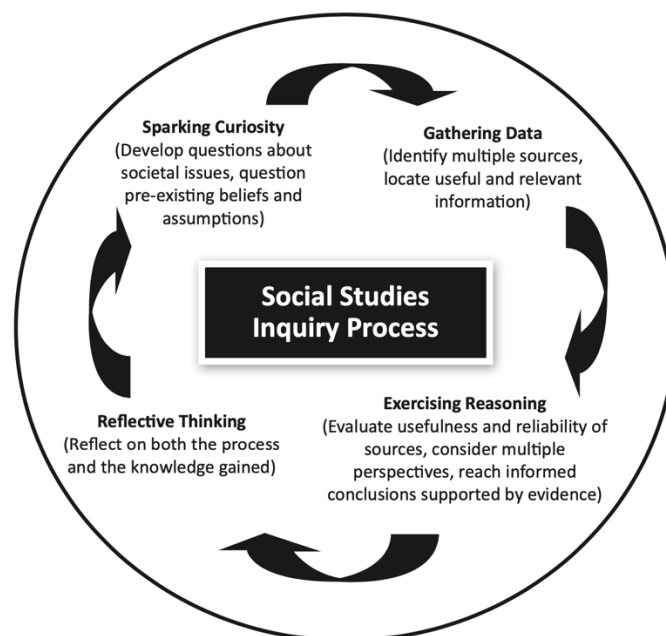


Figure 1: Social Studies Inquiry Process (MOE, 2016)

The premise that IBL results in significant learning as compared to traditional didactic instructional approach is evident, provided that appropriate scaffolding are in place for the learners (Hmelo-Silver, Duncan, & Chinn, 2007). An important element that drives effective IBL environments is the quality interaction and relationship between the instructor (teacher) and the learner, as well as between learners (Blessinger & Carfora, 2014).

The Knowledge Building (KB) approach postulates that authentic creative knowledge work can take place in school classrooms (Scardamalia & Bereiter, 2014). A key KB pedagogical principle – Improvable Ideas, entails that “every idea is to be treated as potentially improvable.” Scardamalia and Bereiter (2014) believes that while the initial generation of knowledge, ideas and theories do come naturally to young people, the process of improving them does not. Considerable help from the teacher, technology and peers are required to maintain students’ engagement in idea improvement. In technology, the Knowledge Forum (KF) is an online collaborative platform that supports KB Discourse (Scardamalia, 2017). The platform allows students to contribute ideas towards inquiry and offers scaffolding tools that enables negotiation, dialogue and appropriate scaffolding to take place between learners and the teacher in the Inquiry Process. In this study, we examine how a Social Studies teacher uses the KB approach, through KF, to enact effective IBL in the Upper Secondary Social Studies classroom.

### **Knowledge Building in the Social Studies Classroom**

In finding out about students’ perceptions on Social Studies in the American context, students found the subject to be boring when the teaching method was primarily an expository form of instruction (Chiodo & Byford, 2004). Moreover, the study also found that the perceived lack of utilitarian value contributed further to students’ negative perception of the subject. For the latter, it seemed that the mere transmission of facts and ideas from the textbook rather than active involvement of learners in constructing knowledge was a key contributing factor. Furthermore, advancement of understanding on these societal “ideas”, like the concept of Globalisation, come not so much as flashes of insight (or “a-ha!” moments), that inquiry on scientific theories provide, but only as increments of perceived complexity (Scardamalia & Bereiter, 2012).

Therefore, it is vital to apply the KB principle of Real Ideas, Authentic Problems when designing the Social Studies lessons. Authentic Problems, as Scardamalia (2002) puts, are problems that students care about and are very different from textbook problems. Authentic inquiry in Social Studies means building theories that explains particular cases, or Authentic Problems related to societal issues, which all the more makes KB a good alternative to accommodate both the interests of learners and the desired education outcomes of Social Studies (Scardamalia & Bereiter, 2012).

### **The classroom and teacher’s lesson design**

The teacher has 5 years of teaching experience and started adopting KB in his lessons in semester two, 2018. In semester two 2019 (runs from the month of July to November), the teacher went further by integrating KF in his KB class. The participants ( $N = 27$ ) from this study were from one secondary 3 (grade 9) class in a government-aided school. The participants consisted of 15 females and 12 males. Of these 27 participants, 13 were Chinese, 7 were Malay, 4 were Indian and 3 were of other race or nationality. The class is an express class and considered the less academically inclined of their express cohort. Upper Secondary Social Studies is a compulsory subject for all secondary school students and, despite having exposure of the subject in their primary school years, the concepts taught can be considered new and unfamiliar to the students.

In selecting the Social Studies concepts with the principle of Real Ideas, Authentic Problems, the teacher chose the concepts of identity and socio-economic status (SES) found in chapter 4 of the SS textbook. The very concepts chosen are real and relevant to the students, especially so since they are all living in a multi-cultural and diverse society like Singapore. It is important to help students recognise that SES is a crucial attribute in shaping one’s identity and, in turn, contribute to the diversity of Singapore.

In designing the lessons, the teacher incorporated KB principles<sup>1</sup>, Elements of Social Studies and Pedagogical Practices postulated by the Singapore Teaching Practice. In considering the Pedagogical Practices, teachers can consider the teaching areas of the four core teaching processes that can help provide additional guide to lesson designs (MOE, 2018). Figure 2 shows the core teaching processes and teaching areas of The Singapore Teaching Practice Pedagogical Practices.

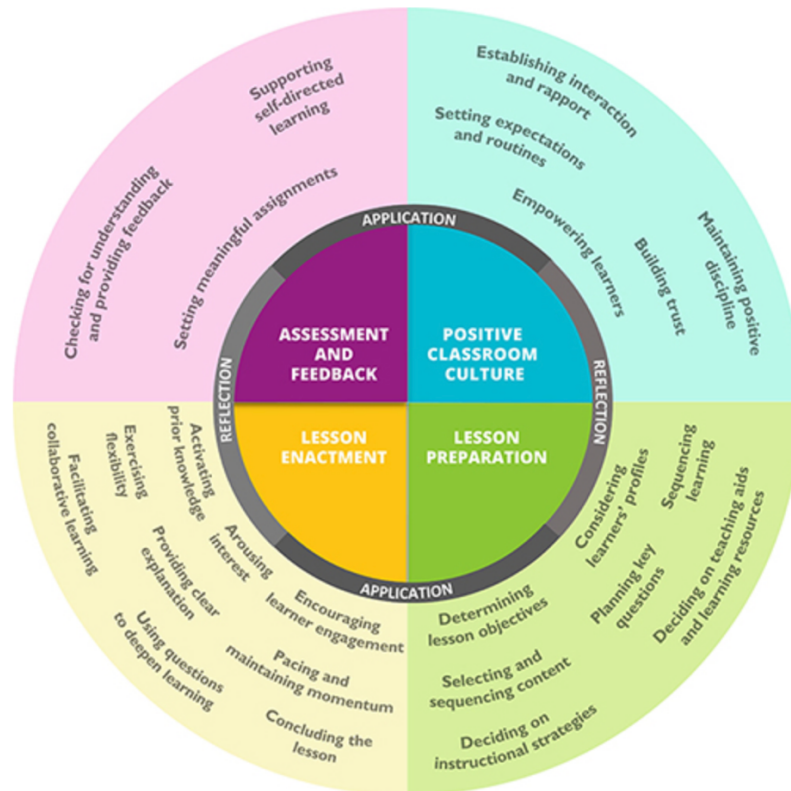


Figure 2: The Singapore Teaching Practice Pedagogical Practices (MOE, 2018).

The lesson design is broken down to three stages of inquiry. In enacting effective IBL through the KB approach, each stage corresponds to one or two elements of the Social Studies and areas of Pedagogical Practices. Tables 1a, 1b and 1c provide the framework and rationales considered in designing stage 1, stage 2 and stage 3 inquiry respectively.

Overall, students would play a leading role of not just contributing ideas to inquiry, but also take an active role, through collaboration, in improving ideas with the use of the scaffolding tools on the KF platform, driving KB discourse. This what makes KB an excellent approach to adopt in the Social Studies classroom.

Table 1a: Framework of Stage 1 Inquiry and teacher's rationales behind the design

<b>Stage 1 Inquiry: How would you describe your identity?</b>			
<b>KB Principles</b>	<i>“Real Ideas, Authentic Problems”; “Improvable Ideas”; “Idea Diversity”; “Democratising Knowledge”; “Community Knowledge”</i>		
<b>Elements of Social Studies Inquiry Process</b>	<i>Sparkling Curiosity</i>	<i>Gathering Data and Exercising Reasoning</i>	<i>Reflective Thinking</i>
<b>Areas of Pedagogical Practices (Based on Singapore Teaching Practice)</b>	<i>Activating Prior Knowledge; Arousing Interest; Encouraging Learner Engagement.</i>	<i>Using Questions to Deepen Learning; Checking for Understanding and Providing Feedback.</i>	<i>Concluding the lesson.</i>
<b>KB activities designed by the teacher</b>	Students are tasked to provide response to the inquiry with the use of <i>My Theory</i> KF Scaffold.	Teacher to use KF Word Cloud Analysis Tool to check for students' understanding of their concept of Identity.  Use questions to help deepen learning and see connections between their personalised ideas and the attributes that shape one's Identity.	Teacher concludes the lesson by introducing the core concept of SES.  This lesson would spark off the reflective thinking process in the topic during the next stages.
<b>Rationale for KB activities &amp; Pedagogical Practices</b>	Getting students to contribute towards their understanding of identity through contribution of personalised, real ideas.  This part of inquiry can help to activate students' prior understanding of real-world issues and pre-existing beliefs (MOE, 2016)  Brings about a culture of “democratising of knowledge” as all students are contributors of knowledge; this increases students' ownership, interests and engagement.	Allows students to appreciate diverse ideas from a community and understand the benefits of combining ideas to reach for better understanding and ideas development.  Understands students' prior knowledge and/or misconceptions related to the Concept of Identity.	The process gets student to reflect on personal assumptions and beliefs that may have shaped their understanding on the concept of identity  Provides the link to stage 2 inquiry.
<b>Advantage(s) and Rationale(s) of Knowledge Forum</b>	Provide a collaborative platform for students to see the variety of ideas at a glance and allowing students to see connections between the ideas through the Analytical Word Cloud Tool.		

Table 1b: Framework of Stage 2 Inquiry and teacher's rationales behind the design

<b>Stage 2 Inquiry: What is Socio-Economic Status?</b>			
<b>KB Principles</b>	<i>"Real Ideas, Authentic Problems"; "Improvable Ideas"; "Idea Diversity"; "Democratising Knowledge"; "Epistemic Agency"; "Knowledge Building Discourse"</i>		
<b>Elements of Social Studies Inquiry Process</b>	<i>Sparkling Curiosity</i>	<i>Gathering Data and Exercising Reasoning</i>	<i>Reflective Thinking</i>
<b>Areas of Pedagogical Practices (Based on Singapore Teaching Practice)</b>	<i>Activating Prior Knowledge; Arousing Interest; Encouraging Learner Engagement.</i>	<i>Facilitate Collaborative Learning; Checking for Understanding and Providing Feedback; Encouraging Learner Engagement.</i>	<i>Checking for Understanding and Providing Feedback; Providing Clear Explanation; Concluding the lesson; Setting Meaningful Assignments.</i>
<b>KB activities designed by the teacher</b>	Students are tasked to provide response to the inquiry with the use of <i>My Theory</i> (KF Scaffold).	Students, in pairs, review each other initial theory and ideas on SES and provide comments using KB Scaffolds.	Teacher reviews lesson by displaying the formulated better theories to consolidate learning.
		The comments can be questions, suggestions or areas for improvement.	Teacher uses students' better theories to explain the concept of SES.
		Based on comments, students synthesise information to formulate a <i>Better Theory</i> (KF Scaffold) to the inquiry.	Based on acquired knowledge, students are tasked to read an article " <i>How to tell if Singapore is high or low class? Poll gets interesting replies from Singaporeans</i> " <sup>2</sup> and share their reflections and thoughts about SES on KF.
<b>Rationale for KB activities &amp; Pedagogical Practices</b>	Getting students to contribute towards their understanding of SES through contribution of personalised, real ideas.	Entire process is student-centric; Students takes a leading role in the scaffolding process and KB discourse. (Epistemic Agency)	Allows students to appreciate diverse ideas towards the concept of SES.
	Understands students' prior knowledge and/or misconception related to SES.	Brings about a culture of collaboration to "build-on" rather than "answering".	Conclusion to consolidate learning of the concept.
	Brings about a culture of "democratising of knowledge" as all students are contributors of knowledge; this increases students' ownership, interests and engagement.	Strengthens students' meta-cognition through evaluating, reconciliation of questions, suggestions and/or ideas to the issue.  Supports assessment as learning through the culture of cross-referencing.  Helps students appreciate that Social Studies Concepts are social constructs and discourse involves dialogue and negotiation. (KB Discourse)	The reflection task provides students with an authentic view of how SES shapes one's identity in Singapore.
<b>Advantage(s) and Rationale(s) of Knowledge Forum</b>	Supports students' meta-cognition reasoning through its KB scaffolds of " <i>I need to understand</i> ", " <i>This theory does not explain</i> " and " <i>I have new information</i> ". Provides a collaborative platform for students to see the variety of ideas at a glance and allowing students to see connections between the ideas. Provides an authentic learning environment to facilitate Social Studies discourse.		

Table 1c: Framework of Stage 3 Inquiry and teacher's rationales behind the design

<b>Stage 3 Inquiry: "How can we help those who struggles to have their basic needs met? Explain your answer using one way"</b>			
<b>KB Principles</b>	<i>"Real Ideas, Authentic Problems"; "Improvable Ideas"; "Idea Diversity"; "Democratising Knowledge" "Knowledge Building Discourse"; "Rise Above"</i>		
<b>Elements of Social Studies Inquiry Process</b>	<i>Sparking Curiosity</i>	<i>Gathering Data and Exercising Reasoning</i>	<i>Reflective Thinking</i>
<b>Areas of Pedagogical Practices (Based on Singapore Teaching Practice)</b>	<i>Activating Prior Knowledge; Arousing Interest; Encouraging Learner Engagement. Setting Meaningful Assignments.</i>	<i>Checking for Understanding and Providing Feedback; Encouraging Learner Engagement.</i>	<i>Checking for Understanding and Providing Feedback; Providing Clear Explanation; Concluding the lesson.</i>
<b>KB activities designed by the teacher</b>	<p>Pre-activity: The teacher shows the class an episode to a Channel New Asia documentary video titled "Don't call us poor".<sup>3</sup></p> <p>After watching the video, students are tasked to provide response to the inquiry with the use of <i>My Theory</i> (KF Scaffold).</p>	<p>Teacher reviews each other initial theory and ideas and provides comments using KB Scaffolds.</p> <p>The comments can be questions, suggestions or areas for improvement.</p> <p>Based on comments, students synthesise information to formulate a <i>Better Theory</i> (KF Scaffold) to the inquiry.</p>	<p>Teacher reviews lesson by displaying the formulated better theories to consolidate learning.</p> <p>Teacher uses students' better theories to explain how to construct explanations.</p> <p>Teacher concludes that moving beyond knowing the definition of SES is the ability to apply knowledge gained towards analysing and resolving societal issues related to SES.</p>
<b>Rationale for KB activities &amp; Pedagogical Practices</b>	<p>Rationale for watching the video: to enact on the KB principle of "Real ideas, authentic problems", it was imperative, as also highlighted in the SS syllabus, that the teacher facilitate the lesson by nurturing disposition that would let students demonstrate empathy in dealing with societal issues. Empathy as an emotion helps to enhance perspective-thinking and critical thinking skills (Gallo, 1989). Further research had shown that videos are effective as a platform to present authentic problems that improve students' satisfaction and empathy (Hee &amp; Yang, 2011) and this would help students cultivate the skills required for stage 3 and KB discourse.</p> <p>Brings about a culture of "democratising of knowledge" as all students are contributors of knowledge; this increases students' ownership, interests and engagement.</p> <p>Stage 3 is also aligned to the scheme of National Assessment where students are required to apply their knowledge and construct explanations in answering Structured-Response Questions (SRQ) part (a).</p>	<p>Supports assessment of learning through teacher's identification of misconceptions/areas for improvement that students can use to re-evaluate their initial theory.</p> <p>Strengthens students' meta-cognition through evaluating, reconciliation of questions, suggestions and/or ideas to the issue.</p> <p>Helps students appreciate that Social Studies Concepts are social constructs and discourse involves dialogue and negotiation.</p>	<p>Allows students to appreciate diverse ideas to recommendations in helping those in need.</p> <p><i>Rise Above</i>: Moving beyond definitions to higher planes of understanding in analysing societal issues.</p> <p>Conclusion to consolidate learning in analysing societal issues and constructing explanations.</p> <p>Entire inquiry process is a form of reflection for students where they reflect on the possibility of further actions and / or recommendations to an authentic problem. This prepares students in constructing explanations for SRQ part (a).</p>
<b>Advantage(s) and Rationale(s) of Knowledge Forum</b>	<p>Supports students' meta-cognition reasoning through its KB scaffolds of "<i>I need to understand</i>", "<i>This theory does not explain</i>" and "<i>I have new information</i>".</p> <p>Provides a collaborative platform for students to see the variety of ideas at a glance and allowing students to see connections between the ideas.</p> <p>Provides an authentic learning environment to facilitate Social Studies discourse.</p>		

### Analysis of Stage 1 Inquiry (How would you describe your identity?)

In the first stage, students are tasked to describe their identity by inputting their responses on KF. Below are two samples of students' descriptions of their identities:

Sample one with the use of “*My Theory*” scaffold:

*My theory: "I am a Philippine national citizen and residing in Singapore. I believe in Christ and is a fairly strong believer. My family doesn't even live in my country anymore. People think I look Malay or Chinese and sound English. I liked American shows when I was younger and thus the accent."*

Similar, another sample with the use of “*My Theory*” scaffold:

My theory: "I am a girl.  
I am a Muslim.  
I am a Manchester united fan.  
I am a Singaporean.  
I am a Disney lover.  
I am a cat owner.  
I am a hockey player.  
I am a cat lover.  
I am a human.  
I am Malay.  
I am a daughter.  
I am a sister.  
I am a friend.  
I am a student of tw."

After students input their responses, the teacher used the word cloud analytic tool in consolidating and displaying their ideas (See figure 3).

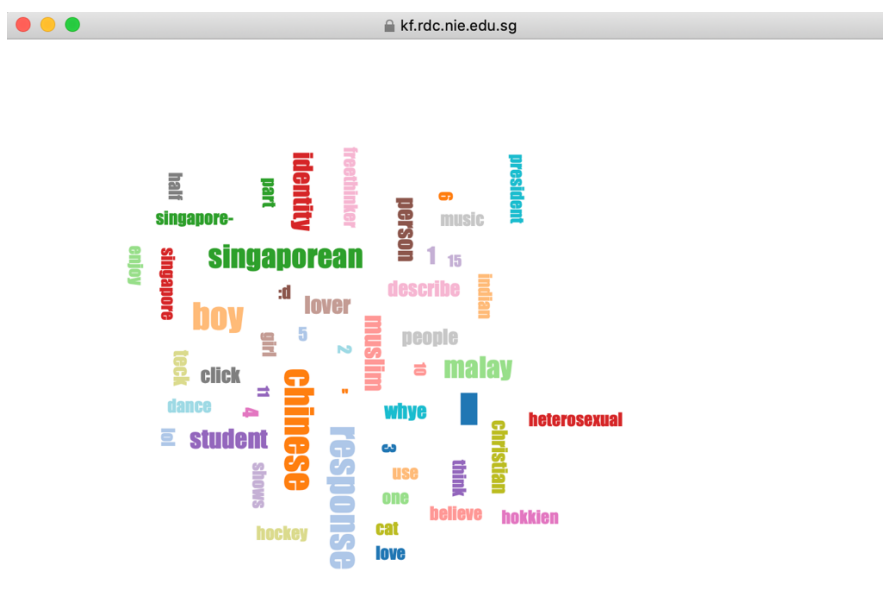


Figure 3: Word Cloud analysis of students' responses in describing their identity.

With the KB principles of Idea Diversity and Democratising Knowledge, the word cloud tool helped illustrate clearly the diversity of ideas, contributed by all students, pertaining to the concept of identity. Straightaway, students were able to categorised the words to the common attributes of nationality, race, religion, gender and personal interests as attributes shaping their identities. Based on the analytical word cloud tool, ideas related to SES are clearly absent. To deepen learning, the teacher tasked students to refer to their SS textbook and identify the “missing” attribute. In application of the KB principle Constructive Use of Authoritative Sources, the textbook became the avenue for students to fill in the missing gaps of knowledge and concepts. This formed the

basis for the next stage as students became to recognise that SES is also an important attribute that shapes one's identity.

### Findings of Stage 1 Inquiry

The use of the KF Analytical Word Cloud tool is evident on how the “democratisation of knowledge” can help the teacher understand students’ prior knowledge and correct misconceptions of a concept. Overall, IBL is enhanced when the variety of ideas helped surface out misconceptions and / or led to the introduction of new theories and ideas.

### Analysis of Stage 2 Inquiry (What is Socio-Economic Status?)

In the second stage, the teacher build-on from the introduction of SES in stage 1 and facilitated a classroom discussion on SES through the inquiry on “*What is Socio-Economic Status?*”. To examine how the KB environment impacted students’ negotiation of ideas on the topic of SES, we focused on students’ notes of this KF segment. We traced and analysed each individual’s theory development, from their initial theory to their better theory built on the scaffolds provided by their partner/peer, using three levels to categorise the extent of idea improvement and KB discourse (See Table 2).

Table 2: Three levels of KB Discourse for Stage 2 Inquiry.

Level	Descriptions	Examples
Level 1	Initial theory and peer scaffolding provided <i>limited avenues</i> for idea improvement.	Suggestions and questions in scaffolding were inadequate; student was unable to proceed to formulate his/her better theory.
Level 2	Initial theory and peer scaffolding provided <i>potential</i> for idea improvement.	Suggestions and questions in scaffolding were constructive but student was unable to proceed to formulate his/her better theory due to the lack of time.
Level 3	Initial theory and peer scaffolding <i>led to</i> idea improvement.	Suggestions and questions in scaffolding were constructive and student was able to formulate his/her better theory.

### Stage 2 Findings

It is evident from the results that there was active involvement in theory development and KB discourse of the concept of SES. Out of the 27 entries, 37% managed to reach level 3, 52% were at level 2 and remaining 11% were at level 1. In examining the development process, most partners provided scaffolds that encouraged the students to include examples to support their initial theory. An example of a pair of students’ KB dialogue that led to idea improvement (Level 3) can be seen below:

Student A provided an initial theory based on the inquiry using “*My Theory*” scaffold:

*My Theory: "I feel that socioeconomic status (SES) is these two terms, economic and sociological combined that is a social standing or class of an individual or group. It is often measured as a combination of education, income and occupation. SES is more commonly used to depict an economic difference in society as a whole. I feel that Socioeconomic status is typically broken into three levels (high, middle, and low) to describe the three places a family or an individual may fall into. When placing a family or individual into one of these categories, any or all of the three variables (income, education, and occupation) can be assessed."*

In Epistemic Agency, student B build-on to student A’s initial theory and provided feedback with the use of a KB scaffold “*I need to understand*”:

*I need to understand: “Your paraphrasing is good, though you lack examples. What are some examples of a socio-economic? And what do countries under socio-economic do?”*



With the peer scaffolding, student A internalised student B's feedback and made improvements on her theory using "My Better Theory":

*My Better Theory: "I feel that social economic status can shape a person's identity. Socio-economic status refers to an economic situation shared by a group of people and some determinants are occupation, income, education and ownership of wealth. I feel that Socio-economic status is typically broken into three levels (high, middle, and low) to describe the three places a family or an individual may fall into. **For example, usually, people with a higher socio-economic status gets to experience fine dining or places where it is private or reserved for them whereas activities such as basketball are accessible to everyone. Another example is that the lower income gets assistance with bursary or subsidies while the higher income will be taxed more.**"*

Through the KB discourse, student A improved on her idea on SES with supporting examples of how groups of people with different SES have varied experiences and activities.

A few even managed to bring forth the concept of stereotype among the various SES groups; a chapter 6 concept that would be covered in subsequent SS lessons. One example of this can be seen from student C's better theory after his partner build-on to his initial theory to include examples as well:

*My better theory: "Social-Economic status (SES) refers to the social class of a person. This is normally divided into low, middle and high. Usually lower class has lower form of education. While, higher class has a higher form of education. But this differs from time to time. For example, people with low education can take over their family business and become a higher class. While, people with higher education can also drop to the lower class. Especially, when they can't find a job."*

As seen from the example provided, student C constructed his improved idea differently by bringing forth the idea that classifying various levels of SES to their educational attainment is stereotypical and provided alternative examples to challenge the assumptions made.

The findings strongly indicate that the KB approach helped enhance effective IBL where dialogue and scaffolding led to improvement on theories and ideas towards the inquiry question.

### **Stage 3 Inquiry (How can we help those who struggles to have their basic needs met?)**

In the third stage, students were required to answer the following SRQ part (a) question – "How can we help those who struggles to have their basic needs met? Explain your answer using one way". Stage 2 helped provide students with conceptual understanding of SES in preparation for stage 3. Before the implementation of stage 3, the teacher showed the class a Channel News Asia documentary video titled "Don't call us poor". As explained in the stage 3 lesson design rationale, the video helped present the authentic problem of the struggles faced by lower SES group and helped student to empathise with the group. After the video, students begin to formulate their initial theory to the inquiry with the teacher providing comments with the use of the KB scaffolds.

### **Analysis of Stage 3 Inquiry**

Similar to the method adopted at stage 2, we traced and analysed each individual's theory development. Theories would be categorised based on the standard Levels of Response Marking Scheme (LORMS) of SRQ part (a) highlighted in the SS syllabus (See table 3). The levels awarded for their initial theories would be compared to the levels awarded for their better theories to examine the impact of KB in improving students' application of knowledge and construction of explanations.

Table 3: Levels of Response Marking Scheme (LORMS) for SRQ part (a).

Level	Descriptions	Examples
Level 1	Provides description to the topic.	Student did not identify any suitable way/recommendation as required by the question.
Level 2a	Identifies one way/recommendation.	Student identified one way/recommendation as required by the question.
Level 2b	Provide description of one way/recommendation that was identified	Student provided descriptions/examples of the identified way/recommendation.
Level 3	Construct explanation of one way/recommendation	After meeting Level 2b, student went on to explain how the way/recommendation would help those who struggles to have their basic needs met.

### Stage 3 Findings

Table 3 summarises the results of stage 3:

Table 3: Results of Stage 3 Theory Development

Initial Theory Level (LORMS)	No. of students at Initial Theory level	No. of students managed to improve one level from their initial theory	No. of students managed to improve two or more levels
1	6	2	1
2a	16	6	1
2b	3	2	N/A
3	0	N/A	N/A

Majority of students whose initial theories were at level 1 did not manage to provide one feasible way/recommendation. Below is a sample of a student's initial theory which was at level 1:

*My theory: "We can help by understanding and not judging them based on their situation. Those who are already struggling do not want to be put down even more by others. We have to encourage and compliment them whenever we can. For example, we can motivate them to not give up hope and keep trying. Simple things like this will make them feel better about themselves. Therefore, we can help by understanding and not judging them based on their situation."*

Teacher's feedback using the KB scaffoldings did lead to her correcting her initial theory to one based on a feasible way/recommendation:

*My better theory: "we can create a donation drive so that their basic needs are met. By having a donation drive, the low SES people do not need to worry about spending money on these needs. For example, the salvation army can help distribute the things that was donated to the low SES people. This way, they do not need to spend financially but also get their basic necessity. Therefore, we can have a donation drive for them so that their basic needs are met."*

Based on the LORMS, her better theory met the level 2b criteria where she provided one feasible way supported with an example on how the recommendation can work. Her notes suggest that the KB approach, through one round of dialogue and scaffolding, would help the student to not just correct her misconceptions but also led her to improve on her initial theory towards the inquiry question.

In summary, close to 50% of the students managed to correct their misconceptions and/or make improvements after re-evaluating the first round of feedback given by the teacher. Since constructing explanations requires a higher level of cognitive response, further dialogue and scaffolding would be needed to ensure students continue making improvements on their explanations.

## Conclusion and discussion

Reflecting on the processes and results, the teacher felt that there are no limits to idea improvement and should have provided more allowance, especially at stage 3, for scaffolding between student to student and between teacher to student. This might provide more room for idea improvement and, perhaps, get more to move up to a higher level of response in stage 3. However, the trade-off for more opportunities of quality scaffolding is time. Balancing between completing the syllabus and allowing for more KB discourse would be a constrain that the teacher needs to learn to navigate better. Notwithstanding, within an examination culture, such constrain intensifies as the SS teacher would be incentivised to 'teach to the test' rather than allowing room for continuous critical discourse in the classroom (Baildon & Sim, 2009). It would be imperative for the teacher, in future lesson designs, to consider integrative use of KB and its technological affordances that can further develop students' ability to construct explanations which would qualify as high levels of response based on the standard LORMS.

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<sup>1</sup> A list of Knowledge Building Principles can be found through this link: <https://www.kbsingapore.org/12-principles-of-kb>.

<sup>2</sup> Link to article: <https://www.todayonline.com/singapore/how-tell-if-someone-high-or-low-class-poll-gets-interesting-replies-singaporeans>.

<sup>3</sup> Link to Channel News Asia documentary: <https://www.channelnewsasia.com/news/video-on-demand/dont-call-us-poor>.

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