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## **WORKING WITH STUDENTS, LEARNING FROM STUDENTS THROUGH A SPECIAL PROGRAMME IN SCIENCE AT NATIONAL UNIVERSITY OF SINGAPORE**

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### **Introduction**

Co-creating through student-educator partnerships in a special programme for science at National University of Singapore has been an immensely exciting and rewarding journey for us. We are a team of student mentors and a staff member from the Special Programme in Science (SPS), a peer-assisted integrated science programme within the Faculty of Science. In this essay, we share our experiences and thoughts about student-educator partnership on various fronts, from the perspective of both the educator partner (Linda) and student partners (Kellie, Kellisa, and Ryan). By sharing how we have been collaborating as teachers and students, we hope to contribute to the conversation on how students can support education and encourage more colleagues to try implementing student-educator partnership in their own classrooms. Throughout the essay, we use “we” and “us” when we are writing as all of us (Linda in her role as educator and Kellie, Kellisa, and Ryan in their roles as student mentors). We use our individual names when we are referring to one of our particular experiences or perspectives.

### **Special Programme in Science (SPS)**

In the Special Programme in Science (SPS), students must complete six modules over their first two undergraduate years. We have small classes (50 students) that include mostly active learning, where staff can easily interact with all students and students with one another. Following the first two years, students are recruited as student mentors to support the administration of the programme for subsequent cohorts. Our student mentors include both undergraduates and postgraduate alumni. From the first two years of interaction, the staff is usually already acquainted with the students who will go on to become student mentors, facilitating staff-student mentor partnerships. Similarly, students have already had the same group of peers as classmates for two years and would have been acquainted with most, if not all, of their class. Additionally, since most students are around for four years or more (two years as students, two years as undergraduate student mentors, and possibly many more years as alumni mentors), there is plenty of time and motivation for all parties to get to know each other.

Each staff member in the programme works closely with the student mentors in module preparation and execution, as well as in various extracurricular activities, such as outreach programmes and celebrations. We also have our own premises where the community interacts outside classes. As a result, the manner in which the programme is structured allows us to enjoy a close-knit environment where we build rapport easily with enrolled students, creating a collaborative environment.

### **Why Student-Educator Partnerships**

As an educator, Linda finds that collaborating with students brings in fresh insights and has inspired her and her colleagues to develop a more fruitful curriculum and more engaging lessons. Hence, she and SPS staff have actively sought out opportunities to collaborate and create with students.

This past year, Linda collaborated with students on two separate projects. The first was when she invited seven student mentors to assist in revamping her module in which one of the student co-authors, Ryan, was the key personnel. These seven students had previously taken her module and demonstrated such a drive to learn while also supporting their peers that she thought it was the right time to try co-creating a curriculum with students. In her module, most assignments aim at promoting self-directed learning and inquiry. For example, students get the chance to further investigate concepts seen in class and explore new topics they will present to the class. In fact, one of the avenues through which Linda identified future student partners was via her interactions with students approaching her during and outside class to discuss and brainstorm their ideas. They were very enthusiastic, inquisitive, and insightful. While some mainly discussed with her outside of class, others were very communicative during lecture discussions. They would lead class discussions and offer alternative explanations to hers if their peers were struggling. Often their participation would help the class to be more vibrant. Linda enjoyed having these inquisitive and creative students who like engaging their peers and making her classes more enjoyable and cohesive for everyone. It became apparent that she had to harness that good energy and commitment to supporting learning in redesigning her module for this academic year.

The other collaborative opportunity she had was when she was tasked with designing a workshop for Southeast Asian educators, addressing remote teaching during the pandemic. Linda found student engagement to be among the most challenging parts of moving teaching online. While she acted on feedback from students to adapt her teaching for the online setting, the feedback she obtained was selective, and she wanted to do better engaging everyone in class. Hence, when she got this workshop opportunity, she thought of collaborating with two student mentors, Kellie and Kellisa, whom she had taught as students in SPS. Linda knew she wanted to have students' perspectives in designing this workshop, but she also needed students with the potential to cope with academics, which can be daunting. She invited Kellie and Kellisa because of their curiosity, maturity, and professionalism. Both were always engaged during class interactions and were reliable and effective mentors. Due to the nature of the task involving many parties and a limited time, Linda also needed students who were accountable. She believed that the collaboration would allow her to include both the student voice and literature-based knowledge to provide insights on remote teaching.

From a student perspective, SPS offers a conducive environment for Ryan, Kellie, and Kellisa to readily participate in learning, which can be an outcome of student-staff partnership. SPS students benefit from the close student-educator partnership within the programme, with opportunities to play a more active role in their own learning, and that of their peers and future cohorts of students. Not only is the curriculum built rigorously on the feedback from past cohorts in this partnership approach, the classroom experience is also enhanced by student mentors who provide enrolled students with close guidance and support. Kellie recalls from her time as an enrolled student having a student mentor peer over her shoulder and guide her through the work slowly back when she had trouble coding for the most basic ‘Hello World’ in our coding module. The unique interactions afforded by student-supported, or even student-led, classes will be discussed further in the following section. Most importantly, the fond experiences Ryan, Kellie, and Kellisa have from their time as students in the two-year programme have been the major motivation for many alumni to join as student mentors in the SPS programme and participate in areas they are most passionate about, from curriculum development to delivering live lessons.

### **Our Experience: Curriculum Development**

Student mentors play a significant role in the delivery of SPS modules, facilitating instructional sessions inside and outside of the classroom. However, student mentors have also been contributing to curriculum design, working together with the staff to create learning outcomes, develop activities and content, and even design assessments. This past year, we have collaborated to revamp a second-year SPS module ‘Science for a Sustainable Earth.’

Developing and delivering the curriculum alongside students has been a refreshing experience, from Linda’s perspective. For the curriculum project, as it is often mentioned, it is time consuming and requires good communication. You could say it would be easier and faster to do it on your own (obviously with a different result). Building a partnership, while gratifying, takes time and effort. It was unplanned that one of Linda’s student collaborators, Ryan, became a coordinator and mediator for the entire team. Student-educator partnership is very much ingrained within our system and beliefs, so without any doubt, Linda gladly accepted the natural state of things and worked with Ryan as the main personnel. This is probably the most important takeaway for her; staff members need collaborators, and students can often communicate better with students. This helped a lot with misunderstandings and with the relational aspect of the partnership.

In terms of content, what surprised Linda the most was the creativity and the rigor the student partners wanted to implement in regard to the work for their juniors. As a matter of fact, the student mentors were way stricter than she was in terms of learning outcomes and assignments. As students who have taken the previous iteration of the module, Ryan and other student mentors might have a better gauge of whether the learning outcomes were met and what the attitudes their classmates have towards certain assignments. As such, we wanted to set clear deadlines and goals, and we also consulted the students on their thoughts on whether they were reasonable since they would know their workload best. In this way, we make the students take ownership of their work and be responsible for their own learning, as opposed to just completing assignments for the sake of completing them or even ignoring certain components that were seemingly more lenient in terms of the weight and grading.

Most students also helped Linda teach during the course, and Ryan became the coordinator/main mentor. Linda is used to teaching alone, so the dynamics of teaching with a co-lecturer or mentors definitely felt different. Because we spent months discussing the curriculum, activities, and assessments, Ryan was very involved, and we had a common vision for the module. Ultimately, Linda was still the one accountable for the module (being the staff member and instructor of record), but she gave Ryan a lot of responsibilities (e.g., giving feedback on students' assignments). She valued his input (e.g., consulting him before some class announcements), and she could see how students were influenced by him. They would approach him more readily for questions and feedback so Linda could have a better understanding of the class. Interestingly, Ryan was also stricter in terms of feedback and logistics (e.g., assignment submissions).

Linda feels that the module being co-created with those seven students and having Ryan as the face of the module gave some kind of legitimacy to enrolled students, maybe because they look up to their seniors. As seniors to the module and in the programme, mentors might have a better rapport with the students since Ryan and other student mentors have had more interactions with them through other programmes (e.g., orientation, other classes) as opposed to with Linda. This makes communicating with them easier from the start of the module, and they might be more willing to share their thoughts such as problems with the content or delivery modes, which they might fear discussing with Linda due to pre-conceived power differential notions. As the main coordinator, Ryan found this bridge essential in working with three main groups: students taking the module, student partners / co-creators, and the educator, to ensure effective communication and execution of any discussions from immediate feedback.

As curriculum designers, student mentors had the opportunity to think outside the box and gather things that would interest them as students to implement in the lesson plan. As the module itself had a broad scope of exploring sustainability, Ryan, Kellie, and Kellisa had the liberty to work around the subject matter. They found themselves overly ambitious at times, as there were too many interesting things they wanted to share! However, some considerations they came to appreciate were the constraints of the timetable and the workload for the students. Hence, a lot of the discussions were focused on making the module enjoyable, and beneficial, but still not overwhelming as a whole.

Our approach for this module was to structure the instructional content and activities to encourage more self-directed learning among students. This approach emerged from our objectives to provide some intellectual stimulation and pique student interest in the field. Students were first introduced to fundamental concepts before moving on to explore their own interests. Within the co-creating team, we had to rack our brains to crystallise interesting topics into four main themes to provide students with sufficient knowledge to start thinking about what interests them or even work towards understanding more about a specific topic of interest. Complemented by student-student collaboration, activities such as experimental design and personal investigation were woven into lessons to allow students to practice sharing their ideas and hone their critical thinking and problem-solving skills in the context of sustainability.

One of the trickiest parts of curriculum design was assessments, and as part of SPS, both as students and as student mentors, student mentors have seen how student-educator partnership can create a supportive assessment system. While academic assessments in the Asian context are notorious for being stressful and extremely competitive, the assessment experience within

SPS is quite different due to the mix of formative and summative assessments and the involvement of student mentors. Student mentors set up an environment that encouraged more learning, and less fixation on the final academic grade, by helping students understand their assessment—and therefore, learning—objectives. Each assignment was carefully crafted and graded by a team of students and staff, allowing us to confidently share intended learning objectives, tips for success, grading criteria, and detailed feedback for every assignment.

In the set-up and administration of assessments, we found that student mentors provided perspectives different from those of the staff. We noticed that mentors may have had a better understanding of the students and their work, possibly due to their own recent experiences taking the same module or the interactions they have with the students during lesson time. On the other hand, the staff was more skilled at using the grading criteria, with mentors reporting challenges while grading, for instance, student reflections and peer feedback. Student mentors found it difficult to use the criteria effectively and provide quality feedback. However, being able to hold discussions about the rubrics and marking between the module coordinator and mentors allowed for Ryan's, Kellie's, and Kellisa's perspectives to be taken into account in the design of the assessment and actual grading.

Discussing the rubrics and feedback as a team was useful in helping us not only improve the assessment by identifying limitations or areas for improvement in the grading scheme, but also reconcile different perspectives of each student's learning, between the instructor and mentors, to allow feedback to be targeted. Bringing together both perspectives ensures that students taking this module do not get left behind, and, at the same time, the refining of learning objectives and assessment outcomes becomes essential for creating assessments that really allow us to evaluate their learning progress. Grading collaboratively has indeed allowed us to create a final assessment outcome that is truly representative of student learning. This level of collaboration and transparency has also helped to set the learning direction in the classroom, to help students focus more on the learning process.

For example, to encourage retrospective learning, we designed a reflection journal within our curriculum. Not only did we start off with a briefing on expectations and grading criteria of the four reflective entries students were required to submit, but timely and detailed feedback by staff and mentors was also given for each piece, allowing students to perform better for the next piece and, more importantly, learn through this assessment. As we progressed through the semester, we noticed a significant improvement in the students' ability to demonstrate their understanding according to grading criteria, and more depth and breadth in their classroom learning. This would not have been possible without the student-educator collaboration in curriculum design and execution, as well as the large teaching team, staffed by both student mentors and staff, and that all student mentors have relevant experience and skills.

### **Our Experience: Workshop Design**

Beyond curriculum development, we also created and delivered a workshop on 'Tips for Online Teaching' together. As student mentors, Kellie and Kellisa had been recruited as student partners to help with the preparation and delivery of a set of workshops on insights from SPS on transitioning to online teaching. This workshop was delivered to ASEAN (Association of South East Asian Nations) educators in 2021, when most academic activities

were online due to the COVID-19 situation. It has since developed into an ongoing project group of staff and students interested in pedagogical strategies for STEM education and teacher-student partnership.

There were various ways in which student-educator collaboration helped support the creation of the workshop. In deciding on the focus of the workshop right at the start, we leveraged our close student-educator partnership and had many discussions considering classroom learning from both the educator's and students' perspectives. Our discussions often end with a problem. Some of the most frequently recurring ones are: (1) We have enjoyed student-educator partnership, but we reckon that this was possible due to our relatively small class size and close-knit community. How can we adapt our student-educator partnership formula such that we can share this with educators who deal with larger class sizes? (2) Group work is beneficial but is it really the best way to learn? Our discussions often bring up complex questions that inspire further introspection and consultation of literature. Putting all this work together, we created a workshop on our recommendations regarding online teaching, including student engagement strategies and assessment formats.

From creating workshop content based on both students' and educators' perspectives to delivering the workshop together, we aimed to showcase how student-educator partnership can play out in and outside of the classroom. We worked together to identify areas where we could provide unique perspectives in addition to existing literature. In particular, the role of student mentors in supporting the transition to online teaching had been an aspect we were eager to share in our workshops with other educators. As SPS mentors, Kellie and Kellisa have been playing an active role in the delivery of blended and hybrid forms of teaching across the various credit-bearing modules offered by the programme. For instance, in a synchronous session with a real-time online lecture for our Python module, students could use the Zoom chat function to clarify doubts or ask the mentors for help with their coding exercises while the lesson is still underway. On the other hand, mentors could use the chat function to chat with individual students, to help answer their questions in real-time.

For many students, asking questions can be quite daunting. In Kellie's first encounter with coding, asking questions like 'how do I run the code' seemed silly. However, student mentors were similar in age and more approachable, making it easier to ask those 'silly' questions, building a strong foundation where Kellie could easily learn more complex skills thereafter. Traditional Asian values have also contributed to the perception that the educator is the most knowledgeable in the classroom (Lee & Kim, 2019; Lee et al., 2009; Chan & Chan, 2005). It was therefore surprising when Kellie first witnessed a senior student mentor working with an educator to solve some code-related problems during class. The senior mentor was more familiar with a very specific aspect of it as it was related to his student research project, and took the reins for that lesson. Everyone, both students, other mentors, and the educator, were able to learn from each other. Therefore, having student mentors around is similar to having a teaching group with diverse expertise and background, for what Kellie believes to be an effective delivery of content in the classroom.

Inspired by the advantages of a diverse teaching team, we shared about the structure of SPS and how that allowed us to create our unique student-educator partnership. Another aspect that Kellie and Kellisa were able to speak on for the workshop was the key roles mentors play in supporting other teaching modes such as facilitating discussions for problem-based learning or higher-stakes collaboration such as graded project work. One of the highlights of the SPS experience is a research-based capstone project for Year 2 SPS students. Kellie and

Kellisa were supported as students and supported the Year 2 students (when they became student mentors themselves) by having regular meeting sessions where they did goal-setting to orient the students in their learning journey, ask reflective questions to encourage them to reflect on their experiences and use our experience to provide technical advice regarding their lab-based project where necessary. Kellie and Kellisa were able to easily continue this even during the shift online because of the decentralised nature of this support system. Each group of students has at least two student mentors attached, allowing groups to easily arrange for online meetings and build rapport, even remotely. As students who completed their research-based project when COVID-19 restrictions were still in place, Kellie and Kellisa have had very different experiences as compared to previous cohorts of students. For the workshop, they then presented these as recommendations alongside their literature review of pedagogical studies.

Another topic we discussed in the workshop was group work. Group work was Linda's favourite educational strategy because it creates discussions among students, which then promotes learning. However, her student partners have shared that group work can be a hit-or-miss experience. It can be a fruitful learning experience with 'good' groupmates, but a frustrating and stressful one with 'bad' groupmates. Acknowledging the pros and cons of group work, we went on to do a literature review and had further discussions with other staff and students to create a better learning environment, to reap the benefits of group work, and minimize the unpleasant parts. We went on to create a unique set of recommendations on educational strategies, informed by our experiences and literature review. This was received well when we shared it during our workshop.

Linda's partnership with Kellie and Kellisa in creating the remote teaching workshop was a bit more straightforward, compared to the module restructuring, probably because of the nature of the project (maybe less risky?) or the size of the group. Here, the motivation was to get deep insights from students on their experiences and their take on literature. Linda enjoyed our brainstorming sessions and Kellie's and Kellisa's personal sharing and analysis. Here, Linda would say the valuable takeaway is the time spent discussing. She would even discuss with Kellie and Kellisa some teaching strategies she wanted to use in her module (that they didn't take) in the same way she asks her colleagues. It allowed her to reflect under conducive conditions. The workshop was conducted online for educators in Indonesia, Thailand, and China. Linda's sense is that the participants were quite surprised and impressed by Kellie and Kellisa. First, they were surprised because there is a hierarchy in Asia, and having students teach educators is not so common (in Linda's experience). They were impressed by the quality of Kellie's and Kellisa's content and delivery. Finally, our work was presented at the HECC 2022 by Kellisa, and feedback from the audience was very positive, showing how we could develop students' agency in education.

### **Reflecting on Student-Educator Collaboration**

As student mentors, Ryan, Kellie, and Kellisa have found that collaborating with educators allowed them to share their perspectives on being on the receiving end of education and co-create their ideal learning environment. Whilst creating the curriculum for a revamped module, they had to first figure out the basic and fundamental concepts that would be sufficient for students to approach new topics, with a focus on creating a self-directed learning environment. This was beneficial to them as they reflected on fundamental concepts relevant to the topic, reinforcing their own knowledge. In the process of collaborating, they



were also practising self-directed learning! Ryan remembers attending a talk on materials that can help to reduce the urban heat island effect by incorporating ideas from radiative equilibrium, chemical interactions to work on coating buildings with such materials so as to either reflect the thermal energy or to convert such thermal energy into useful forms. This invited a rather interesting discussion on other methods used currently to maintain the beauty of the architecture yet at the same time keep it cool and green. Considering how classroom activities may be strategically placed or students can be probed to think more critically were extremely insightful for our own growth as aspiring scientific researchers.

In addition, while grading the reflective learning journals, Ryan, Kellie, and Kellisa were able to learn about a lot of new things from the students' write-ups on further questions and answers related to content learned in class. Overall, the learning experience has been positive regardless of the role played in the process. Learning is not a unidirectional process, but a multidirectional process. Not only did Ryan learn from the lecturer, for instance, but also from his peers in the mentoring and curriculum development process, and the students themselves from all the insightful ideas they have presented to us.

In the process of creating the workshop, Ryan, Kellie, and Kellisa reflected on their learning journey and shared their experience and perspective on classroom learning during their meetings. Higher education in Asia often feels fast-paced and competitive, with students pressured to keep up or be left out. But having the opportunity to be heard and be engaged as student partners to research the best practices for classroom learning feels empowering. Acknowledging that there are shortcomings in the classroom experience and committing to improving it for all students is reassuring. Researching teaching approaches has also helped Ryan, Kellie, and Kellisa understand classroom engagement strategies and the learning objectives of their own modules better, in turn making them better learners themselves.

Similarly, collaborating with students has allowed Linda to better understand the students' perspectives, which was very useful for her when planning and conducting her module. She believes it benefits both parties for staff to partner with students in education. As educators can partner with students at different levels, choosing a level you can be comfortable with is essential to gain experience and confidence. The environment is key to the partnership, and efforts must be invested to create a safe and conducive environment. Educators always tell students to venture out of their comfort zone, as this is the best way to grow; well, now it is staff members' turn, and it might even be their responsibility.

## References

- Chan, K. L., & Chan, C. L. W. (2005). Chinese culture, social work education and research. *International Social Work*, 48(4), 381–389. <https://doi.org/10.1177/0020872805053461>
- Lee, J.-A., & Kim, C.-J. (2019). Teaching and learning science in authoritative classrooms: Teachers' power and students' approval in Korean elementary classrooms. *Research in Science Education*, 49(5), 1367-1393. <https://doi.org/10.1007/s11165-017-9659-6>
- Lee, M. H., Chang, C. Y., & Tsai, C. C. (2009). Exploring Taiwanese high school students' perceptions of and preferences for teacher authority in the earth science classroom with

relation to their attitudes and achievement. *International Journal of Science Education*, 31(13), 1811-1830. <https://doi.org/10.1080/09500690802308654>