eCitizen Education 數碼素養 360

# Online-learning preparedness for teachers

Progressive innovative teachers and online preparedness for the new normal

Encourage the **use of online learning platforms** and digital resources for **student-centered interactive learning**

Promote teacher sharing and collaboration on online pedagogy to nurture **"Progressive Innovators"**

Focus teacher professional learning provisions on fostering **higher-order thinking**, **e-assessment** and **digital feedback**

In the first release of research findings from the eCitizen Education 360 study, we reported that pre-suspension e-learning preparedness was crucial to effective online learning transition during the COVID-19 induced school suspension period. e-Learning Preparedness of a school include having an e-learning strategy well-integrated into the school's overall development plans and giving a high priority to student-centered e-learning pedagogies. Further, it was found that schools that participated in the BYOD program generally had higher levels of e-learning preparedness.

In bulletin 2, we explored in detail schools' e-learning policy and implementation to investigate the key features that constitute preparedness for quality online learning experiences and outcomes. There was a huge diversity across schools in the number of staff members, their roles and functions involved in e-learning coordination. Further, e-learning coordination and the school's vision for e-learning have a major impact on the experience and perceived outcomes of online learning reported by teachers and students.

In this bulletin, we report on the in-depth analysis of the teacher survey data to understand what constituted the key characteristics of teachers who were most prepared for the shift to fully online learning, and what factors contribute most to such teacher preparedness.
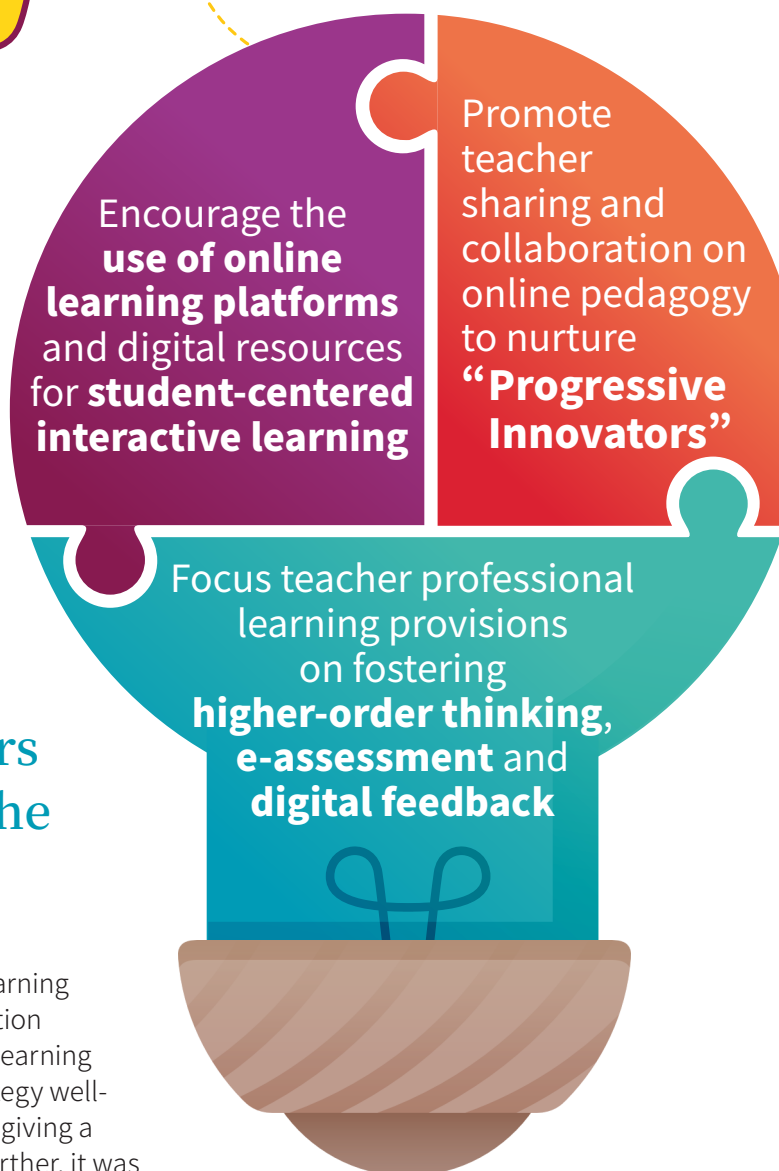
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Findings from earlier releases of study results

Bulletin 1:

Outcomes and challenges of online learning during school suspension

Effort of schools and parents to sustain learning paid off

Pre-suspension e-learning preparedness crucial to effective online learning transition

The cumulative negative effects due to socioeconomic and digital divides on disadvantaged students need attention

Bulletin 2:

Key factors influencing school level online learning preparedness

Teachers' online teaching preparedness is positively correlated with e-learning-related teacher professional development provisions and students' online learning experience and outcomes

e-Learning coordination team membership and roles, infrastructure priorities, and teacher professional development provisions constitute the most important school-level implementation factors

School and teacher preparedness for online teaching is a protective factor against a widening digital divide for students with lower socioeconomic status

Bulletin 3:

Research Questions for this bulletin

1 Are there typical groupings of teachers based on their perceived effectiveness of online teaching and their attitudes towards continuing online teaching after school resumption?

2 What are the most significant predictors of teachers' online teaching preparedness?

3 What should be the priority areas for online teaching related professional development?

Research Design

Eleven indicators were calculated from responses to the teacher survey. Of these:

- Five were factors influencing online teaching,
  - two of which pertain to characteristics *before school suspension*: (i) teachers' priority for student-centered pedagogy, which measures teachers' willingness in motivating students and understanding their difficulties, and the extent of using online teaching for assessment and feedback, and (ii) the extent to which the teacher used online teaching;
  - two are indicators on teacher collaboration *during school suspension* regarding: (i) sharing and promotion of online pedagogy, and (ii) management and organization of online teaching and learning; and
  - one indicator on the teachers' online teaching self-efficacy.

- Two were indicators about the extent of teachers' use of online teaching methods: (i) organizing interactive learning activities for students using Learning Management Systems and digital resources, and (ii) using instant messaging and videoconferencing software to teach and communicate with students; and

- Four were indicators of perceived outcomes from online teaching and learning:
  - Two pertaining to teachers' perceptions of the extent of (i) positive impacts, and (ii) negative impacts of online teaching on students *during the school suspension period*. Positive impacts include students' improvements in digital skills, students becoming more self-directed in their learning, and the teacher knowing more about his/her students. Negative impacts include problems such as inability to achieve the planned curriculum progress, widened academic achievement gaps among students, students from low SES families adversely affected, and increase in cyberbullying problems;

Figure 1. The list of 11 variables analyzed and reported in this bulletin
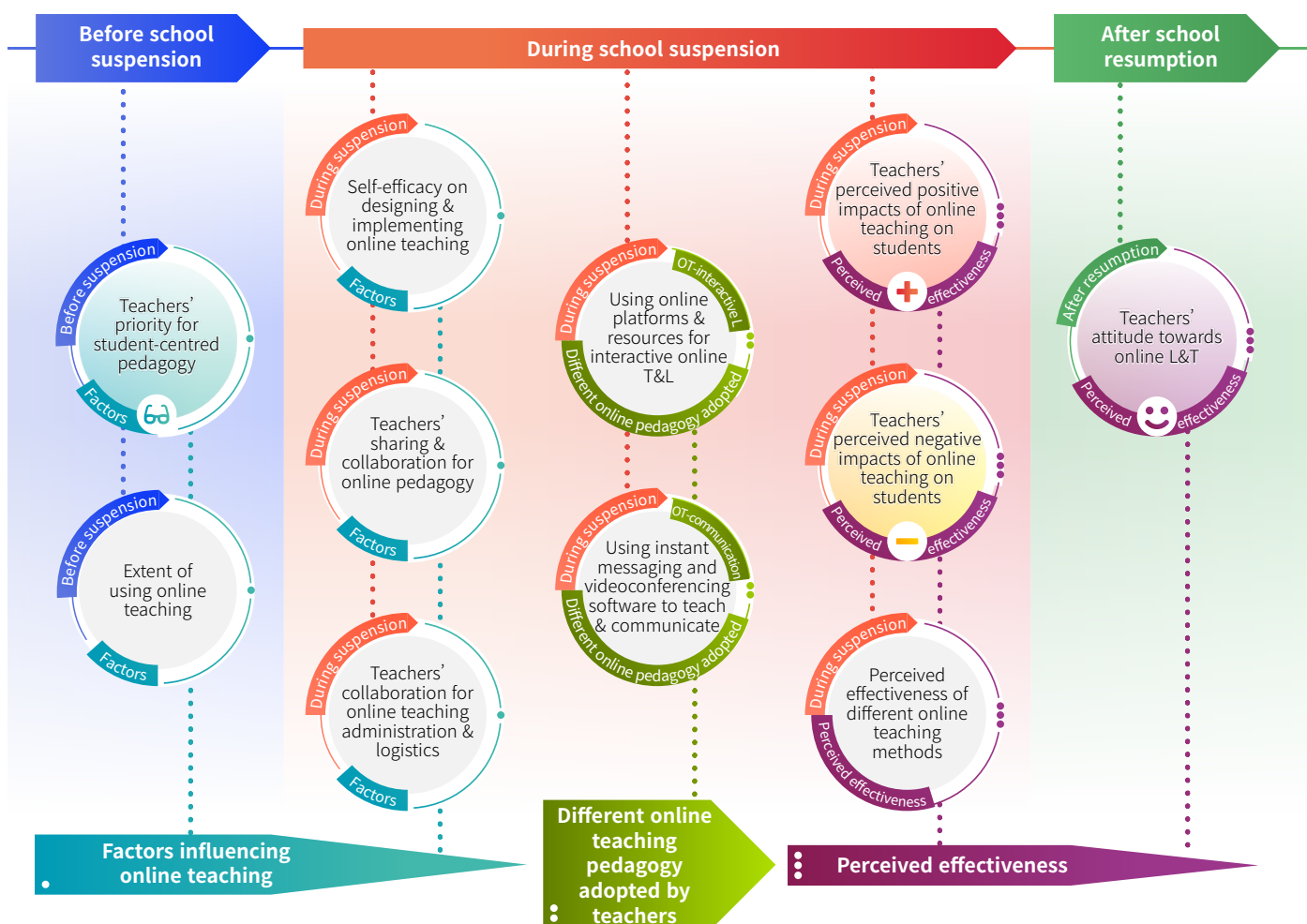
- One pertaining to teachers' perceptions of the effectiveness of some popular methods of implementing online teaching *during the school suspension period*, such as videoconferencing and discussion forums; and
- Teachers' attitudes towards continuing the use of online learning *after school resumption* to address different learner needs and to foster students' self-regulated learning ability.

Profile of the surveyed teachers

A total of 836 teachers (339 primary school teachers and 497 secondary school teachers) were included in the analysis for Bulletin 3. The sample had a relatively even age distribution: 195 teachers were below 30 (23%), 277 teachers were between 30 and 39 (33%), 212 teachers were between 40 and 49 (25%), 122 teachers were 50 or over (15%) and 30 teachers did not report their age. In terms of teaching experience, nearly one-third had fewer than 5 years of teaching experience, about 20% had more than 20 years of teaching experience as shown in Figure 2.

As shown in Figure 3, teachers from a broad range of school subjects participated in the survey, including Humanities (i.e., liberal studies, moral and civic education, social and humanities education), Languages (i.e., Chinese and English education), STEM (i.e., mathematics, science education, technology education), and others (i.e., physical education, arts education).

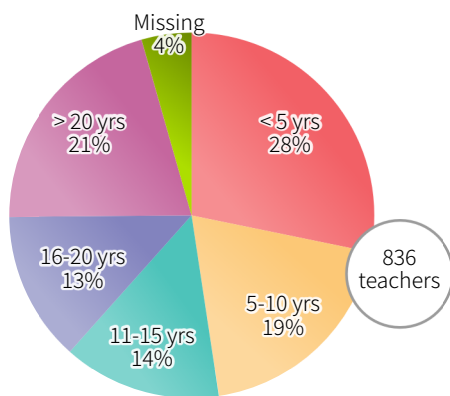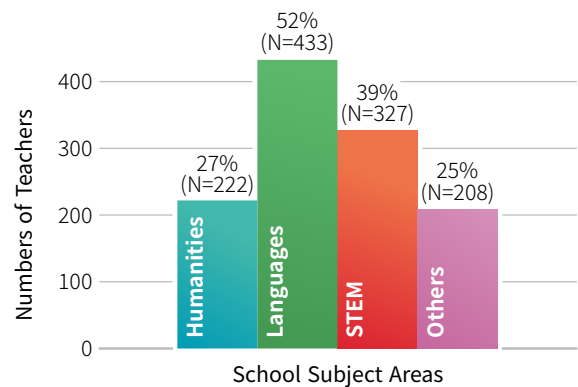Figure 2. Teaching experience of sampled teachers

Figure 3. Percentage of surveyed teachers reported teaching in each of the school subject areas

N.B. A teacher may teach in more than one subject area. Hence, the total percentage is greater than 100.

Progressive innovators lead in the 4 categories of teachers based on their characteristics related to **online teaching**

To find out whether there are typical groupings of teachers based on their perceived effectiveness of online teaching and learning during the school suspension period, and their attitudes towards continuing to provide online learning to students after school resumption, we conducted Latent Class Analysis (LCA) on the survey data. Four indicators were included in the LCA: teachers' perceived importance of student-centred pedagogy before school suspension, perceived positive and negative impacts of online teaching during the school suspension period, and their attitudes towards continuing the use of online learning to address learner diversity and to foster students' self-regulated learning ability after school resumption. Four groupings (latent classes) were identified: "Progressive Innovators", "Cautious Explorers", "Conservative Explorers" and "Traditional Instructors". Teachers belonging to the *Progressive Innovators* (N=159, 19.0%) are characterized by the high importance they place on student-centred teaching prior to school suspension, a high level of agreement with the view that online teaching during school suspension have a positive impact on students, remaining neutral attitude regarding online teaching had negative impacts on students, and have high motivation to continue organizing online learning after school resumption for its potential to cater for learner diversity through online remedial/enrichment provisions and to support students' self-directed learning.

Figure 4. The LCA analysis results showing the factor means of the four selected variables for each of the four categories of teachers identified
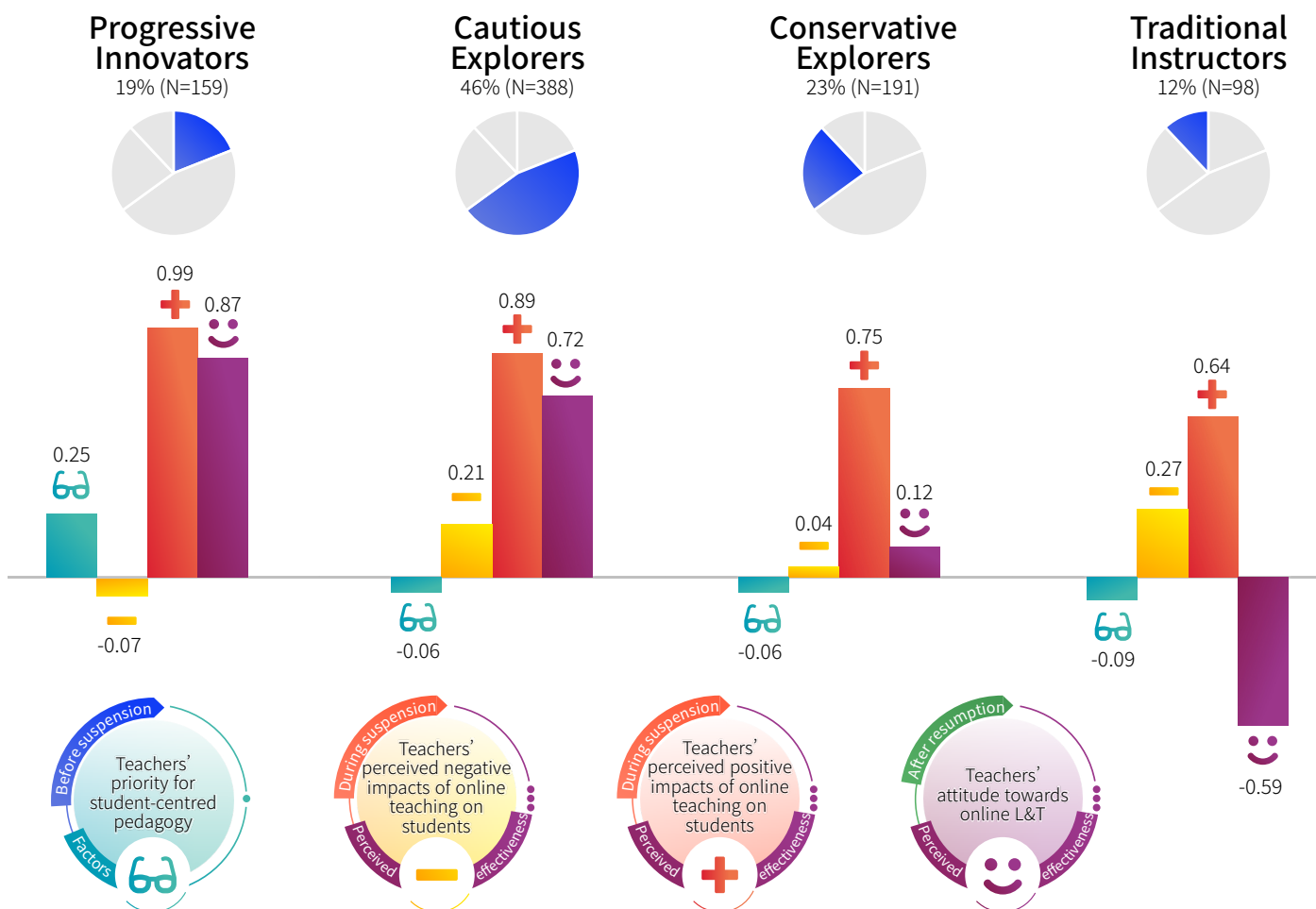
Note. The meaning of "0" on the vertical scale differs across the four variables. For teacher's priority for student-centered pedagogy, "0" represents the average of all teachers. More positive scores indicate valuing more strongly student-centered pedagogy compared to the mean of all surveyed teachers. For the other three indicators, "0" means neutral, positive values indicate agreement and negative values indicate disagreement.

All the other three categories of teachers accorded a similarly low importance on student-centered pedagogy before the school suspension. *Cautious Explorers* (N=388, 46.4%) are similar to the progressive innovators in sharing a very positive attitude toward continuing the organization of online learning after school resumption for its potential benefits. However, they are more concerned about the negative impacts of online learning on students, such as widening the achievement gap among students. Thus, this group of teachers are prepared to explore online teaching and learning, even though they may be somewhat cautious.

Conservative Explorers (N=191, 22.9%) are only mildly positive towards continuing with online learning implementation after school resumption. They are neutral about negative impacts of online learning and are highly positive towards the positive impacts of online learning. Hence, this group of teachers can be convinced to explore further the use of online learning even when face-to-face classes resume.

Traditional Instructors (N=98, 11.7%) hold distinctly negative attitudes toward continuing to implement online learning after school resumption. They agree that online learning had negative impact on students. While they agree that online learning had positive impacts on students, their level of agreement is the lowest among the four categories of teachers. Figure 4 shows the characteristics of the four categories of teachers as well as the proportion of the surveyed teachers belonging to each category.

In our further analysis, we find that the likelihood for a teacher to belong to any of the four groupings (latent classes) is independent of whether he/she teaches in a primary or a secondary school, and independent of the teacher's years of teaching experience. However, younger teachers (below 40 years old) were 1.66 times more likely to belong to Progressive Innovators than the older teachers.

In examining further the other characteristics across the four categories of teachers, we find differences in their practices as well as their self-efficacy with regard to online teaching. As shown in Table 1, "Progressive Innovators" were significantly more active, particularly when compared with "Traditional Instructors", in collaborating with colleagues in making online teaching arrangements, and in the sharing and joint development of online pedagogies. They are also more likely to make use of Learning Management Systems (LMS) and digital resources to implement interactive learning, and use instant messaging and videoconferencing software to teach and communicate with students.

Table 1. Mean extent of engagement in different practices and self-efficacy in the design and implementation of online teaching

Latent Classes	Progressive Innovators Mean[1] (SD)	Cautious Explorers Mean[1] (SD)	Conservative Explorers Mean[1] (SD)	Traditional Instructors Mean[1] (SD)
Teachers' collaboration for arrangements and logistics for online teaching	3.44 (0.5)	3.19 (0.44)	3.11 (0.4)	2.96 (0.64)
Teachers' sharing & collaboration for online teaching pedagogy	3.36 (0.69)	3.08 (0.59)	2.98 (0.51)	2.8 (0.82)
Interactive online T&L using online platforms & resources	3.41 (0.29)	3.24 (0.27)	3.11 (0.25)	3.15 (0.41)
Using instant messaging & videoconferencing software to teach & communicate	3.6 (0.47)	3.41 (0.48)	3.3 (0.43)	3.38 (0.55)
Self-efficacy on designing and implementing online teaching	3.36 (0.48)	3.08 (0.42)	3.03 (0.39)	2.99 (0.56)

[1] | 1 Not at all | 2 To a small extent | 3 To a moderate extent | 4 To a large extent

Intensity of teachers' **pedagogy-oriented collaboration** and emphasis on **student centered pedagogy** key to teacher online teaching preparedness

Looking into the future of learning beyond the pandemic, it is important that teachers are able to perceive positive impacts of online learning on their students and be enthusiastic about continuing to implement online learning even after school resumption. We refer to these characteristics as online teaching preparedness. In this section, we report on our explorations to identify the key factors that contribute to teachers' online teaching preparedness.

The statistical method Structural Equation Modelling (SEM) was adopted to investigate how factors before and during the school suspension influenced actual online teaching practices and teachers' perceptions of how online learning and teaching (L&T) have impacted on students' learning, as well as their attitudes towards continuing online L&T after school resumption. The analysis results are summarized in Figure 5 below. The direction of the arrows indicates the path of influence and the thickness indicates the magnitude of the influence.

The SEM results show that teachers' perceived negative impacts of online L&T does not have a significant relationship with the other indicators. The negative impacts are mostly related to existing divides among students such as social economic and academic divides which may be aggravated during the period of online L&T. The fact that the extent of perceived negative impacts does not correlate with the other variables indicates that teachers are aware that these negative impacts are not intrinsic to online L&T.

Figure 5. Results of the full SEM conducted on 9 of the 11 variables listed in Figure 1
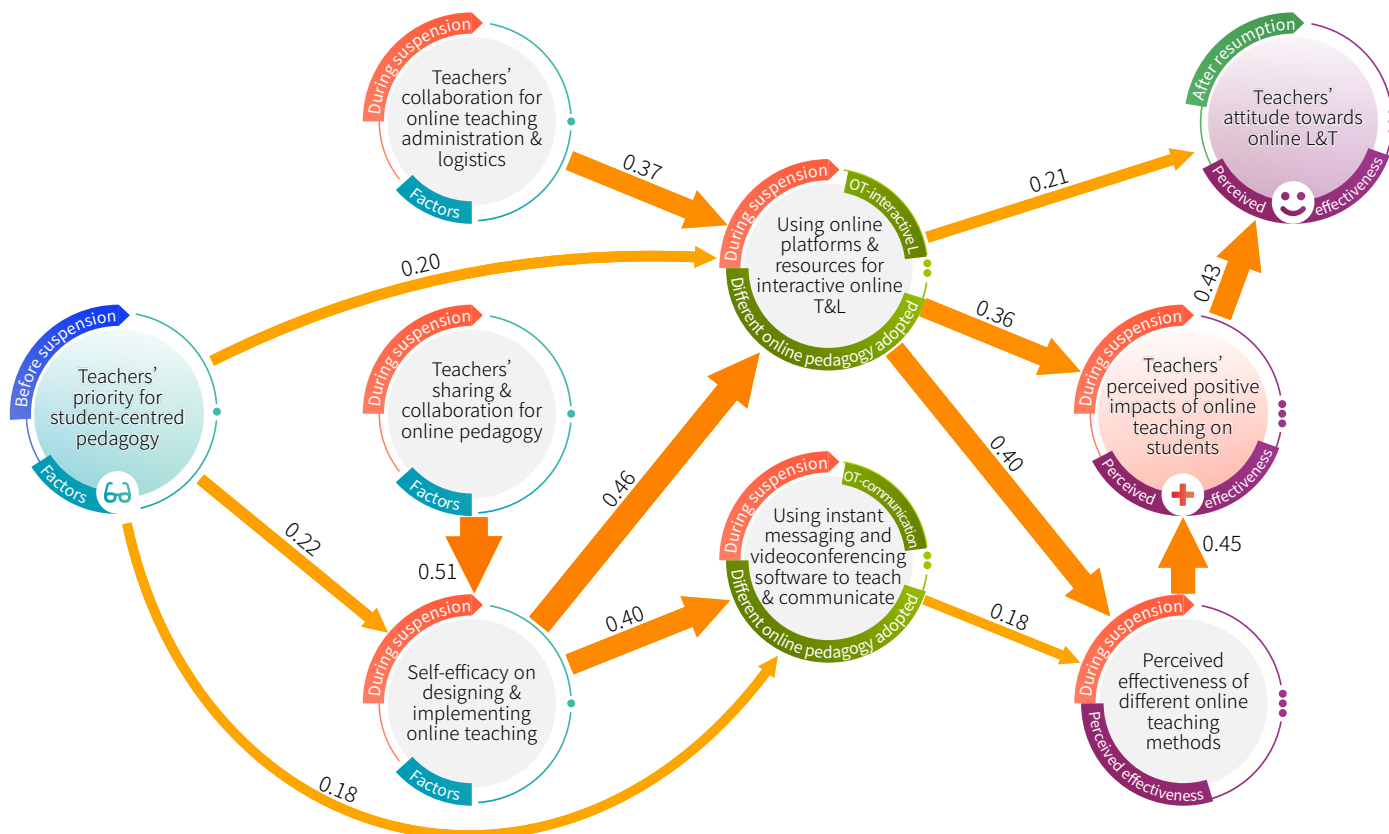
Results presented in Figure 5 also shows that a teacher's attitudes towards continuing online L&T after school resumption ("*OLT after resumption*" for short) is positively influenced by the teacher's extent of use of online platforms and digital resources for interactive online L&T during school suspension ("*Online Interactive Learning*" for short) and the extent of positive impact of online L&T as perceived by the teacher, with the latter having the strongest correlation. However, if we take into account the indirect effects of other factors, then we find that *Online Interactive Learning* has the strongest influence on *OLT after resumption* as it has a strong direct positive influence on teachers' perceived positive impact of online L&T and perceived effectiveness of different online L&T methods.

Figure 5 also shows that of the five factors influencing online L&T represented in Figure 1, the teachers' extent of online L&T use before school suspension does not have a significant influence on the teachers' online L&T practices during school suspension. This does not imply that taken individually, teachers' extent of online L&T use before school suspension does not have an influence on what happened during school suspension. However, this factor is correlated with other factors. The SEM results thus show that when all the factors are taken into consideration together, the other factors will have already accounted for this already. Hence, the results also show that the teacher's priority for student-centred pedagogy is the only pre-school-suspension factor that influences the other factors. Further, while all three factors during the school suspension period had a significant influence on teachers' actual practices and outcomes, the extent of a teacher's engagement in pedagogy-focused sharing and collaboration regarding online L&T has a very strong direct influence on the teacher's self-efficacy for designing and implementing online L&T, which in turn influences both kinds of online L&T practices in the model.

Based on the results presented in Figure 5, we identified the five most important factors and their associated paths of influence and conducted another SEM on these. The model results for this reduced set of factors is presented in Figure 6. It shows that the intensity of teachers' collaboration within their schools regarding online teaching, particularly through in-depth sharing and collaborative work on online pedagogy, including observations and discussions of each other's lessons, has a very strong positive influence on teachers' confidence in designing and implementing online L&T. As a personal characteristic, the importance that a teacher attaches to student-centred pedagogy before school suspension also has a significant positive influence on the teacher's online teaching self-efficacy, though the magnitude of the influence is much smaller than the influence from collaboration with peers. The teachers' self-efficacy is a strong, positive predictor of their reported use of LMS and digital resources for student interactive learning, which in turn positively influences their inclination towards continuing to adopt online L&T to address issues of student diversity and promoting self-directed learning after school resumption.

Figure 6. Results of the SEM on the reduced set of five most important factors selected from the full model
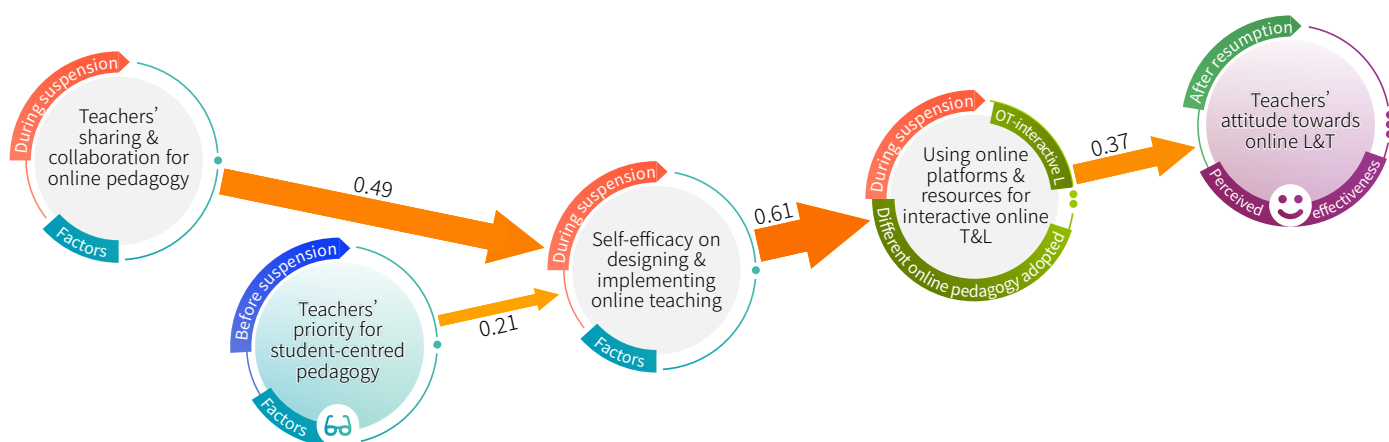
Fostering critical thinking and creative capacities, using data to support assessment and feedback through online L&T are

most challenging for teachers

The survey contained questions that asked teachers about their levels of self-efficacy with different online L&T methods and the extent to which they employ them during the school suspension period. By applying an Item Response Theory (IRT) model on teachers' responses on a list of online L&T activities and methods, an item-difficulty map (Figure 7) was constructed that shows the relative likelihood that certain activities/methods would be adopted by the surveyed teachers. The IRT framework is able to estimate individuals' abilities as well as item difficulties onto the same scale. Therefore, endorsing one level of item difficulties reflects a specific level of abilities.

The right side of Figure 7 presents the difficulty levels of all item thresholds. A total of 23 items from four questions were analyzed. All of the questions adopted Likert scale responses. Three questions (Q7, Q10 and Q19) adopted a four-point Likert scale (1 = not at all, 2 = to a small extent, 3 = to a moderate extent, 4 = to a large extent). The fourth question (Q16) adopted a five-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). To construct the item difficulty map, we interpret the higher levels of confidence or use to be more difficult, and we compute the relative difficulty of transitioning from a lower level to the next higher level. The difficulty of a transition is referred to as a threshold. For example, Q7 is about self-efficacy. Item 5 in this question is the statement: "*I am able to design online learning activities that are engaging for the students*". Since this question has a four point Likert scale, there are three thresholds for this item: t1 for transitioning from "not at all" to "to a small extent", t2 for transitioning from "to a small extent" to "to a moderate extent", and t3 for transitioning from "to a moderate extent" to "to a large extent". For Q16, as the response is in the form of a five-point Likert scale, each item would have four thresholds. For the 23 items analyzed, there is a total of 75 thresholds.

Figure 7. Item difficulty map constructed from the survey responses to four questions
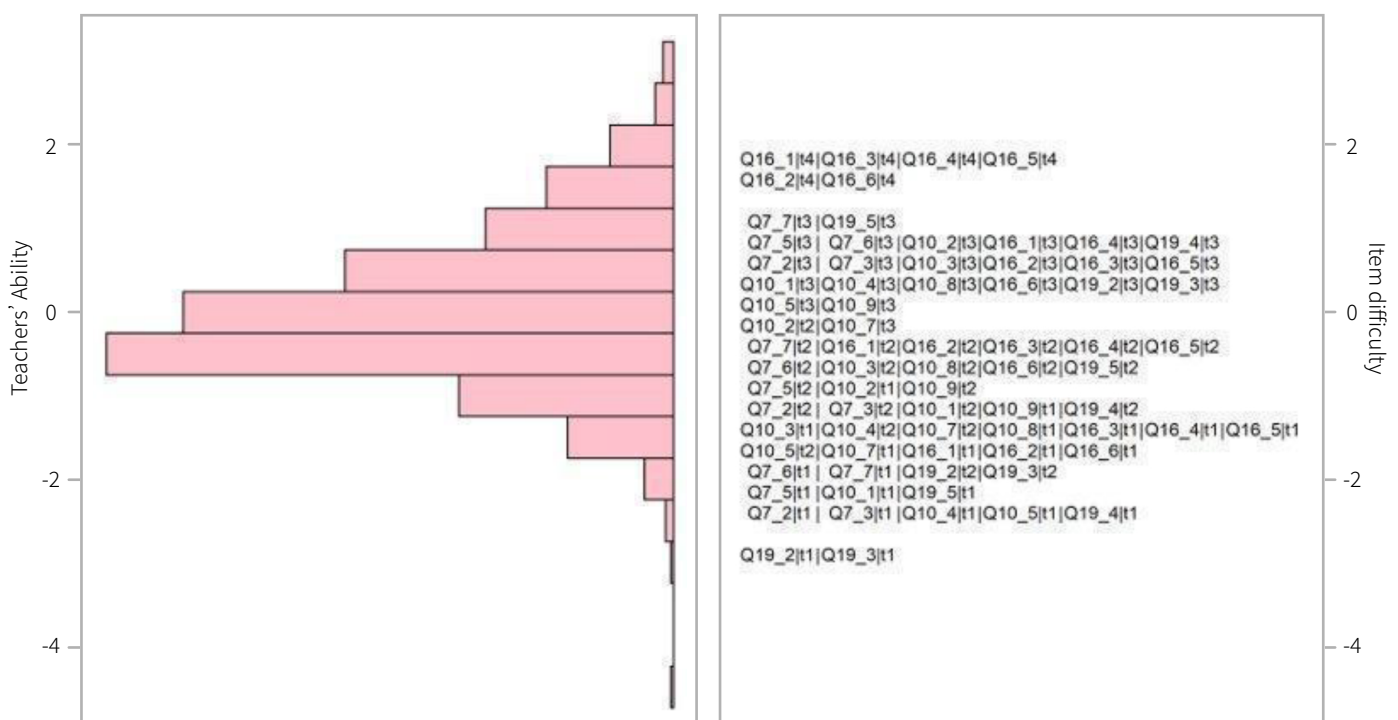
Thresholds at the bottom of the left-hand panel are the "easiest", and those at the top are "most difficult" in terms of their occurrence. For example, Q10_4|t1 is on the second lowest level. Q10_4 is "*I search for useful learning materials online for my online teaching.*" So, we can interpret that almost all teachers are able to do this, at least to a small extent.

The top of the item difficulty map is dominated by items in Q16, indicating that the digital technology uses surveyed in this question are the most challenging for teachers. The items in this question pertains to using digital technology for assessment, feedback, and promoting student reflection.

Summarizing the findings from the item difficulty map, we find that most teachers are able to do basic online learning operations such as using videoconferencing tools (e.g. Zoom) to conduct lessons, upload self-produced videos for students, and using existing online resources to conduct online lessons. However, there are some uses of digital technology for online L&T that teachers are least confident about, and these should constitute the core focus for future technology professional development. The uses of digital technology that teachers need more help with are:

● Designing a student-centred online lessons and implementing them on a Learning Management System (LMS),

● Designing learning activities that use digital technology to foster students' critical thinking and creativity,

● Using technology to support assessment, including student self- and peer- assessment,

● Using data to support students' reflection on their own learning and providing feedback,

● Gathering and analyzing student data to improve teaching.

The left side of Figure 7 presents the distribution of teachers' estimated competence on the item difficulty levels (from least to most challenging thresholds). Teachers at a particular ability level on the map are most likely to be able to perform tasks at or below the corresponding difficulty levels on the right-hand panel of the map.

Summary of findings

Findings from the study show that most teachers are positive towards continuing to use online learning and teaching even after face-to-face teaching resumes. However, school suspension has led to an overwhelming use of videoconferencing and chat for communication between teachers and students. Such uses tend to prioritize e-teaching rather than e-learning. The analysis also shows that many teachers are unfamiliar with the use of online platforms and resources to implement interactive, student-centered learning.

Three key constructs from the teacher survey — importance of student-centred pedagogy, perceived impact of online teaching, and attitudes towards continuing online L&T after school resumption — yielded four groupings of teachers in terms of their orientations regarding online L&T: *Progressive Innovators*, *Cautious Explorers*, *Conservative Explorers* and *Traditional Instructors*. **Progressive Innovators** have **significantly higher Preparedness for Online L&T**: higher levels of self-efficacy for online L&T, valuing more student-centered pedagogy and having a stronger disposition to adopt online L&T after school resumption for the purpose of enhancing student-centred learn and catering for learner diversity. Moreover, every teacher has the potential to become a progressive innovator.

Our findings show that **a teacher's engagement in online L&T related collaboration in school, in particular pedagogy-oriented sharing, is the best predictor of their Online L&T preparedness**. Thus, the most effective way to nurture *Progressive Innovators* is to encourage and support teacher sharing and collaboration on online pedagogies.

Most teachers are capable of conducting basic online teaching such as using videoconferencing to teach, creating/selecting videos and other resources for online lessons. **Professional development to foster teachers' Online L&T Preparedness should focus on using online learning platforms, digital resources and tools to design and promote interactive, self-directed learning, critical thinking and creativity, conduct e-assessment and give e-feedback, as well as collecting and using data to improve teaching and learning**.

Recommendations

1 **Policy and system level:** Through Centres of Excellence or similar bodies, expand the professional network among **teachers and schools to foster Online L&T Preparedness**, leveraging the use of online learning data for assessment and feedback, and for advancing teachers' ability to make use of data to improve learning and teaching.

- Provide teacher professional development programs on enhancing the pedagogical understanding of e-learning, in particular the design and implementation of self-directed learning tasks that harness technology for student empowerment.

- Facilitate professional development opportunities that foster pedagogically focused sharing and collaboration among teachers within and across schools, such as through Centres of Excellence and thematic innovation networks.

2 **School leadership level:** Expand the professional networks within and between schools, establish and/or strengthen the e-learning coordination teams' professional development roles and functions, deepen teachers' in-depth sharing and collaboration regarding both online and blended teaching pedagogies to help more teachers become "Progressive Innovators".

- Integrate e-learning elements into the school's *strategic development plan* as a lever for curriculum and pedagogical innovation.

- Institute and/or strengthen the *professional development role* of the school-based e-learning coordination team, especially on fostering e-learning related pedagogical sharing and collaboration.

- Develop *school-based guidelines* for appropriate e-learning deployment under school suspension, half-day school and full-day school contexts to maximize the contribution of digital technology to student learning.

3 **Individual teacher level:** Strengthen personal professional confidence and competence in the age of the New Normal through leveraging the learning opportunities offered by various professional and supporting networks, with special attention to enhancing one's ability to design and implement student-centred, interactive, online learning that can foster students' **critical thinking** and creativity.

- Sustain and expand your professional network to foster a positive culture of collaboration.

- Be confident in turning tacit knowledge into explicit knowledge for sharing with other teachers in the wider school community

- Be empowered to leverage various professional learning/support opportunities to expand your student-centred e-learning pedagogical repertoire for the New Normal.

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