Learning and Assessment for DIGITAL CITIZENSHIP

Student well-being during COVID: Navigating through different phases of school suspension

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WP4 in Digital Citizenship Project

- Molly Runzhi Kong
- Nancy Law
- Patrick Lam

Outline

- Background
- A Multifaceted Well-being Framework
- An In-depth Study during COVID
  - Three-phase design
  - Semi-automated Day Reconstruction Method (DRM)
  - Results
  - Implications
- Ongoing Work: Smart Planning Workshop
- Next Steps

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Learning lives:
Individual / home / school / community

Context

engagement

Cognitive & metacognitive capacity

DIGITAL LITERACY

COLLABORATIVE PROBLEM SOLVING

participation

community

Home

School

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Learning lives & Digital citizenship

In addition to background surveys to students, teachers and principals…









Research challenge (innovation):

Connecting observable data

to

activities and learning-related constructs

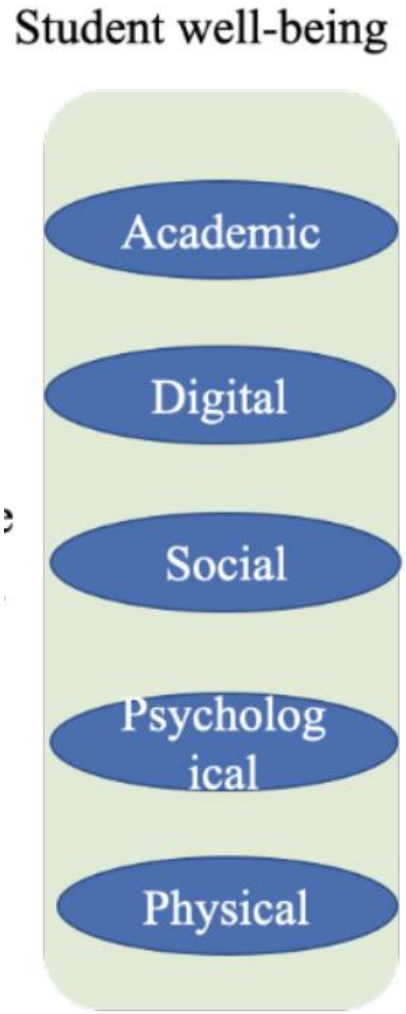
(cognition, motivation, emotion, belief, etc.)



The Pandemic and Student Well-being

- School closure and home confinement globally
- An urgent call to understand the impacts on student's live
- Well-being
  - Foremost importance
  - Many definitions, from
    - Large and diversified sample (e.g., 150 countries)
    - Positive psychology (e.g., Flourishing scale)
    - The lack of positive well-being (e.g., depression and anxiety criteria)
  - A comprehensive concept
  - With multidimensional elements
    - physical well-being, social well-being, financial well-being, community well-being, and career well-being (Rath, Harter & Harter, 2010)
    - positive emotion, engagement (in work), relationships, meaning, and accomplishment (Seligman, 2011)
    - competence, emotional stability, engagement (in learning new things), meaning, optimism, positive emotion, positive relationships, resilience, self-esteem, and vitality

A Multi-faceted Framework of School Student Well-being



- Common components in many existing definitions
- Population dependent (school students)
- Digital well-being
  - New demand for online learning and social life
- Academic well-being
  - Student version of career/work/accomplishment

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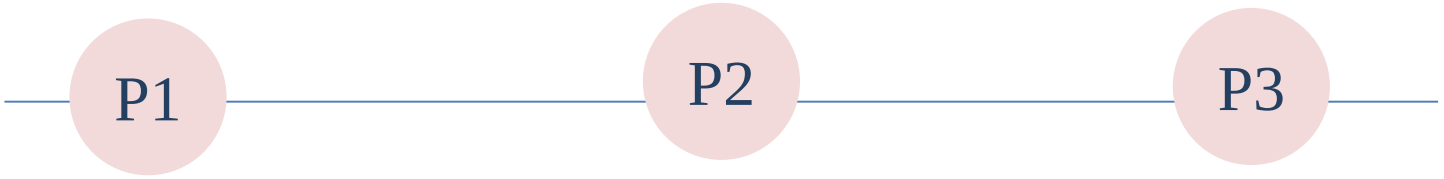
An In-depth Study on Students' Well-being during COVID-19 Pandemic

- Research Design with Three Natural Phases



P1	P2	P3
Confined at home Taking online lesson	Back to school Half-day School	Summer holiday COVID-19 outbreak

Research Questions

- RQ1. How was the student's well-being in the three distinct phases during COVID-19 pandemic?
- RQ2: What were the reasons for changes of students' well-being in the three distinct phases during COVID-19 pandemic?

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Participants

22

20

3

- Purposeful sampling & snowball sampling
- School A (local band 3)
- School B (local band 1)
- Forms 2 & 4 (grades 8 & 10)

	Female	Male	Total
Form 2 (A)	3	6	9
Form 4 (A)	7	2	9
Form 2 (B)	1	0	1
Form 4 (B)	0	3	3
Total	11	11	22

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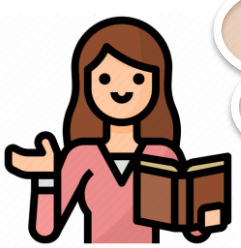
Multimodal Data Collection Methods (P1, P2 &P3)

Method		Description
Survey (20-30 minutes)		Learning experience , social life, internet use and other well-being aspects.
Interview (30-40 minutes)		Experience during each phase "Show & Tell" on digital device use.
Semi-automated Day Reconstruction Method (DRM) [**Every day task**]	Fitbit Versa	Physical activities Sleep 
	Daily report	Major social activities Internet Usage (apps) RescueTime
	BlockyTime (App)	Day use At the end of the day
	Reflection	Important experience during the day and how they think or feel

Interviews with Teachers and Parents

Who	When
Teachers	P1 & P3



- I manage online teaching…
- I think online learning …
- I think….

Who	When
Parents	At the end of P1

- I think children's learning at home...
- My attitude towards digital tech.
- I think…

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Table 1. Collected Data and Sources

Well-being Construct & its approach	Indicators/variables	Instrument
Physical (Objective)	Duration of physical activity	Goldberg (1978); Goldberg & Williams (1988);
	Life regularity	Daily activity report (BlockyTime)
	Steps	Wristband (duration is recorded in minutes; Sleep efficiency= TST/Total time in bed*100)
	Sedentary duration	
	Duration of Physical Activity in each Level (light, fairly and very active)	
	Sleep onset	
	Sleep offset	
	Total sleep time (TST)	
	Awakening times (AT)	
	Number of awakenings (NOA)	
	Wake time after sleep onset (WASO)	
	Duration of each sleep stages (light, deep, REM)	
	Total time in bed	
	Sleep Efficiency	
Mental (Subjective)	Mental health	Goldberg (1978); Goldberg & Williams (1988);
Social (Objective& Subjective)	Time, Node, Mode & Feeling	Daily social reports
Digital (Subjective)	Internet addiction test	Teo & Kam (2014)
Digital (Objective)	Digital footprint	Time management Applications (e.g., Rescuetime)
Academic (Subjective)	Self-efficacy, intrinsic value	Lee, Zhang, & Yin (2010)
	Cognitive Strategy Use, self-regulation	Lee, Zhang, & Yin (2010)
	Agentic Engagement	(Reeve & Tseng., 2011)
	Emotional Engagement	Fredricks, Blumenfeld, & Paris, (2004)
Other quality of life indicators	Experience of Online Learning	Palmer & Holt (2009)
	Demographic survey	N/A

Data Analysis

- Missing value replaced using multiple imputations
- Cross phase comparison: one-way repeated measures (RM) ANOVA with the Greenhouse-Geiseer correction
- Post hoc tests with Bonferroni-adjusted pairwise comparisons
- Interviews, dairies: inductive, thematic content analysis method, explaining the changes in RQ1.

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Results- Mental and Physical Well-being

Data Type	P1 Mean (SD)	P2 Mean(SD)	P3 Mean(SD)	RM ANOVA				Post Hoc		
				F	df	p	η_p^2	p (P1-P2)	p (P1-P3)	p (P2-P3)
Mental health	3.38(.72)	3.52(.79)	3.41(.62)	.420	2	.660	.020	.437	.785	.548
PA (Survey)	3.01(.84)	2.86(.68)	2.98(.54)	.707	2	.499	.033	.242	.829	.377
SRS	5.25 (.53)	5.39(.46)	5.04(.62)	2.546	2	.090	.108	.745	.841	.097
TST	381.66[b] (116.34)	361.8[b] (40.47)	400.86[b] (67.09)	1.423	2	.252	.063	1.000	1.000	.057
WASO	54.37[b] (26.28)	52.40 [b] (13.14)	62.40 [b] (18.99)	2.199	2	.123	.095	1.000	.730	.022*
NOA	25.13 [b] (13.4)	24.87 [b] (9.83)	27.94 [b] (12.38)	.808	2	.452	.03	1.000	1.000	.748
Sleep Efficiency	87.10 [b] (1.04)	87.26 [b] (.61)	86.01 [b] (.866)	1.606	1.519	.272	.060	1.000	.921	.260
REM	73.01 [b] (7.59)	77.32 [b] (16.72)	82.80 [b] (21.67)	1.62	2	.198	.04	1.000	.449	.717
Light	217.54 [b] (63.628)	210.78 [b] (22.42)	237.44 [b] (29.37)	2.678	2	.08	.113	1.000	.532	1.000
Deep	74.27 [b] (22.77)	74.47 [b] (12.37)	89.74 [b] (14.05)	1.506	6.433[a]	.008*	.23	1.000	.032*	.000**
Steps	2974.97 [b] (1786. 27)	6513.52 [b] (1856.96)	2490.07 [b] (1318.17)	2.793	2	.000**	.715	.000**	.668	.000**
SD	928.82 [b] (231.33)	854.57 [b] (158.42)	921.26 [b] (198.06)	2.318	2	.111	.099	.189	1.000	.132
Lightly active PA	112.42 [b] (62.86)	185.83 [b] (58.61)	126.29 [b] (47.88)	20.39	2	.000**	.493	.000**	.092	.000**
Fairly active PA	9.55 [b] (7.53)	18.35 [b] (11.70)	5.67 [b] (6.72)	19.11	2	.000**	.477	.001*	.200	.000**
Very active PA	7.74 [b] (7.17)	17.44 [b] (11.42)	4.23 [b] (4.77)	18.065	2	.000**	.462	.003*	.193	.000**
LRS	5.71 (.30)	6.04(.68)	5.46(.51)	7.346	2	.002*	.259	.125	.166	.010*

Note: a. result was adjusted with a Greenhouse-Geisser correction; b. wristband obtained data was present as daily average in each phase; c. Duration was presented in minutes; PA=physical activity; SRS= sleep regularity score; TST=total sleep time; WASO=Wake time after sleep onset; NOA=number of awakenings; REM= rapid eye movement (one phase of sleep stages); LRS=life regularity score; SRS=sleep regularity score; SD=sedentary duration; PA= physical activity;

Interpretation

- wristband measured data: students are significantly less active in P1 and P3 compared with P2.
  → home confinement & living environment
- Sedentary behavior → no significant differences; sit for around 14.2 hours to 15.4 hours per day
- Moreover, sleep indicators (TST, AT, NOA,WASO, sleep efficiency, light sleep, deep sleep, REM sleep, sleep regularity score) were compared between phases, but no difference was found.
- Deep sleep, increase in P3.
  → rebound sleep (Shrivastava, Jung, Saadat, Sirohi, & Crewson, 2014).
- Life is most irregular during summer, and most regular when returning back to school.
  → school scheduled routines

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Results– social Well-being

- The frequencies of emotions associated with social interactions
- most social events are perceived as positive or neutral.
- positive emotional experience when adolescents experience social events during the pandemic.
- Social connectedness protected against poor mental health during home confinement (Magson et al., 2020).
- a relationship between social well-being and digital technology use

	Negative emotions									
	Fear	Helpless	Exhausted	Envy	Disappointment	Desperation	Sadness	Anxiety	Anger	Boredom
P1	0	2	4	2	2	1	8	16	7	4
P2	0	2	10	0	0	0	4	12	2	2
P3	1	1	6	0	1	0	3	14	0	2
	Positive Emotions									
	Hope	Enjoyment	Gratitude	Happiness	Enthusiasm	Amusement	Focused	Contentment	Positive	Surprise
P1	8	3	2	133	20	24	5	5	13	1
P2	0	6	1	156	13	10	2	0	0	0
P3	0	9	0	134	9	7	2	1	0	2
	Neutral Emotions									
	Calm	Relaxation			Total negative emotions		Total positive emotions		Total Neutral	
P1	143	27		P1	46		206		170	
P2	65	20		P2	32		196		85	
P3	96	13		P3	28		164		109	

Results-digital wellbeing

- The average daily internet usage was compared across three phases using the aggregated daily self-reported data recorded by time management App and Internet addition survey.

Data Type	P1 Mean (SD)	P_2MS(SD)	P_3MS(SD)	RM ANOVA				Post Hoc		
				F	df	p	η_p^2	p (P1-P2)	P (1-3)	P (2-3)
PlO (hr)	3.80(3.35)	2.33(1.07)	4.76(3.62)	7.374	2	.002*	.260	.092	.252	.010*
PdO (hr)	1.52(1.45)	.54(.56)	1.67(1.97)	.500	2	.014*	.184	.021*	1.000	.016*
SN (hr)	1.32(.86)	1.02(.65)	1.25(.70)	1.224	2	.304	.055	.449	1.000	.735
Total IU(hr)	8.54(3.54)	6.71(2.60)	9.02(4.83)	4.034	2	.025*	.161	.077	1.000	.03*
Internet addiction	3.78(.46)	3.81(.65)	3.90(.59)	.652	2	.526	.030	.776	.256	.776

Note: PlO=Pleasure-Oriented; PdO=Productivity Oriented; SN=Social networking; IU=Internet use;

Interpretation

- after returning to school, students significantly reduced internet use, especially on learning
  → learning activities happen mostly in school during P2

- P3, students increased their internet use significantly (pleasure, learning, or interest development)
  → a more free schedule to learn and interest development
- increase in pleasure-oriented and overall internet use.
  → boredom and internet use
- no significant differences in the Internet addiction test
- the parental role of regulating digital devices

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Results-Academic well-being

Table 1. Summary of self-reported general learning behaviours

	P1	P2	P3
How many hours did you spend on doing assignments a day?			
Less than 2 hours per day	8 (36.3%)	9 (40.9%)	11 (50%)
2-4 hours per day	11 (50%)	12(54.5%)	11 (50%)
More than 4 hours	3 (13.6%)	1 (4.5%)	0
TOTAL	22	22	22
Is feedback from teachers useful?			
Feedback is useful	13 (59%)	11(50%)	Not applicable
Unsure whether the feedback is useful or not	8 (36%)	5 (22.7%)	
Feedback is not useful	0	0	
Did not receive any feedback	0	6 (27.3%)	
TOTAL	22	22	

Table 2. Descriptive statistics and summary of one-way RM ANOVA results for intellectual well-being

Measure	P_1MS(SD)	P_2MS(SD)	P_3MS(SD)	RM ANOVA				Post hoc		
				F	df	P	η_p^2	P (1-2)	P (1-3)	P (2-3)
EGN	3.42(.70)	3.63(.73)	3.32(.57)	1.830	2	.173	.080	.655	1.000	.262
AGN	2.68(.90)	3.22(.99)	3.2(.95)	8.792	2	.001*	.295	.001*	.005*	1.000
SE	3.12(.74)	3.7(.64)	3.20(.55)	9.641	2	.000**	.315	.000**	.659	.002*
IV	3.67(.768)	3.87(.71)	3.56(.48)	2.319	2	.111	.099	.051	.525	.069
CSU	3.72(.65)	3.89(.66)	3.62(.52)	2.918	2	.065	.122	.059	.419	.052
SR	3.54(.73)	3.84(.69)	3.55(.50)	2.989	2	.061	.125	.012*	.940	.070

Note: AGN=Agentic engagement; EGN=Emotional engagement; SE=self-efficacy; IV=intrinsic value; CSU=cognitive strategies use; SR=self-regulation;

Interpretation

- Statistical increase in self-efficacy after going back to school (P2); Statistical decrease in self-efficacy in P3.
  → f2f learning's advantages, such as the "learning atmosphere" in schools.

- Increase of agentic engagement from P1 to P2, sustained during P3.
  → reluctance and difficulty in help-seeking during P1.

- Emotional engagement, intrinsic value, cognitive strategy use, and self-regulation: no differences
  → the final academic achievement rule settled by the school. (weakening the proportion of exams on the final score)

Summarization

- Our finding has revealed
  - (1) changes of students' multifacted well-being across the three phases
  - and (2) the reasons behind well-being changes.
- the risk of home confinement
- benefit of returning to school, even half a day only.
- the emotional value of social connectedness under the pandemic.
- semi-automated DRM can be a more automatic and less intrusive approach

Limitation

- Sample size
- Limited to secondary school students in Hong Kong.
- Missing data → tracking application was created

Conclusion

- how the changing context under pandemic impacts adolescents' well-being in Hong Kong.
- implications for teaching and learning
- novel methodologies for researchers in the field to use.

Ongoing Work

- Design and conduct a "Smart Planning" course for schools and the related research
- Conducted in one school in May– June, 2021
- Use wearable device and Day Reconstruction Method to help students track own activities and reflect for better planning

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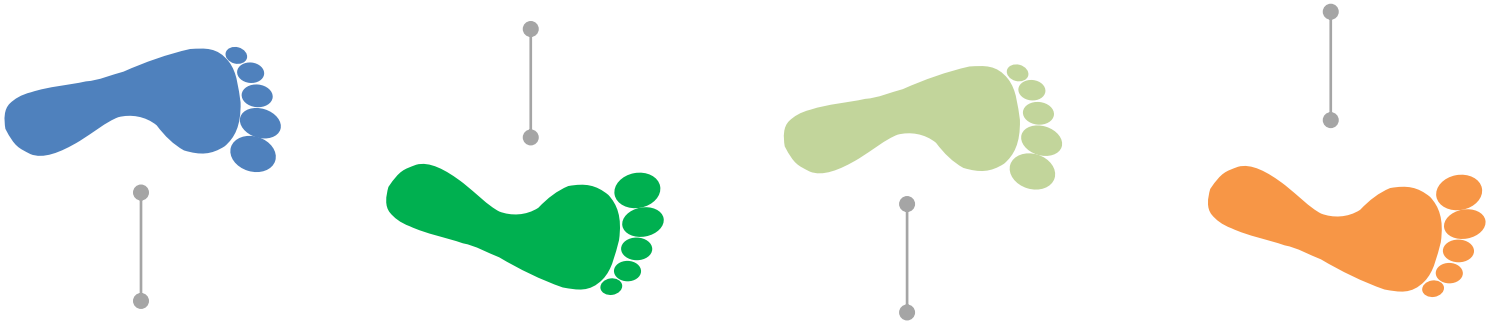
Next Steps

- Refine Smart Planning course and research schools
- New research proposal(s) on multimodal learning analytics in different contexts



- Smart Planning course initial implementation data analysis

The following are backup slides

- Which may be deleted, or incorporated in some of previous slides.

Multimodal Learning Analytics

- Leverage different modes of data to make sense of the learner and context where learning happens(Chua, Dauwels, & Tan, 2019).
- Tracked automatically with sensors including wearable devices (Di Mitri et al., 2018)
- Interdisciplinary: machine learning + learning science

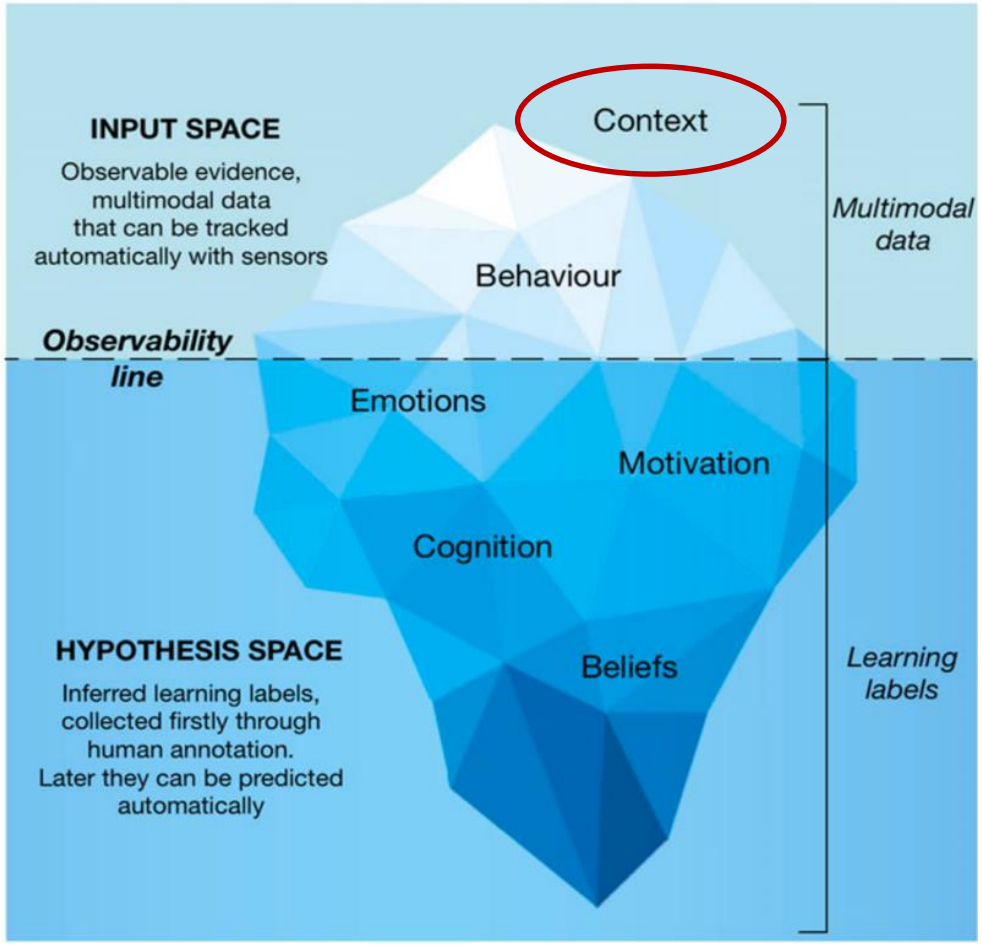


Figure from (Di Mitri et al., 2018)

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Our Studies

To make sense about context and collect contextual data, the following research approaches are explored.

- Surveys: multilevel contextual data
- Activity tracking app: digital footprint
- Location detection: classroom interaction and motion
- Wearable devices and machine learning: socioemotional states
- Anthropological observation: sociocultural dynamics

Involve significant
Conceptual, methodological and technological innovations

Summary of these studies

- Multi-perspective contexts
  - School, home, community; friends, family; digital, physical, …
- Multi-faceted constructs
  - ICT usage, activities, productivity, movement, engagement, emotion, etc.
- Multidisciplinary approaches
  - Education, statistics, psychology, information science, engineering, anthropology
- Multimodal data channels
  - self-reported, automatically tracked; physiological signals, sleep, Internet usage
- Provide opportunities that lie ahead for a new science of learning lives

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