DEVELOPING IN DIGITAL WORLDS

We set out to describe the development and teaching of three groups of '21st Century skills' in Digital Environments (DE)

COGNITIVE, ***INTRA***PERSONAL & ***INTER***PERSONAL

36 Teachers we asked generally reported DE increased opportunities for teaching the skills and they did this daily or weekly

4 Reported not deliberately teaching these skills and some thought the DE reduced opportunities, however most were willing to deliberately teach with access to PLD

THE *INTER*PERSONAL SKILLS

18 CLASSROOM

1/4 to 1/2 of the time these interactions occurred (peer help, showing concern), but little obvious activities or instruction

300+

Perspective taking & collaboration - small developmental increases; Empathy (cognitive & emotional) - no age differences

Strong classroom interpersonal interactions; students aware of challenge in DE; limited DE classroom activities and instruction

THE *INTRA*PERSONAL SKILLS

18 CLASSROOM

About 1/2 the time there was obvious teaching of these, particularly for academic purposes

300+

Self-regulation of attention & inhibitory control - students increasingly rated difficulty applying in a DE

Lower reported levels of self-control than NDE; but high levels of awareness of DE challenges; limited DE classroom activities & instruction

COGNITIVE (CT & CL)

18 CLASSROOM

Teaching occurred less than a 1/4 of the time and often presented as general prompts (3 teachers with strong instruction)

250+

Very low overall test scores generally (though some quite high); students scored highest in English and lowest in science

Lower levels generally in classroom and NDE measures; higher levels (CT) occurring in discussion board activity

COGNITIVE (ARGUMENTATION)

18 CLASSROOM

Obvious teaching about 1/4 of the time. Forms included: consensus building; persuasion; considered position; element teaching

225+

Keen interest by teachers; engagement at all year levels from Year 3 ; Key areas affording promise: warranting; selection bias; corroboration

Suggests strong persuasion influences as very high levels of single perspectives; emerging integrated perspectives as young as lower primary

PROMOTION

- Develop shared understanding of forms & purposes of the sets of skills
- Leverage dialogic argumentation to concurrently build other aligned skills
- Increase frquency of dialogic use of digital tools in teacher & student-peer formats

Developing in Digital Worlds: A profile of teaching and learning 21st century skills in digital classrooms

An overview

We set out to describe the development and teaching of '21st century skills', skills that many commentators claim are increasingly important for personal growth and success through school and beyond. Our idea is that where students have their own devices and teachers employ innovative digital tools and pedagogies (such as interactive dashboards and classroom sites within and beyond school), then several outcomes are possible. These include new ways of teaching and learning, both teaching and learning being enhanced, and parental support for learning affecting further change. There are also potential problems which we need to know about.

Our focus is on three sets of skills: those important for interacting with others[1]; those important for managing oneself[2]; and those important for thinking[3]. In addition, our interest is in how teachers can effectively promote these cognitive, intrapersonal and interpersonal skill sets in different subject areas (English, mathematics and science). We are equally interested in how parents guide students' access and use of devices to develop 21st century skills in out- of-school contexts. Existing international measures have been used pertaining to non-digital environments (NDE), together with our own set to check development in digital environments (DE); these include specially constructed measures of critical thinking and argumentation. Observations of classrooms were used to describe current teaching. Also, we asked (through questionnaires) for the views of teachers, students and parents on teaching, learning, guidance, access and use. All of this has been done with two clusters of English medium schools and one cluster of Māori medium schools. Here we summarise the results of one cluster of English medium schools. This cluster was very experienced with 1:1 devices, having had more than 5 years in a fully digital initiative.

Teaching the skills and development

Consistent with our idea, thirty-six teachers we asked generally reported that the DE increased opportunities for teaching the skills and they did this weekly or daily; although they were less positive about the skills of interacting (interpersonal skills[1]), and teachers of mathematics were generally less positive about increased opportunities than other teachers. Not all teachers reported deliberately teaching these skills (four teachers) and some teachers thought the DE reduced opportunities. But in each case teachers were willing to use opportunities and deliberately teach given they had access to professional learning and development.

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[1] *interpersonal* (perspective taking, pro social skills of getting on with others, and both cognitive and emotional empathy)
[2] *intrapersonal* (attention focus and inhibitory control)
[3] *cognitive* (critical thinking, critical literacy and argumentation / critical reasoning)

Interpersonal skills[1]

In general, the 18 classrooms we observed were very positive. Between a quarter and a half of the time there were interactions that related to these skills: either students with students (such as unprompted peer helping) or teachers responding positively to student need (thereby modeling forms of empathy and perspective taking). But there was little obvious designing of activities or instruction that specifically related to the skills (e.g. through feedback or prompting).

From our measures (with around 300 students) we found small increases in some skills as measured in the DE and NDE assessments (perspective taking, collaboration), but no age differences for the two forms of empathy (cognitive[4] and emotional[5]). Generally, students' rating of their skills in DE tended to be lower than their ratings for skills in NDE. For example, students rated themselves as more like: "*I try to be nice to other people. I care about their feelings*" (pro social behaviour) than "*I try to be nice to others online, I care about their feelings*"; and again, more like "*I can understand my friend's happiness when they do well at something*" (cognitive empathy) than "*I find it hard to know whether my friends are upset online when we game chat, e mail, post blogs*." The overall ratings and patterns on the NDE assessments are similar to overseas findings given the age ranges involved, although our students may be higher on the interpersonal skills.

Interpretation

We interpret these findings as showing that the students have good levels of interpersonal skills (although there is quite a lot of variability between students), but that the skills are not as strong in the DE and often not being promoted through classroom activities and instruction, despite the classroom environments being very positive.

Intrapersonal skills[2]

Most teachers saw the DE as increasing the opportunities to promote intrapersonal skills, even more so than the interpersonal skills; and consistent with this about half of the time we observed there was some obvious teaching of these skills. It was focused on self-regulation on academic tasks through teaching strategies, task management and goal setting. But there was little focus on self-control of social and emotional skills (e.g. regulating emotion; perseverance). There was no pattern of development over the age range in the two measures of self-control in NDE, but the patterns for DE showed students increasingly rating themselves as finding it difficult to self-control. For example, students rated themselves as neutral on this NDE statement (neither 'not like' or 'like me'): *"It is easy for me to concentrate on homework problems" (*self-control: attention focus, NDE*).* Whereas, students increasingly said the following statement was like or very like them: *"When I do my learning after school on the computer (or online), it is hard for me to stay focused (e.g. put off by gaming, emailing, online browsing)"* (self-control: attention focus, DE). The ratings of self-control in various measures appear lower than international samples.

[4] Recognising and predicting emotional states of others

[5] Subjectively feeling the emotion of others

We checked what the questionnaire information added to this picture. Students reported daily usage of the internet at home which increased across the age range (from 42% of Year 3 and 4 students to 90% at Year 10-12). This was in the context of different patterns of monitoring by parents and changes over ages (42% of Year 3 and 4 students reported parents 'never or almost never' monitored their use and 37% 'mostly or always'; this changed in Year 7 and 8 where 43% said parents 'intermittently checked' and only 27% 'mostly or always'). There was no change across the age range with the majority students saying *"things can go wrong when you are online using the Internet"* (60% to 80% of students).

Interpretation

We interpret these patterns as showing the students may generally have lower levels of self-control than some international samples on the traditional assessments; but they are increasingly aware that the DE poses challenges in self-control. This increased awareness may be a positive effect of the DE. But while teaching is focused on self-regulation for academic purposes, the needs for perseverance and managing distractions may not be being fully met, either in the classroom or outside of the classroom.

Critical thinking and critical literacy

Most teachers also saw the DE as increasing opportunities for teaching critical thinking and critical literacy (CTCL). But, when nominated as a lesson focus, it was often not very clear that this teaching for CTCL was actually a focus. The lowest levels of deliberate teaching were observed for CTCL (scored as occurring in fewer than a quarter of the intervals observed). When it did occur it was mostly in the form of general prompts (referring to templates or WALTS); "*think critically*"; "*put the thinking cap on*" or "*let's scratch the rust and start thinking*".

Scores on our purpose built test of critical thinking in three domains (English, mathematics and science) were very low, but increased over the age range with a progressively wider spread of scores (some scores very low some quite high). Students scored best in English and lowest in science (on average only a quarter of the questions answered correctly). We tried the test out in piloting with students (14-16 years) in another higher SES community and the scores were much higher than our Year 9-12 students.

Interpretation

We interpret the patterns here as showing that the teachers are concerned to promote CTCL, but apart from some general directions, it appears that more needs to be done on what to focus on and how (including a shared conceptualization of CL).

Argumentation

Teachers were more aware of, or had more preference for teaching argumentation and collaborative reasoning than other skills. Argumentation and collaborative reasoning were observed about a quarter of the time and they took several forms: consensus building through discussion; persuading and outperforming others (e.g. debate); persuading and deciding on a best solution (e.g. voting); developing a considered position or solution; or being reminded about elements ("*What does a good listener look like*?").

Our purpose built test (Google Groups discussion board) enabled us to assess how students argued online over a social issue – Taylor Swift's recent visit to New Zealand and dotterel conservation. Emerging findings include:

- strong patterns of selection bias (students favouring confirming evidence for their own position and disregarding disconfirming evidence);
- adopting a binary (right or wrong) position;
- generally insufficient warranting, attention to accuracy and some reliance on emotive argument;
- curiously students didn't generally use the internet as a resource to help their arguments by extending inquiries online for verification or corroboration purposes;
- some effective (and highly amusing) use of everyday analogous thinking (e.g. "if Taylor Swift can take good care of her skin than I think that she can take good care of New Zealand's environment") but limited connections to conceptual learning such as scientific notions of conservation, extinction, and environmental management.
- some promising examples of dual and emerging integrated perspectives where even younger students demonstrated an openness to "finding a better truth" – holding different perspectives in a creative tension to inform final decision making or judgement.

Interpretation

We interpret these patterns as teachers' keen interest in promoting students' intellectual competencies through dialogic interactions, but collective student needs suggest approaches that progress beyond persuasion and binary position taking. Offering tasks within internet contexts and with digital platforms to socialize integrated perspective taking, may offer promising ways to further students' critical openness, reasoning and consideration of available (or omitted) evidence. There also appears to be considerable opportunity to build students' language and the dispositions of dialogic argumentation to further conceptual and curriculum content knowledge.

Promoting in classrooms?

We have drawn up pictures of classrooms in which the interpersonal skills were generally well promoted (as determined by the measures). In one year 5 / 6 class the teacher took small groups in a close (complex) reading activity where she specifically focused on empathy and perspective taking : "*imagine you are x [character in text], in the context of the story*". When working independently students prepared a complex Digital Learning Object about 'secrets' (which was provoking students to think about how others might think differently about something). These skills were reported to be promoted daily by this teacher (only 5 of 36 teachers reported this frequency). In a year 12 class students were preparing for complex science problems in an exam. The teacher communicated high expectations *"You can do it"*; modeled checking with others about whether they needed help "*Is that helping [you]?"* and reported deliberately promoting these skills at least once a month.

In both classrooms there were few instances of direct instruction but the teachers held a developmental view in which they had 'front loaded' the deliberate teaching at the beginning of the school year and used classroom tasks and interactions to maintain the near automatic use. The classroom climate in each was noticeably positive, empathetic and collaborative (peer to peer). However, these classrooms had the lowest mean scores for digital self-control measures and the largest differences between DE and NDE versions.

We looked at two classrooms in which students had high self-control scores. In a year 5/6 class the students were engaged in a relatively prescribed task, the creation of DLOs (slide shows) which presented definitions of words. The teacher modeled and prompted awareness of how to employ strategic thinking when self-regulating to problem solve: *"If I don't understand, I think what question do I need to ask to help me understand."* There was a very clear management structure, more so than some other classrooms. The teacher strongly believed in the significance of regulating academic performance: *"Students are learning the skills of presenting their understanding …in different mediums and how to choose the appropriate medium and how to use that medium appropriately. These skills are important for the future workforce they will be entering."*

In an older classroom group (Year 7/8) the task was a close reading of cartoons with collaborative reasoning, where students had to work as a team employing a democratic approach to argumentation. The teacher was deliberately prompting individuals to be aware of how to interact: *"What do we need to do to work effectively [in a group]?"* and vote counting was the means arriving at consensus. The group practices were well ingrained and reported by the teacher to be frequently practiced. Nevertheless, this class had the lowest mean of all classes on the measures of interpersonal skills.

Interpretation

We interpret these patterns to mean that it might be difficult to teach these sets of skills concurrently. The skills themselves might be best taught developmentally with clear and explicit instruction early on and then embedded reference to or commentary during everyday classroom (authentic) tasks (in Table 1 below going from cell 1 to cell 2 and 4). This would be in the context of a whole school focus on the skills.

Table 1 – 21st century skill development within 'authentic' dialogic tasks in DE's

	Outside 'authentic'[1] tasks	Within 'authentic' tasks
Explicit teaching	1 *Example: specific programme to teach social and emotional skills or direct and explicit instruction*	2 *Example: extended discussion about a character (empathic) in talk about text or drawing attention to how a peer might feel about an inappropriately negative comment in an argumentation task*
Implicit teaching	3 *Example: whole school messages about digital citizenship (values of: perspective taking, empathy, collaboration)*	4 *Example: Use task design to build skills in argumentation (e.g. argumentation task which requires being able to attend to, understand and respond to another's perspective)*

Thoughts for Discussion

Putting all of this information together our collective focus could be on how we are able to:

Develop greater clarity and shared understanding over the forms and purposes of the sets of skills. For example, building common language, conceptions and approaches to advance student learning both *for* and *through* 21st century skill development.

Increase the frequency of digitally based collaborative activity, in English, mathematics and science, especially using dialogic argumentation formats. For example, by leveraging the potential efficiencies of an argumentation focus in order to concurrently build other closely aligned skills (critical thinking; collaboration; perspective taking).

Increase the frequency of dialogic use of digital tools in teacher: student and peer: peer formats. For example, discussion platforms for synchronous and asynchronous forms of interaction, recording (audio/video) and annotating tools to afford 'rewindability' and metacognitive reflection.