MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Briefing Note: Update from Chief Science Education Advisor on Key Projects

To:	Hon Jan Tinetti, Associate Minister of Education (School Operations)		
Cc:	Hon Chris Hipkins, Minister of Education		
Date:	08 September 2022	**Priority:**	Low
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Purpose of Report

The purpose of this paper is for you to receive an update from Stuart McNaughton, Chief Scientific Education Advisor, on the progress and status of following items:

- Building Youth Resilience Through Critical Thinking and Digital Citizenship Skills
- Digital Literacy
- Education Research Evaluation and Research and Development Strategy
- Other areas of advice: Youth Health and Wellbeing as well as evaluation, comments and other programme development

Summary

The Chief Scientific Education Advisor, via the Ministry of Education,provides you with regular updates from his work programme, outlining progress, risks and recommendations.

Proactive Release

a **agree** that the Ministry of Education release this briefing in full once it has been considered by you.

Agree / Disagree.

Tom Dibley
National Director
Te Pae Aronui

09/09/2022

Hon Jan Tinetti
Associate Minister of Education

18__/09__/_2022___

Background

1. You receive regular updates from our Chief Scientific Education Advisor, Stuart McNaughton, on his portfolio projects.

2. The updates inform you of the current status and progress made, as well as stakeholder engagements, and highlight risks and opportunities within the Education research area.

3. The paragraphs below provide you Stuart's updates on the following items:
   a) Building Youth Resilience Through Critical Thinking and Digital Citizenship Skills
   b) Digital Literacy
   c) Education Research, Evaluation and Development Strategy
   d) Youth Health and Wellbeing
   e) Evaluation, comments and programme development

Building Youth Resilience Through Critical Thinking and Digital Citizenship Skills

Background

4. Professor Juliet Gerrard, Associate Professor Melinda Webber and I, along with the Office of the Prime Minister's Chief Science Advisor (OPMCSA) are starting a project 'Building youth resilience through critical thinking and digital citizenship skills. The draft Terms of Reference[1] is attached (Annex 1).

5. The draft has been sent out to national and international experts for review and feedback, and the forum of Chief Science Advisors will have input. The focus is very specific to an educational response and how best to prevent harm and intervene to optimise resilience and citizenship skills.

Stakeholder Engagement

6. Note that there is cross-agency work going on in this area, and the OPMCSA project will be reviewing the different work streams and connections. This includes the National Security Communications group (DPMC) and the Media Freedom Committee (MFC). I am meeting with the MFC on 14 September to advise on the project and our approach.

7. Another connection is with the Department of Internal Affairs who is doing work on preventing radicalisation and reducing the harm caused by violent extremist content. Part of the department's Digital Safety mandate involves keeping New Zealanders safe from online harm by responding to and preventing the spread of objectionable material that promotes or encourages violent extremism. DIA is currently in the process of establishing their prevention work. I am meeting with the senior lead advisor on this work to provide a briefing (9 September)

Digital Literacy

Background

8. As noted in my previous briefing ([1258181 refers], 3 May 2021), a paper was prepared on Digital Literacy and subsequently formed one of the commissioned research papers

[1] https://cpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/f/688/files/2022/08/Terms-of-Reference-Youth-digital-citizenship-final-300622.pdf

supporting the Literacy & Communication and Maths Strategy[2] (Annex 2). The paper notes the risks of two digital divides, and a related concern about advice and guidance to whānau.

The Digital Divides

9. The first digital divide, differential access to digital tools, connectivity and other infrastructure, is still an issue in Aotearoa New Zealand. This issue has been highlighted in the evaluation of the Ministry of Education's response to the Covid lockdowns. While the provision of connectivity and devices was very impressive in international terms, there remains a shortfall for some communities and whānau. The impending cessation of funding to support existing connectivity heightens that risk.[3]

10. There are known positive impacts on school success for students from low SES communities and Māori and Pasifika whānau arising from ubiquitous access at school and at home. The impacts are in the context of well-designed digital pedagogy and other enablers, such as strong evidence-based research and development (illustrated by the Manaiakalani intervention[4]).

Manaiakalani Intervention

11. The Manaiakalani example provides evidence for how to counteract a potential second 'digital divide', reported internationally and also in Aotearoa New Zealand. This can occur where there are less complex and less educationally relevant usage patterns by students from poorer and less privileged communities.

12. The Provision of Internet Connectivity and Devices to Learners | Evaluation Report, provides evidence that the Covid provisioning was successful in maintaining educational outcomes for those whānau and ākonga who were provided with resources, indicating that in general, schools provided appropriate distance teaching and learning conditions. But the evidence and ongoing modelling by the MOE of 'learning loss' also indicates variability in outcomes and that existing disparities in achievement patterns remained unchanged.

13. The ubiquity of digital use raises the question of the role of whānau in supporting valued outcomes at schools through digital use at home, and children's resilience.

14. There is some evidence about what strategies parents use locally with their children[5], and we know that the strategy of restricting access to the internet and devices is not seen as helpful by a majority of adolescents who have been surveyed.[6] But there is an urgent need for evidence to help develop evidence-based guidance to schools and whānau about how best support tamariki at home.

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[2] Digital-Literacy-a-review.pdf (education.govt.nz)

[3] Provision of Internet Connectivity and Devices to Learners | Evaluation Report https://www.educationcounts.govt.nz/__data/assets/pdf_file/0007/214468/Full-Report-Evaluation-of-Provision-of-Connectivity-and-Devices-A-Covid-19-Response.pdf (Appendix E Lessons Learned).

[4] https://www.manaiakalani.org/

[5] McNaughton et. al. (2021). In school and out of school digital use and the development of children's self-regulation and social skills. *British Journal of Educational Psychology*. DOI:10.1111/bjep.1244; McNaughton et. al. (in press) Parenting beliefs and strategies for children's self-regulation and social skills and internet use. Chapter in Li, J (ed.).

[6] Netsafe (2017) New Zealand teens' digital profile: A factsheet

Education Research, Evaluation and Development Strategy

Background

15. The Minister was briefed at a strategy session (10 August 2022). At that session an update was provided of progress and next steps. Ministers generally endorsed the approach and gave four key action points. These are as follows:

    - Provide a more precise identification of the evidence gaps to prioritise, particularly those that are unique to the needs of New Zealand, taking an equity lens. Add organisational leadership and culture to the list.

    - Take a more tactical approach to current Budget round in terms of employing and improving our evidence-base for major system changes, building in evaluation, and making bids for new research investment.

    - Advise on translating the work other jurisdictions are doing to ensure research is informing practice, for the New Zealand context. Advice to include options for promoting an understanding of the profession as researchers, and improving evaluation of teaching practice, with a targeted approach to what we ask teachers to upskill on.

    - Advise on opportunities for conversation on consistent measurement of progress and achievement, within the research and evaluation space.

16. The strategy has parallels with the MBIE Green paper on the Research, Science and Innovation (Te Ara Paerangi - Future Pathways). I have previously provided the Minister with my individual submission (Annex 3), but there is opportunity to further discuss the connections between our strategy and the green paper process. A major concern in the submission is the relatively low levels of funding for ERED, and the need to raise the status and impact of educational research and science.

17. I noted in my previous briefing, the need to build capability. Mechanisms include pathways for early career academics and senior students through internships and other levers. Strong targeting of these mechanisms for Māori and Pasifika students is key to developing the research base for meeting our equity objectives. Currently, we are supporting an internship application for an early career academic as an intern in the OPMCSA engaging in research and policy work on how to raise achievement in science from Year 4 to Year 8.

Other Areas of Advice

Youth Health and Wellbeing

Advice to the Cross-Agency Group of implications of the What About Me:National Health Youth and Well-being Survey (successor to the Youth 2000 survey)[7]

18. Much of the 2021 data confirm existing evidence and policy directions, such as the Building Youth Resilience through Critical Thinking and Digital Citizenship Skills project. For example, 30% of respondents don't feel safe online from (e.g.,) bullying, harmful

[7] Survey of 7,209 of Aotearoa New Zealand's young people in years 9 to 13 in school settings between June and November 2021. An additional 502 young people completed surveys in community settings (for example, alternative education and community organisations that support young people).

material online; with female young people more worried about their social media use and feeling less safe. Rainbow and disabled young people also feel less safe online.

19. While overall ratings for the importance of social media is high; at the same time worry about usage is high. These patterns underline the need to capitalise on what internet use affords for positive skills, as well as needing to develop the resilience strategies.

Evaluation, comments and programme development
Advice both within MOE and with other agencies includes:

- Evaluation of the Literacy and Numeracy standards pilot;
- Evaluation of the ENGAGE intervention roll out (self-regulation intervention in early childhood) space and advice on the larger Kia Tīmata Pai Study which adds the ENRICH and ENRICH+ interventions (oral language and literacy from 15 months).
- Comments on School-based mental health provisions (Cross-party Mental Health & Addiction Wellbeing Group);
- Comments on Impacts of Covid on mental health;
- Comments on Child and Youth Wellbeing Strategy Review: Proposed priority focus areas and key enablers (DPMC);
- Options for addressing the impact of COVID-19 on learning in schools;
- Consultation on the Ministry for the Environment's draft Long-term Insights Briefing 2022;
- Evaluation of the Curriculum Refresh process and outcomes;
- Comments on School EQI evaluation.

Next Steps

20. You will receive further updates as the work progresses.

Annexes

Annex 1: Building Youth Resilience Through Critical Thinking and Digital Citizenship Skills: Terms of Reference

Annex 2: Digital Literacy: Literacy & Communication and Maths Strategy

Annex 3: Education Research Evaluation and Research Development Strategy: Te Ara Paerangi – Future Pathways, individual submission

Office of the Prime Minister's Chief Science Advisor
Kaitohutohu Mātanga Pūtaiao Matua ki te Pirimia

Terms of Reference

Building youth resilience through critical thinking and digital citizenship skills

(working title; consider te ao Māori framing)

Background

Access and susceptibility to online information which is false, ranging from being misleading to being harmful and hateful[1], are rapidly growing global challenges. The increase in use of the internet and social media by our children and young people poses a significant risk for Aotearoa New Zealand. The threats include the undermining of social cohesion, well-being and a well-informed citizenry. The threat is very real. The Disinformation Project has been monitoring this growth, and their recent report shows how the February-March 2022 parliamentary protest was projected on social media which seeded and spread the false and harmful information that underpinned the events that took place.[2] But importantly, the tools and the communities afforded by the internet and social media also can provide the means to increase citizenship skills.

This general area was addressed by Sir Peter Gluckman in 2018, who released a report prepared by the Chief Science Advisors (CSAs) for Education, Health, Justice and MSD[3] which foreshadowed many of the issues we see today. The CSA for the Ministry of Education, Professor Stuart McNaughton, has continued this work and recently highlighted the central role of education in mitigating the risks and increasing the positive skills, by promoting critical thinking and critical literacies.[4] A working paper by him and other members of the Science Advisors Forum[5] proposed a multi-pronged approach to reducing the threat, including legislative and regulatory approaches. This project will build on these reports.

[1] False and harmful information includes: misinformation (use of false information that people didn't create, but without the intention to hurt others); disinformation (false information created with the intention of harming a person, group, or organization, or even a country), and mal-information (true information used with ill intent). Wardle, C. & Derakhshan, H. (2018). https://rm.coe.int/information-disorder-toward-an-interdisciplinary-framework-for-researc/168076277c

[2] Hannah, K., Hattotuwa, S. & Taylor, K. The murmuration of information disorders: Aotearoa New Zealand's mis- and disinformation ecologies and the Parliament Protest. (2022). https://thedisinfoproject.org/wp-content/uploads/2022/05/The-murmuration-of-information-disorders-May-2022-Report-SHORT-VERSION.pdf

[3] Gluckman et al., 2018: A Commentary of Digital Futures and Education, Office of the PM's Chief Science Advisor.

[4] Stuart McNaughton, (2022). Digital-Literacy-a-review.pdf (education.govt.nz)

[5] Stuart McNaughton (Chief Science Advisor, Ministry of Education), John Roche (Chief Science Advisor, Ministry for Primary Industries), Hema Sridha (Chief Science Advisor, Ministry for Defence), and Jessica Berentson-Shaw (The Workshop). (2022) Dealing with mis information in the digital age: Prevention and intervention for Aotearoa New Zealand. (Link to follow)

Core to a preventive and long-term solution is an educational focus across the life course and at each level of provision, from classroom instruction through to the national curriculum. A similar national approach was adopted by Finland in 2016, when they added information literacy and strong critical thinking to the national school curriculum, at all year levels. This and other approaches overseas will be assessed as part of an evidence base to build resilience in our youth.

Aim of project

This project seeks to provide a localised and detailed evidence synthesis of how to support children and young people in Aotearoa to:

a) be more resilient to online manipulation and harassment, including conspiracy theories; and

b) increase their digital citizenship skills and understand how to use the internet to interact positively with others.

It will support the specific objectives of an education system approach to:

- reduce young people's susceptibility to inappropriate and dangerous online messaging through increased levels of critical thinking and literacy skills
- develop digital citizenship skills (including self-regulation and social and emotional skills) for using the internet and especially social media
- reduce misuses of the internet and social media
- provide interventions which reduce the harmful and hurtful effects of online messaging
- develop system level changes in response to the Royal Commission of Inquiry into the terrorist attack on Christchurch masjidain findings that education has a significant role to play in prevention of such events.[6]

It will draw on the international and national evidence base, with particular attention given to Māori researchers and practitioners who bring a strengths-based approach to foster resilience in tamariki.

Draft scope

If this project is of interest to the PM, the scope, objectives, workstreams and authors for the project will be finalised in conjunction with experts in Te Ao Māori and Mātaraunga Māori perspectives, such as the Mātuaranga Iwi Leaders Group with the Ministry of Education/Te Tāhuhu o te Mātauranga. This expertise will be essential for developing appropriate advice for educational provisions in Māori medium education. We will also seek Pacific perspectives.

Summary of workstreams

1. **Context:** This workstream will analyse the global and local context and explain the approach taken for the report. It will also provide definition of key terms such as forms of harmful and hateful information, 'resilience' and digital citizenship skills. It will describe how the social and emotional skills and those of critical thinking and literacy are complementary and are needed to develop digital citizenship and resilience.

[6] The relevant chapter from the Royal Commission is here: https://christchurchattack.royalcommission.nz/the-report/findings-and-recommendations/chapter-5/ Recommendation 36 is: Invest in opportunities for young New Zealanders to learn about their role, rights and responsibilities and on the value of ethnic and religious diversity, inclusivity, conflict resolution, civic literacy and self-regulation

2. **Curriculum and instructional changes:** This workstream will outline how changes currently underway by the Ministry of Education/Te Tāhuhu o te Mātauranga, including the 'curriculum refresh' process and development of the 'Common Practice Model' for instruction are able to support the objectives and what changes or new directions might be needed.
3. **School programmes and interventions:** This workstream will describe what school-wide programmes and interventions currently provided by the Ministry of Education/Te Tāhuhu o te Mātauranga, may directly or indirectly contribute to the objectives.[7] It will review the evidence for how these might be best used, or what new approaches are required in the context of international evidence. It will also examine workforce familiarity with tools and approaches. Are teachers using aware of the skills and tools they need, and are they using them?
4. **National uptake, coherence and consistency:** One of the major challenges to address is how to guarantee consistent and equitable implementation, with local adaptation where necessary. This workstream will examine the challenges of scaling successful policies and reducing inequities.
5. **Engagement with parents and whānau**: The current generation of parents is the first to have to consider how best to develop these new forms of resilience. This work stream will examine examples of best practise for how parents and whānau and schools can work together to optimise the objectives.

Process

- Scope, objectives and workstreams and authorship finalised in collaboration with a diverse group of experts.
- Co-authors to draft the report with support from the OPMCSA and peer review from a wide reference group of experts and stakeholders.
- The report will be delivered to the Prime Minister and Ministry of Education and later it will be made public on the PMCSA website.

Timeline

- Pre-election with specific timing TBD, commensurate with the size and ambition of the project.

[7] No one current programme has the full school wide focus for the resilience and include PB4L, NetSafe, and Mana Ake.

Digital Literacy: a review

Professor Stuart McNaughton

Chief Education Scientific Advisor

Introduction

This review paper is divided into three sections. The first deals with definitional issues. In the second, the two major areas of skills and knowledge introduced in the definitions are examined in greater detail more. The areas that are substantially different from well-known areas of literacy are given greater attention, notably: the role of creativity through Digital Learning Objects; the critical literacy needed in digital environments; forms of collaborative reasoning with digital texts; and the role of digital games. This section also contains evidence about the instructional conditions which are required to capitalise on the affordances of digital tools. There follows a section noting some risks associated with educational provisions for digital literacy and what will be required to mitigate them. Appendix One provides a note on evidence related to screen time.

There are issues and areas that are not dealt with in this paper. These include how to protect students from the risks of online access, through regulatory, legislative and infrastructure means, such as the role of Network for Learning (N4L). In addition, the issues of data sovereignty and privacy are not addressed. The closely related area of computational thinking or programming, important components of the technology curriculum or in science and mathematics is not covered here.

Digital literacy defined

Digital literacy is an umbrella term for a variety of competences and skills ranging from more operational and technical to those that are more complex forms of critical thinking and purpose driven analysis.[1] Two major sets of skills can be distinguished. These are: (a) foundational skills for reading, writing and producing effectively and creatively using the tools; and (b) citizenship skills or competencies needed for being a responsible and critically engaged digital citizen.

1. *Digital literacy as new foundational skills*. Across jurisdictions these are identified as the skills of basic computing capability (eg knowing how to use a search engine); digital problem solving (e.g., navigation using various and multiple sources to meet goals); information literacy (e.g., locating and evaluating information effectively); media literacy (creating, designing and producing digital products) and data literacy (deriving meaningful data from

[1] UNICEF (2019). Digital Literacy for children: exploring definitions and frameworks. United Nations Children's Fund (UNICEF), August 2019.

sources).[2] They are the operational skills to use the Internet and other computer and digital equipment to search, find and understand information on the Internet and for creative skills to create and share quality content online.

2. *Critical Literacy for digital citizenship*. These are the skills and competencies for being able to think critically and reason effectively online, for being resilient with mis-, dis-, and mal-information, and being able to use the affordances of tools including social media for collective as well as personal wellbeing. These are universally needed in the sense of being fundamental to citizenship and guaranteed basic levels are required for all young people leaving secondary schooling. They are built from the foundational skills, but not necessarily in a sequential fashion, and are distinct from these foundational skills. Resilience has the generally accepted meaning of the capability to adapt positively and resourcefully to changing contexts and disturbances.[3] It is applied here to mean that capability within the specific context of digital texts in digital contexts, including social media. Citizenship in digital worlds is taken to mean, engagement in local and global communities, with knowledge, critical reasoning, understanding, compassion, responsibility.

Digital literacy: new and emergent aspects

Clearly, the concept of digital literacy ha considerable overlap with well-established areas of literacy, notably informational literacy and critical literacy in English and other learning areas in *The New Zealand Curriculum* (*NZC*) and Te Marautanga o Aotearoa (TMOA). In part, the areas of digital literacy represent another medium in which these skills and knowledge, already recognised in NZC and TMOA, need to be applied. But in three respects digital literacy may represent different or new and emergent aspects of these skills and knowledge, and in these respects need to be considered separately or in addition to those already recognised and easily applied to the new contexts.

1) **New or adapted skills and knowledge.**

These differences are firstly in what extra, enhanced or adapted skills are required by the textual conditions of greatly increased accessibility to texts and online communities created by digital

[2] Burns, T. and F. Gottschalk (eds.) (2019), *Educating 21st Century Children: Emotional Well-being in the Digital Age*, Educational Research and Innovation, OECD Publishing, Paris, https://doi.org/10.1787/b7f33425-en.; Vanek, J. (2019). Issue Brief: Teaching skills that matter –Digital Literacy. US Department of Education. https://lincs.ed.gov/sites/default/files/TSTMDigitalLiteracyBrief-508.pdf

[3] The Treasury Living Standards and well-being frameworks refer to resilience generally as: capability to adapt positively and resourcefully to changing contexts and disturbances (e.g., https://www.treasury.govt.nz/publications/dp/dp-18-05-html)

contexts. Digital media (including social media) provide increasingly immediate and direct access to networks, commentary, information, and ideas, with a consequent amplification of contacts, social influence, and the shaping of ideas and beliefs.

There are potential benefits of greater connectedness, notably an increasingly well informed and critically aware citizenry, with amplified social cohesion. Social media can enhance access to valuable support networks, providing positive effects for those with health needs and fostering social inclusion and community membership for marginalised or excluded groups, such as LGBTI youth.[4] The significance of not being connected is illustrated by the relationship between usage and mental and physical health outcomes which, for adolescents, is not linear. Negative outcomes have been found at both extremes of low/no Internet usage and heavy usage (>2 hours/day).[5]

There are, however, risks to citizenship which come from how opinions can be manipulated with the rapid and extensive access to information and with the use of smart social-media platforms. Self-perpetuating and reinforcing systems of knowledge can be created whereby misinformation, inaccuracies or untruths are taken as truths through the repetition and support within the network.[6] The potential consequence is the uncritical adoption of positions on political and other issues, and uninformed resistance to alternative views. Susceptibility (or not being resilient) reflects basic predispositions; the need to understand the world, to feel safe, and to belong and feel good about oneself and social group.[7] In addition, we are, to varying degrees, all predisposed to making (warranted and unwarranted) associations between events and identifying patterns; confirmation bias (seeking out evidence that aligns with our pre-existing views); disconfirmation bias (actively dismissing or finding counterarguments for contradictory information); evaluating arguments like our own as stronger and more accurate than counter arguments; making meaning through narratives; and belonging to an in- group or community.[8]

The instructional implication drawn below is that facilitated or 'augmented' exposure to different viewpoints is very important. This means, for example, teaching skills of argumentation and the

[4] Reid Chassiakos Y, Radesky J, Christakis D, et al., AAP COUNCIL ON COMMUNICATIONS AND MEDIA. Children and Adolescents and Digital Media. *Pediatrics.* 2016;138(5): e20162593

[5] Bélanger,R. E., Akre, C., Berchtold, A. & Pierre-André Michaud, P-A. (2011). A U-Shaped Association Between Intensity of Internet Use and Adolescent Health www.pediatrics.org/cgi/doi/10.1542/peds.2010-1235 doi:10.1542/peds.2010-1235.

[6] Supovitz, J., Daly, A.J., del Fresno, M., & Kolouch, C. (2017). *#commoncore Project.* Retrieved from http://www.hashtagcommoncore.com

[7] Cichoka, A. (2020). To counter conspiracy theories, boost well-being. *Nature* 587, 177 (2020) doi: https://doi.org/10.1038/d41586-020-03130-6

[8] Kahneman, D. (2011). *Thinking fast and slow*. London: Penguin Books; Mair, D., Smillie, L., La Placa, G., Schwendiger, F., Rakkovaska, M., Pasztor, Z., van Bavel, R.. (2019).op. cit.

capabilities for engaging in dialogic or collaborative reasoning with and through digital texts, where active, empathetic, and respectful understanding of others' perspectives together with criticality are central.

An example of how the digital environment can exacerbate risks, is computational propaganda: algorithms, automation, and human curation designed to purposefully distribute misleading information over social-media networks.[9] Use of this tool is increasingly influencing popular decision making, including in democratic elections. Judgments about health matters and complex science issues are increasingly susceptible to these influences. Prevalence and impact on individuals appear to be particularly high in social platforms, rather than in digital forms of traditional media.[10]

2) **New or adapted strategies.**

The second area is the likely qualitative differences in the literacy strategies required when reading and writing online. As noted below, current evidence is that children and adolescents have higher levels of comprehension when reading print compared with reading on a screen. However, the effects are small and noticeable only on information (expository) texts and not when reading narrative (story) texts.[11] This suggests there isn't an essential advantage to print (or weakness to screen use), rather new or adapted strategies for comprehension may be needed for reading certain types of texts on screen.

3) New or adapted instructional approaches.

The third area is the possible differences, both quantitative and qualitative, required of instructional conditions. While this review is not primarily about instruction, this feature of instructional fit with the affordances needs to be part of the defining features of digital literacy. For example, a way of thinking about the teacher's role with digital tools is that the tools such as games or digital platforms for topic work require teacher *augmentation* (e.g., in preparation and follow up) in order to capitalise on the affordances.[12]

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[9] Woolley, S. C. & Philip N. Howard, P. N. (2017). Computational Propaganda Worldwide: Executive Summary. In Samuel Woolley and Philip N. Howard, Eds. Working Paper 2017.11. Oxford, UK: Project on Computational Propaganda. comprop.oii.ox.ac.uk. 14 pp. http://comprop.oii.ox.ac.uk/wp-content/uploads/sites/89/2017/06/Casestudies-ExecutiveSummary.pdf

[10] Nyhan, D. (2014). Americans don't live in information cocoons. *New York Times*. October 24, 2014; Slatterly, J. G. (2014). The information cocoon. *The Harvard Crimson*. March 5, 2014Tett

[11] Clinton, V. (2019). Reading from paper compared to screens: A systematic review and metaanalysis *Journal of Research in Reading*, Volume 42, Issue 2, 2019, pp 288–325. DOI:10.1111/1467-9817.12269

[12] McNaughton, S., Rosedale, N., Jesson, R. N., Rashina Hoda, R., & Teng, L. S. (2018). How digital environments in schools might be used to boost social skills: Developing a conditional augmentation hypothesis. *Computers & Education,* 126 (2018) 311–323.

Specific areas of skills and knowledge

1) Foundational skills in digital literacy: general comment

Foundational skills in digital reading contribute to reading comprehension online. For example, skills for navigating sources of information online are significantly related to reading performance in 15-year-olds,[13] with a substantial 80 score-point gap identified in the recent Programme for International Student Assessment (PISA) data in achievement between students who actively navigate and those who don't. This is a relative strength in our schools, in that Aotearoa New Zealand had a high proportion of 15-year-olds who actively navigate.

Clearly, continued and expanded attention to these skills is needed, within and across curriculum areas. More than 50% of our students exhibited limited or no navigation skills in the PISA assessment, and there were substantial student background (SES) differences. Because the evidence from PISA and other sources shows that these foundational skills are able to be taught and learned, this is a powerful indication of digital divides in operation in Aotearoa New Zealand.

2) Foundational skills: Creation of Digital Learning Objects (DLOs)[14]

Skills of design and creation are potentially activated more in digital environments. Being a designer and producer is required in learner-created digital learning artefacts, such as mash-up and remix designs and other multi-modal creations. Skills include choosing combinations of tools for creative acts and to influence others in a virtual world. An example[15] comes from Digital Story Telling (DST) which involves collaborative design and production of media-based digital stories, resulting in blog posts and audience response. In one experimental study DST was associated with increased effects on measures of engagement, critical thinking and academic performance in high school students in English Language Arts classes, and they had higher ratings and espoused stronger beliefs relating to self-efficacy.

[13] OECD (2021), *21st-Century Readers: Developing Literacy Skills in a Digital World*, PISA, OECD Publishing, Paris, *https://doi.org/10.1787/a83d84cb-en*.

[14] DLO: a process wherein students learn as they design for the learning of others (e.g., designing for teaching and knowledge building), and as a reusable digital entity (or object) designed with the affordances of different media modalities (e.g., textual, audio, visual, spatial, kinaesthetic). Rosedale, N. A., Jesson, R. N. & McNaughton, S. (2021). Business as Usual or Digital Mechanisms for Change? What Student DLOs Reveal About Doing Mathematics**.** *International Journal of Mobile and Blended Learning***.** Volume 13 • Issue 2 • April-June 2021

[15] see Rosedale et. al. (2021) op. cit.

This study illustrates the concept of augmentation. The phases in the DST design included the teacher introducing orienting questions, and providing feedback as a member of the class, augmenting the core design activities.

A local study in Year 7 and 8 examined DLO forms (e.g., screencasts) and online platforms such as shared learning blogs in design-for-learning practices in mathematics.[16] In a well-embedded 1:1 programme across several low decile schools with a widely shared pedagogical approach, digital creation practices occurred which increased participation in mathematics discourse, and supported investigative problem solving and community knowledge building. The design for learning features (such as audio explanation, video modelling, annotation and complementing explanations with mathematical figures) necessitated the use of complex mathematical discourse, and modal combinations.

This study published in 2021 from data collected three years earlier was focused on use in mathematics and may illustrate how our instructional focus may vary across curriculum areas or rapidly become out of date in the face of alternative and rapidly developing technologies. Creativity in that study was mainly shown through Google slides and screencasts, enhanced by animation features. Additional tools are available and used in classrooms too such as website design, podcasts and video creation. Currently, it is not known how widespread across our curriculum areas the creative use of the tools might be.

3) Digital Literacy as Critical (or media) literacy.

Critical literacy ('media literacy', 'epistemic vigilance') skills are increasingly recognised as important for resilience (as defined above) and more generally as core citizenship skills. These do not just sum to a predisposition to questioning things or the status quo,[17] but include cognitive skills of 'criticality' (e.g., critical evaluation, reasoned judgements, identifying accuracy and credibility of information).

Critical literacy is a focus in many educational systems and is a core part of international assessments. Many systems aim to promote students' ability to reason effectively, navigate sources of information confidently, and engage critically with the systems of knowledge in content areas. The skills involved are not captured by traditional measures of reading comprehension. Recognising

[16] Rosedale. Et. al. (2021). Op. cit.

[17] Kahne, J. & Bowyer, B. (2018). 'Educating for Democracy in a Partisan Age: Confronting the Challenges of Motivated Reasoning and Misinformation'. *American Educational Research Journal*, February 2017, Vol. 54, No. 1, pp. 3–34 DOI: 10.3102/0002831216679817. Mair, D., Smillie, L., La Placa, G., Schwendinger, F., Raykovska, M., Pasztor Z., van Bavel R. (2019). Understanding our political nature: how to put knowledge and reason at eth heart of political decision-making. EUR 29783 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-08621-5, doi:102760/374191,JRC117161

this, in 2018 PISA increased the focus on these skills when assessing reading comprehension, with items assessing how well students evaluate the credibility of a writer's arguments, recognise an author's point of view or biases, and judge the reliability of sources.[18]

Despite this, students' capabilities to reason effectively, navigate sources of information confidently, and engage critically with the systems of knowledge in content areas, are not taught well, across schooling and even at college level.[19] Access to information online, online communities and social media markedly increase the potential for misinformation, manipulation and prejudice. But educational systems are not good at promoting the critical skills needed.[20] In one study of online civic reasoning, fewer than 10% of advanced college history students could successfully judge whether a website was a reliable source of information by using multiple sources to verify a claim. The International Computer Information Literacy Study (ICILS) 2018 found only 2% of Grade 8 students (Year 9) were able to critique online information.[21]

Capability does depend on content knowledge relevant to the content of texts, but high levels of knowledge are not sufficient; rather, specific skills in critical literacy are necessary.[22] In one study, 15-27-year-olds' judgements of the accuracy of online posts about controversial political issues depended on the alignment of the claim with their prior policy position and to a lesser extent on whether the post included an inaccurate statement. However, although level of political knowledge did not improve judgments of accuracy, levels of media literacy education did.[23]

It is clear these are quite specific skills, malleable but dependent on instructional support to learn and to use, even with adults. A recent test showed that a 'behavioural nudge' to adults to consider the accuracy of information resulted in increased discernment of truthfulness and intention to share misinformation.[24] The PISA (2018) data on 21st century skills shows that the opportunity for 15 year old students to learn in school how to detect whether information is subjective or biased is closely

[18] www.oecd.org/pisa/test

[19] McGrew, S., Ortega, T., Breakstone, J. & Wineburg. S. (2017). The Challenge that's bigger than fake news. Civic reasoning in a social reasoning environment. *American Educator* Fall 2017. 4-9; Fraillon, J., Ainley, J., Shulz, W., Friedman, T. & Duckworth, D. (2018). Preparing for life in a digital world: IEA International Computer and Information Literacy Study 2018 International Report.

[20] National Literacy Trust (2018). Fake news and critical literacy. The final report of the Commission on Fake News and the Teaching of Critical Literacy in Schools; McGrew, S., Ortega, T., Breakstone, J. & Wineburg. S. (2017). The Challenge that's bigger than fake news. Civic reasoning in a social reasoning environment. *American Educator* Fall 2017. 4-9.

[21] Fraillon, J., Ainley, J., Shulz, W., Friedman, T. & Duckworth, D. (2018). op.cit.

[22] Fraillon, J., Ainley, J., Shulz, W., Friedman, T. & Duckworth, D. (2018). op. cit.

[23] Kahne, J. & Bowyer, B. (2018). op. cit.

[24] Gordon Pennycook, Jonathon McPhetres, Yunhao Zhang, Jackson G. Lu, and David G. Rand. (2020). Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. Psychological Science, 2020, Vol. 31(7) 770–780

linked to the capacity to distinguish facts from opinions across OECD countries, and remains strong when controlling for reading achievement.[25]

While quite distinct, the skills nevertheless contribute to wider expertise in reading. Students who are more aware of effective strategies for assessing the credibility of sources also perform better in the PISA reading assessment, including with single and multiple-texts. [26] The differences are large, with students in the top quartile with these strategies scoring 114 points more in reading achievement than students in the bottom quartile.

A particular strength in teaching on which Aotearoa New Zealand could build is the focus on critical literacy in subject English classes. Up to 80% of our 15-year-old students report learning about aspects such as the consequences of making information public online; judging whether to trust information from the internet; or comparing different webpages and deciding the relevance of information.[27] In addition, the recent analysis of the PISA reading results, which examined critical literacy, found that 61% of these students were correct when asked to distinguish fact from fiction (one item only). This was higher than the international average (47%) and similar to Canada, Australia and the United Kingdom.

However, this overall strength contrasts with observations of a low focus in critical literacy teaching in primary schools.[28] Given that the PISA data indicate that our 15-year-olds in English classes are relatively strong in these skills, this may indicate a lack of specialist knowledge in curriculum areas to teach these skills in primary schools. This is supported by local studies in low decile schools which show well-designed digital tools, augmented with teacher instruction, can help build higher order critical literacy.[29] Playing a digital game designed to increase vocabulary and critical literacy was associated with increased accuracy of judgments about the bias sources and evidence. These studies

[25] OECD (2021), *21st-Century Readers: Developing Literacy Skills in a Digital World*, PISA, OECD Publishing, Paris, *https://doi.org/10.1787/a83d84cb-en*

[26] OECD (2021), *21st-Century Readers: Developing Literacy Skills in a Digital World*, PISA, OECD Publishing, Paris, *https://doi.org/10.1787/a83d84cb-en*

[27] educationcounts.govt.nz/publications/series/PISA/pisa-2018

[28] Jesson, R., McNaughton, S., Rosedale, N., Zhu, T. & Cockle, V. (2018). A mixed-methods study to identify effective practices in the teaching of writing in a digital learning environment in low income schools. *Computers and Education*, 119 (April), 14-30; McNaughton, S, Zhu, T, Rosedale, N., Oldehaver, J, Jesson, R., & Greenleaf, C. (2019). Critical perspective taking: Promoting and assessing online written argumentation for dialogic focus. *Studia Paedagogica* (special issue: Better Learning through Argumentation). 24(4). 119-141.

[29] McNaughton, S, Zhu, T, Rosedale, N., Oldehaver, J, Jesson, R., & Greenleaf, C. (2019). Critical perspective taking: Promoting and assessing online written argumentation for dialogic focus. *Studia Paedagogica* (special issue: Better Learning through Argumentation). 24(4), 119-141; Rosedale, N., McNaughton, S., Jesson, R, Zhu, T. & Oldehaver, J. (2019) Online written argumentation: Internal dialogic features and classroom instruction. Chapter 15 (pp. 263-278). In Emmanuel Manalo (Ed.), *Deeper learning, dialogic Learning, and critical thinking: Research-based strategies for the classroom.* Oxfordshire, England: Routledge.

are consistent with the wider literature which shows that the impact of games can be more consistent and greater with teacher augmentation.

The PISA data on digital literacy show major equity issues in all the analyses. For example, Aotearoa New Zealand had one of the largest difference between high SES ('advantaged') and low SES ('disadvantaged') students in perception of difficulty of the PISA 2018 assessments, , and this remained even when controlling for reading achievement. But importantly, aspects of students' self-efficacy and strategies explained about 12 times more variance than students' socio-economic status. This means that a major part of the variation due to SES is attributable to what can be learned about literacy in general and digital literacy in particular.

Less is known about critical literacy in science, maths, health and physical education, history and the other learning areas compared with English (ELA). The *NZ Curriculum* refers to developing critical and creative thinkers, and, in each learning area, there is reference to students being critical, but there is no elaboration in terms of the critical (digital) literacy skills described above.

We know a lot about how to promote these skills. Effective approaches need to guarantee transfer from classroom to everyday use with information sources. Currently, the consensus is that a 'mixed' approach involving explicit instruction in thinking critically embedded in major subjects, coupled with some dedicated course work focused on the critical literacy (media literacy) skills, such as in civics or philosophy courses, likely works best for transfer.[30] In addition to embedded and deliberate forms of instruction, communities of practice at a classroom and school level, which feature caring teacher and student relationships, clear norms, expectations and practices, create effective conditions for the acquisition of these skills.[31]

In Aotearoa New Zealand there are enablers including the relatively open curriculum, and generally high levels of reading literacy, which create conditions for innovation and impact. However, evidence reviewed above from several countries indicates educational systems are not good at promoting these skills and this includes evidence from local innovative digital interventions.

[30] Shane Horn & Koen Veermans (2019). Critical thinking efficacy and transfer skills defend against 'fake news' at an international school in Finland. *Journal of Research in International Education*. 2019, Vol. 18(1) 23–41.
[31] Abrami, P.C., Bernard, R.M., Borokhovski, E., Waddington, D. I., Wadwe, C. A., & Persson, T. (2015). Strategies for teaching students to think critically: A meta–analysis. *Review of Educational Research*, *85*(2), 275-314. https://doi.org/10.3102/0034654314551063. Goldman, S. R., Braasch, J. L. G., Wiley, J., Graesser, A. C. & Brodowinska, K. (2011). 'Comprehending and learning from Internet sources: Processing patterns of better and poorer learners'. *Reading Research Quarterly* 47(4), 356-381. Reznitskaya, A., Kuo, L. J., Clark, A. M., Miller, B., Jadallah, M., Anderson, R. C., & Nguyen- Jahiel, K. (2009). Collaborative reasoning: A dialogic approach to group discussions. *Cambridge Journal of Education*, *39*(1), 29–48.

There is an emerging technology of serious games that can add value to our promotion, although most games have focused on knowledge acquisition.[32] Early examples of games for more complex cognitive skills suggest the possibility of effectiveness, given they share the features shown to be effective in well-designed games.[33]

In 2014, Finland launched an anti-fake news campaign that has the hallmarks of a community of practice at a societal level aimed at developing the criticality needed by citizens.[34] It is comprehensive and meant to prepare all citizens for threats in the complex digital world, with a particular focus on being able to identify and counter false information designed to undermine the country's politics. The President called on the country to take responsibility for upskilling and, in 2016, a revision to the critical thinking curriculum foregrounded identifying misinformation.

Other jurisdictions are focusing more on digital skills, but the emphases may vary. Singapore has launched a "Strengthening Digital Literacy" strategy Strengthening Digital Literacy | Committee of Supply 2020 (moe.gov.sg) the purpose of which is to equip students to thrive in a digital society and take on the jobs of the future. It has a strong focus on the foundational skills and those for problem solving and creativity, through a framework of *finding, thinking, applying and creating* with perhaps less of an emphasis on the criticality aspects of digital literacy.

It is as yet not known how successful the Finnish approach has been. As with all prevention and intervention efforts, a research and development approach is needed where strategies, especially at a system level, are accompanied by evaluation and iterative redesign. Developing consistency in the school level (community of practice) and classroom level (augmentation) conditions across our system is likely to be particular challenge that will take several years to establish and it will be critical to know whether strategies for change (such as in the curriculum refresh) are making a difference at a national level. Changes to the curriculum such as those made by Finland are needed. A mandatory focus across learning areas on critical literacy, which is supported by resources, teacher training and

[32] Boyle, E. A., Hainey, T., Connolly, T. M., Gray, G., Earp, J. Ott, M. Pereira, J. (2 016). 'An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games'. *Computers & Education*, 94, 178-192, 2016.

[33] A local example uses these features, such as a highly motivating problem scenario (an imminent asteroid collision threat), and real world solutions for collaborative activity in immersive experiences. The quest element of the game, means players search for information to solve the problem and they have to identify bias in the information they gather, the credibility of sources and whether particular statements can be classed as "facts" or not. Initial testing has shown that the *Astria* educational game with teacher augmentation can support critical thinking, critical literacy, and technical vocabulary skills for both upper primary and lower secondary students (years 7-10). https://developingindigitalworlds.blogs.auckland.ac.nz/astria-countdown-to-impact/.

[34] Shane Horn & Koen Veermans (2019). Critical thinking efficacy and transfer skills defend against 'fake news' at an international school in Finland. *Journal of Research in International Education*. 2019, Vol. 18(1) 23–41.

professional development (PLD), similar to the changes being made for Aotearoa New Zealand Histories, is recommended (see below).

An important note of caution in implementing critical literacy in schools is that teachers are as susceptible as anyone else to motivated reasoning and confirmation bias. A recent study of US social studies teachers showed that their ratings of the credibility of different news sources mirrored their ideological (political) beliefs. However, those teachers that understood 'credibility' in terms of higher level journalistic processes such as fact checking and verification (skills related to critical literacy), were less likely to align their judgment to their own political position.[35] This carries major implications for the preparation of teachers and for PLD provision for digital literacy.

4) Digital Literacy as Collaborative reasoning (argumentation)

A valued expression of literacy is being able to reason effectively, most obviously through writing. Argumentation, or collaborative reasoning, provides a means to make reasoned judgments but has wider significance, including assisting students to conceptualize and filter information, make connections across contexts, enhance their abilities to communicate knowledge and integrate alternative viewpoints.[36] Developing expertise requires perspective taking and aspects of cognitive and emotional empathy. Experimental demonstrations in face-to-face 'communities of learners' show these skills can be used in reading and writing across different subject areas such as science and English Language Arts.[37]

The face-to-face communities demonstrate the significance of deliberately designing activities, and explicitly establishing values, beliefs, norms, knowledge and skills needed, for a functioning community. Studies of collaborative reasoning communities show how peers can learn from each other in the process of arguing and the development of an argument schema (knowledge and skills for formulating a claim, providing relevant reasons, questioning assumptions, and offering counterarguments). Well-designed communities have been associated with a 'snowball' phenomenon through which students' uses of dialogic skills for interacting with peers can ripple

[35] Clark, C. H., Schmeichel M. & Garrett, H. J. (2020). *Educational Researcher*, Vol. 49 No. 4, pp. 262– 272 DOI: 10.3102/0013189X20909823

[36] Kuhn, D. (2005). *Education for thinking*. Harvard University Press; Rapanta, C., Garcia-Mila, M., & Gilabert, S. (2013). What Is meant by argumentative competence? An integrative review of methods of analysis and assessment in education. *Review of Educational Research*, *83*(4), 483-520.

[37] Brown, A. C. (2016). Classroom community and discourse: How argumentation emerges during a Socratic circle. *Dialogic Pedagogy: An International Online Journal*, *4*. Retrieved from http://dpj.pitt.edu/ojs/index.php/dpj1/article/view/160; Rapanta et. al. (2013). op. cit.

across and grow in strength through the community with transfer of the skills, across different activities, most notably to student writing.[38]

An important distinction which is significant for digital literacy is between the skills required for individual argumentative writing and for dialogic argumentation between peers. Developing effective reasoning through dialogue involves internal integration of others' positions, such as counter arguments and taking into account their perspectives ("the framework of alternatives").[39]

This capability to reason effectively can be greatly enhanced through, and may be particularly important for, digital literacy. In online contexts such as forums, blogs and instant messaging , argumentation with dialogic focus is an increasingly important skill when participating in social media and uncensored global communities, and for maintaining well-being and contributing or consuming content, for example about immunisation. The intellectual skills of countering, rebuttal, acknowledging alternative evidence and self-correction are features of an internalised awareness of 'other' ways of knowing and the incomplete nature of personal knowledge.

Evidence is accumulating for the theoretical claims about impacts of argumentation on social and emotional skills under well-designed conditions.[40] Cooperation can be enhanced in a digital version of 'constructive controversy', a cooperative learning procedure involving dialogic argumentation which has the goal of reaching and raising awareness of an integrated position. However, incorporating argumentation with classroom curriculum needs thoughtful planning and presents pedagogical challenges, which include use of multi-modal evidence, and the foundational navigation skills being established.

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[38] Anderson, R. C., Nguyen-Jahiel, K., McNurlen, B., Archodidou, A., Kim, S. Y., Reznitskaya, A., & Gilbert, L. (2001). The snowball phenomenon: Spread of ways of talking and ways of thinking across groups of children. *Cognition and instruction*, *19*(1), 1-46.Reznitskaya, A., Anderson, R. C., McNurlen, B., Nguyen-Jahiel, K., Archodidou, A., & Kim,S. Y. (2001). Influence of oral discussion on written argument. *Discourse Processes, 32*(2–3), 155–175; Reznitskaya, A., Kuo, L. J., Clark, A. M., Miller, B., Jadallah, M., Anderson, R. C., & Nguyen-Jahiel, K. (2009). Collaborative reasoning: A dialogic approach to group discussions. *Cambridge Journal of Education*, *39*(1), 29–48.

[39] Kuhn, D., Hemberger, L., & Khait, V. (2014). *Argue with me: Argument as a path to developing students' thinking and writing*. Bronxville: Wessex Inc.

[40] Saltarelli, A. J., & Roseth, C. J. (2014). Effects of synchronicity and belongingness on face-to-face and computer-mediated constructive controversy. *Journal of Educational Psychology*, *106*(4), 946. http://dx.doi.org/10.1037/a0036898; Howell, E., Butler, T., & Reinking, D. (2017). Integrating multimodal arguments into high school writing instruction. *Journal of Literacy Research*, *49*(2), 181-209. Hutchison, A., & Reinking, D. (2010). A national survey of barriers to integrating information and communication technologies into literacy instruction. In *Fifty-ninth yearbook of the National Reading Conference* (pp. 230-243). Milwaukee, WI: National Reading Conference; Purcell, K., Heaps, A., Buchanan, J., & Friedrich, L. (2013). How teachers are using technology at home and in their classrooms. *Washington, DC: Pew Research Center's Internet & American Life Project*. Retrieved from http://www.looooker.com/wp-content/uploads/2013/05/PIP_TeachersandTechnologywithmethodology_PDF.pdf

As noted, the skills can be developed in non-digital contexts. The recent National Monitoring Study of Student Achievement (NMSSA) analysis of items relating to critical literacy[41] indicated more than 50% of students did not accurately identify the author's point of view (Year 4), or shift perspectives in interpreting texts (Year 8). But crucially almost half could at each level. This suggests even under current conditions we could expect both foundational and basic critical literacy skills to be in place at Year 4. Establishing just when, is both a developmental and a pedagogical question. Tasks require different levels of skills. For example, with the NMSSA item 'Analysing the representation of a film character, and the purpose of this representation', very few Year 4 students could provide a high level answer (5%), but four times as many Year 8 students could, perhaps reflecting again the limited specialist teaching in subject English in primary schools.

Studies of written argumentation show the skills don't typically develop without a deliberate teaching focus (augmentation by teaching and through the design of the tools). Like critical reasoning, adolescents don't typically have the high level skills to move beyond concentrating attention on exposition of their own claims and ignoring other positions. But with pedagogical conditions in place the skills can be improved and various studies show skills improving in studies with middle and upper school years and locally in students as young as nine years old.[42]

However, these studies also show that students tend to argue from their own position and it is difficult learn to critique their own position and empathise with others', either in face-to-face or online interactions. The local studies in low-decile schools show that without curriculum resources (e.g., a digital platform with sets of texts focused on a challenging environment science or social issue) and deliberate instruction, there are generally low levels of the specific argumentation skills.[43] Students mostly still argue for their position, even older students tend to do this and all students find it easier to acknowledge another's position but harder to critique their own or the other's.

[41] INSIGHTS FOR TEACHERS NMSSA English 2019 MULTIMODAL TEXTS AND CRITICAL LITERACY NMSSA Insights for Teachers 3 Multimodal Texts and Critical Literacy (educationcounts.govt.nz)

[42] Crowell, A., & Kuhn, D. (2014). Developing dialogic argumentation skills: A three-year intervention study. *Journal of Cognition and Development*, *15*(2): 363–381; Kuhn, D., & Crowell, A. (2011). Dialogic argumentation as a vehicle for developing young adolescents' thinking. *Psychological Science, 22*, 545–552. doi:10.1177/0956797611402512; McNaughton, S, Zhu, T, Rosedale, N., Oldehaver, J, Jesson, R., & Greenleaf, C. (2019). Critical perspective taking: Promoting and assessing online written argumentation for dialogic focus. *Studia Paedagogica* (special issue: Better Learning through Argumentation). 24(4), 119-141; Rosedale, N., McNaughton, S., Jesson, R, Zhu, T. & Oldehaver, J. (2019) Online written argumentation: Internal dialogic features and classroom instruction. Chapter 15 (pp. 263-278). In Emmanuel Manalo (Ed.), *Deeper learning, dialogic Learning, and critical thinking: Research-based strategies for the classroom.* Oxfordshire, England: Routledge.

[43] McNaughton et. al. (2019) op. cit., Rosedale et. al., (2019) op. cit.

There is limited systematic evidence about collaborative reasoning across content areas in Aotearoa New Zealand. General collaboration skills appear to be well developed and provide a basis for developing in digital literacy. Collaborative problem solving on computers (working with others to solve a problem through shared understanding and group focus) in a game-based format is a strength of our 15-year-olds in international comparisons.[44]

Risks

There are risks with all educational designs, from the instructional moves a teacher makes, through to the curriculum and overarching pedagogical foci in a system.[45] Some are particularly pertinent to implementing a strong focus on digital literacy and three in particular are noteworthy.

1) Inequalities

As with many other educational innovations, there is a risk of differential access, whereby richer or more privileged groups get access to innovation and resources and those less rich and less privileged groups get less, with compounding effects on educational achievement gaps (known as 'Matthew Effects').[46] Between countries, the differences in access to, and use of, computers are associated with national wealth and within countries, they are associated with individual Socio Economic Status (SES).[47]

There is evidence from 2014 for a similar 'digital divide' in New Zealand.[48] Whereas over 90% of schools reported online learning occurring at school, the pattern was markedly different at home, with substantially higher proportions of students in more affluent (higher decile) schools than of students in low-decile schools reporting internet access at home . These differences appear to be exacerbated in Māori medium settings.

This first digital divide is still an issue in Aotearoa New Zealand. Access to broadband, wireless and the infrastructure of digital technology may be becoming more fully national, but the overall costs of access are still high in international terms, internet speeds are relatively low

[44] https://www.educationcounts.govt.nz/ data/assets/pdf_file/0009/183483/PISA-Collaborative- Problem-Solving-Report.pdf
[45] McNaughton, S. (2018). *Instructional Risk in Education. Why instruction can fail.* New York NY: Routledge.
[46] McNaughton, S. (2011). *Designing better schools for culturally and linguistically diverse children: A science of performance model for research.* New York, NY: Routledge.
[47] OECD (2015a), *Students, Computers and Learning: Making the Connection,* PISA, OECD Publishing. *http://dx.doi.org/10.1787/9789264239555-en*
[48] 2020 Communications Trust. *Digital Technologies in New Zealand Schools.* Report 2014.

in international terms, and there are regional and household differences in both access and costs.[49] A 2015 survey indicated age and household income, ethnicity and regional location, remained significant factors in differential internet usage.[50]

In addition, a second 'digital divide', reported internationally and also in Aotearoa New Zealand, can occur whereby there is less complex and less educationally relevant usage patterns by students from poorer and less privileged communities.[51] COVID dramatically exposed both these divides, both internationally and locally. [52]

2) Capability

Changing a curriculum to include the foci indicated here is one thing. Having a capable work force to teach these skills is another. This is not just a matter of qualifications, experience and professional development. As noted, teachers are as susceptible as anyone else to accepting and amplifying mis- dis- and mal-information through motivated reasoning and confirmation bias. The same foundational and critical skills are needed developed through Initial Teacher Education (ITE) and PLD.[53]

3) Whānau – school relationships and parental guidance

The ubiquity of digital use raises the question of the role of families in supporting the areas of development deemed important for children's resilience. The risk here is twofold. One is that existing inequalities may be exacerbated further through digital devices and access adding to the 'capital capital' of some communities. The other is that the developmental potential for children of

[49] https://www.consumer.org.nz/articles/telco-providers#article-survey-results; https://www.cable.co.uk/mediacentre/ release/new-worldwide-broadband-price-league-unveiled/; https://www.nbr.co.nz/sites/default/files/2016- Annual-Telecommunications-Monitoring-Report-May-2017.pdf

[50] http://www.aut.ac.nz/__data/assets/pdf_file/0008/635669/150416-Online-Version-WIPNZ-2015-April-15.pdf

[51] Jesson, R, J., McNaughton, S. & Wilson, A. (2015). Raising literacy levels using digital learning: a design-based approach in New Zealand. *Curriculum Journal* 26, no. 2: 198-223. DOI:10.1080/09585176.2015.1045535.

[52] British Academy (2021), *Shaping the COVID decade: Addressing the long-term societal impacts of COVID-19, The British Academy, London DOI doi.org/10.5871/ doi.org/10.5871/ bac19stf/9780856726590.001;* OECD (2020), *"Education responses to COVID-19: an implementation strategy toolkit", OECD Publishing, Paris, https://doi.org/10.1787/81209b82-en Addressing Rangatahi Education: Challenges after Covid-19.* A partnership report by Ngāti Whātua Ōrākei and Koī Tū. The Centre for Informed Futures. Rangimarie Hunia, Shazeaa Salim, Stuart McNaughton, Rochelle Menzies, Peter Gluckman and Anne Bardsley. July 2020. pp. 1-19.

[53] Clark, C. H., Schmeichel M. & Garrett, H. J. (2020). Social Studies Teacher Perceptions of News Source Credibility. *Educational Researcher*, Vol. 49 No. 4, pp. 262– 272 DOI: 10.3102/0013189X20909823

having the two 'microsystems' (developmental systems in school and at home) linked can be lost if there are weak linkages or conflicting messaging.[54]

Two broad areas of research suggest the importance of families. We know from decades of research, including experimental interventions, that specific practices at home can affect academic learning and achievement as well as social and emotional skills, and ultimately students' achievement. The second area of evidence comes from well-designed home and school collaboration showing that both teachers' knowledge and skills and parents' knowledge and skills, for children's development can be increased.[55]

These largely non-digital research findings suggest that parent guidance at home could support children's learning of digital literacy. In the UK, Ofcom's tracking of media literacy shows that nearly all parents of school aged children mediate their child's use of the internet in some way, either through technical tools, supervision, rules or talking to their child about staying safe. More than a third of parents use all four of these approaches.[56] Oxform also reports that there has been an increase in parents reporting that controlling screen time has become harder. Despite parental concerns about the internet increasing, and that up to a third of children younger than 13 years are using social media, parents are in some cases becoming less likely to moderate their child's activities.

It is not known what strategies parents use in Aotearoa New Zealand, but the strategy of restricting access to the internet and devices is not seen as helpful by a majority of adolescents who have been surveyed. Fewer than half identified parental monitoring as a helpful protective measure.[57] The PISA digital report indicated rapid increase in use of the internet for 15-year-olds, doubling from 2012 to over 40 hours per week. But the bulk of this time is out of school.[58]

Local research in several low decile schools confirm OECD estimates of time spent online after school.[59] Most of the 9-to-12 year old students in that study were online most days and a typical session involved 1.7 hours for schoolwork and 2.7 hours for social or fun activities. The students knew about risks, with 70% of them aware "things could go wrong"; and 55% worried about what

[54] Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by Nature and Design*. Cambridge, MA: Harvard University Press.
[55] Sheridan, S. M., Smith, T. E., Moorman Kim, E., Beretvas, S. N., & Park, S. (2019). A meta-analysis of family-school interventions and children's social-emotional functioning: Moderators and components of efficacy. *Review of Educational Research*, *89*(2), 296-332. https://doi.org/10.3102/0034654318825437
[56] Ofcom (2019) Children and parents: Media use and attitudes report 2018
[57] Netsafe (2017) New Zealand teens' digital profile: A factsheet
[58] OECD (2021), *21st-Century Readers: Developing Literacy Skills in a Digital World*, PISA, OECD Publishing, Paris, *https://doi.org/10.1787/a83d84cb-en*
[59] McNaughton et. al. (2021). In school and out of school digital use and the development of children's self-regulation and social skills. *British Journal of Educational Psychology*. DOI:10.1111/bjep.12447

others post. The students' descriptions of their parents indicated that most (93% of their parents) used the internet. But there was wide variation in parents' knowledge of what their children were engaged in, with 30% of the students reporting their parents never or almost never monitored what they were doing (33% reported always).

Recommendations

1) *Overall:* we need to be much better at promoting both the foundational and critical literacy digital skills; this is a challenge for system excellence and equity aspirations.

2) *Foundational digital literacy skills*: Continued and expanded attention to these skills is needed, within and across curriculum areas and from Year 1. An urgent focus on equity issues is needed to mitigate potential digital divides associated with SES and ethnicity.

3) *Critical Literacy for digital citizenship:* these skills and competencies are universally needed in the sense of being fundamental to citizenship and guaranteed basic levels are required for all young people leaving secondary schooling. Building these skills should be a focus within and across curriculum areas and from Year 1. An urgent focus on equity issues is needed to mitigate potential digital divides associated with SES and ethnicity

4) *The NZC and TMOA curricula:* refer to developing critical and creative thinkers, and, in each learning area, there is reference to students being critical, but there is no elaboration in terms of the critical digital literacy skills. Tighter specification of these is needed across learning areas trough the curriculum refresh process.

5) *Progressions*: Better understanding or how skills develop, expected progressions and the role of teacher guidance (augmentation) is needed. This likely will require both consultative processes as well as new research, development and redesign cycles.

6) *Dealing with issues*: Developing students' understanding of issues such as data sovereignty, privacy, and digital divides should be part of the curriculum and pedagogical focus.

7) *Teacher capability:* to teach these skills, will require changes to ITE and to PLD provisions. Building the capability will require attention to more specialist teaching in primary schools and a coordinated approach across subject areas in secondary schools.

8) *Parent and whānau involvement*. Just as in other area of learning and development, schools' relationships with parents and whānau are important to developing the skills. A deliberate and well-resourced set of guidelines, advice and mechanisms for linking schools with their communities is needed, for mutual and reciprocal understandings.

9) *Instruction general*: Teaching has a central role in developing these skills, and new pedagogical content knowledge (PCK) and instructional designs are needed. Guaranteeing that the skills are well learned in a timely and consistent fashion nationally requires addressing the equity challenges of digital divides as well as capability building needed through ITE and PLD.

10) *High value activities*:
    a. Instructional designs for collaborative reasoning (argumentation) are needed appropriate to different year levels and across learning areas. These will design for 'augmented' exposure to different viewpoints, capabilities for engaging in dialogic or collaborative reasoning with and through digital texts, and the promotion of active, empathetic, respectful understanding of others' perspectives together with criticality.
    b. Specific instructional designs for critical digital literacy, including game-based learning are needed at all year levels and across learning areas. Again, the designs need to incorporate augmentation by teaching and draw on gaming principles that directly augment the target skills.
    c. Creativity through and with digital tools and through DLOs should be a focus across curriculum learning areas.

11) *Enablers*. There is already capability in the system, albeit variable and in pockets. That capability includes non-digital instructional designs that can be adapted to be used for digital settings. The strengths in English teaching and collaborative problem-solving in science have been noted. But even in In Year 1 capabilities already exist, for example, through the activity of shared book reading which can build the perspective-taking and the empathy skills central to collaborative reasoning. The refresh of the curriculum creates an opportunity for tighter specifications and associated specification of progressions. The expectations and teacher

expertise for local curriculum design is both an enabler and a constraint, there will need to be well developed exemplars and resources for local curriculum design.

12) *Constraints*. Constraints have already been noted as risks (such as digital divides) and in existing nationally consistent teacher capability. Currently, apart from the few items in PISA and NMSSA there is little emphasis on the higher order critical literacy skills in our assessments of reading comprehension or writing. The refresh of the curriculum will require repurposing our assessment tools. There is no equivalent assessment tool for formative assessment in these areas in either mathematics or in science. A major constraint is the lack of a research and development programme that will provide the evidence for instructional designs able to be used at scale and for the developmental and pedagogical underpinnings of progressions.

APPENDIX ONE

Screen time at school and outside of school

Access to and time with digital tools, especially social media and the internet, provide both opportunities and risks for the development of digital literacy skills. Quite rightly there has been general public concern about the possible detrimental effects of screen time. The actual risk and the perceptions of risk also will need to be managed. There is an emerging research base around these issues relating to access to, and time on screens. The following is a recent summary of the evidence relating to screen time.

SUMMARY:

1) Apart from the extremes of too little and too much (which we do have evidence for), there is not enough evidence to be definitive about amounts of time and relationships with different aspects of development and learning – we need to: "better understand how, for whom, and under what conditions … interactions with mobile technologies influence their still developing social relationships, brains, and bodies."[60]

2) It is clear that apart from extreme amounts (both too little or too much) it is not the amount of screen time that is important, it is the "context (where, when and how digital media are accessed), content (what is being watched or used), and connections (whether and how relationships are facilitated or impeded)".[61]

3) In order to understand effects, and to provide advice to teachers, parents and whānau types of uses and tools need to distinguished. For example, school-related use of chrome books or laptops or tablets, either online or offline; social media use on smart phones; serious games (those with educational aims) or games for entertainment on smart phones, tablets, laptops or computers.

4) It is also useful to think about the issues in terms of cumulative inside and outside of school usage. The question is about screen time in terms of content and connections accumulated within and outside of school.

'Screen time' in general.

1) Because of the relationships between content, connections and individuals, The *American Academy of Paediatrics* recently lifted its long standing advice to limit amount of **total** non-school related screen time to <1-2 hours daily. But it still suggests discouraging screen media exposure for children <2 years of age.[62] For children younger than 18 months, the advice is to avoid use of screen media other than on line chatting, for children 18 to 24 months of age high-quality programming, which parents and whānau watch together to help them understand what they're seeing; and for children ages 2 to 5 years, limited screen use (eg one hour per day of high-quality programmes) with co-viewing media with children to help them understand what they are seeing and apply it to the world around them.

2) There are extremes of screen time that are clearly problematic when it involves internet uses. The OECD has a cut point at six hours or more per weekday of internet use outside of

[60] George, M. J. & Odgers, C. L. (2015). Seven Fears and the Science of How Mobile Technologies May Be Influencing Adolescents in the Digital Age. *Perspectives on Psychological Science* 2015, Vol. 10(6) 832–851
[61] Blum-Ross, A. and S. Livingstone (2016) Families and screen time: Current advice and emerging research. *Media Policy Brief 17*. London: Media Policy Project, London School of Economics and Political Science.
[62]American Academy of Paediatrics (2016). Media Use in School-Aged Children and Adolescents *Pediatrics*; originally published online October 21, 2016;

school, which is associated with a range of negative features of developmental (increased distraction, loneliness) and learning (eg lower achievement).[63] 28% of Aotearoa New Zealand students reported this level of use (the OECD average is 26%). On average, students spend a little more time per day on the internet outside of school than the OECD average (2 hours and 43 minutes, versus 2 hours and 26 minutes).

3) Reanalysis of the PISA data for New Zealand 15-year-olds shows that not having access to the internet on weekdays after school is associated with lower wellbeing. This positive relationship with wellbeing declines after about two hours.[64]

4) There is evidence that the relationships between usage and outcomes are not linear for adolescents. Relationships with mental and physical health problems have been found at the extremes of both low/no usage or heavy Internet uses (>2 hours/day).[65]

5) There are known relationships between some forms of usage and problems in development. For example, cyber bullying and increased internalising problems such as anxiety and depression, and externalising problems such as aggression and antisocial behaviour, each of which are linked to negative educational outcomes.[66] Other examples include language delay and irritability with younger children from screen time.

6) There are also positive relationships between usage and valued developmental outcomes, including in cognitive development, social skills and well-being. [67]

'Screen time' at school

7) As with screen time in general, apart from extremes, it's not the amount of time spent with digital technologies it's the usage, content and relationships with valued learning objectives.

8) It is useful to think about the benefits and risks of 'screen time' in terms of opportunity costs. There is evidence that a blend of digital engagement with extended face-to-face interactions with teachers is associated with effective learning.[68] This suggests that at the extreme of spending all day in class on digital technology would compromise the interactions and mediation provided by teachers.

9) We know that access to and use of digital technologies in classrooms alone are not sufficient to impact consistently on learning and achievement. The teacher adds value through designing and managing usage to better personalise, match digital activities with current levels and background, and extend and generalise learning through the sequencing and

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[63] PISA 2015 Student Well-being Report

[64] Grimes, A, & White, D. (2019). Digital Inclusion and wellbeing in New Zealand. Motu Working Paper 19-17 Motu Economic and Public Policy Research A report to Department of Internal Affairs. October 2019

[65] Richard E. Bélanger,R. E., Akre, C., Berchtold, A. & Pierre-André Michaud, P-A. (2011). A U-Shaped Association Between Intensity of Internet Use and Adolescent Health www.pediatrics.org/cgi/doi/10.1542/peds.2010-1235 doi:10.1542/peds.2010-1235.

[66] Gardella, J. H., Fisher, B. W. & Teurbe-Tolon, A. R. (2017). A Systematic Review and Meta-Analysis of Cyber-Victimization and Educational Outcomes for Adolescents. *Review of Educational Research* Vol. 87, No. 2, pp. 283–308 DOI: 10.3102/0034654316689136

[67] George, & Odgers, (2015). Op. cit. American Academy of Paediatrics (2016). Op.cit.

[68] Jesson, R., McNaughton, S., Rosedale, N., Zhu T. & Cockle, J. (2018). 'A mixed-methods study to identify effective practices in the teaching of writing in a digital learning environment in low income schools'. *Computers in Education*, 119, 14-30. doi.org/10.1016/j.compedu.2017.12.005
Jesson, J., McNaughton, S., Wilson, A., Zhu T. & Cockle, J. (2018). 'Improving Achievement Using Digital Pedagogy: Impact of a Research Practice Partnership in New Zealand'. *Journal of Research on Technology in Education*, DOI:10.1080/15391523.2018.1436012;

complexity of tasks. But with appropriate conditions in place there are clear benefits to learning and teaching with use of digital environments in classrooms. Benefits under appropriate condition can be shown in cognitive development and achievement as well as with social skills and self-control. This means at the extreme of no access to and use of digital technologies there are now risks to learning.

10) There are issues to be researched about the relationships between age and screen time and use in classrooms. Higher amounts of use for younger children have been associated with increased distractibility and there may be costs for cognitive and brain development in terms of efficiency and accuracy of performance of multitasking on digital devices, especially for younger children whose attention systems and executive functions are immature.[69] The evidence is mixed for an association between amount of screen time and myopia. [70]

11) Current evidence is that children and adolescents have higher levels of comprehension when reading print compared with reading on a screen. However, the effects are small and noticeable only on information (expository) texts and not when reading narrative (story) texts.[71] This suggests there isn't an essential advantage to print (or weakness to screen use), rather new or adapted strategies for comprehension may be needed for reading certain types of texts on screen.

[69] Courage, M.L., Bakhtiar, A., Fitzpatrick, C., Kenny, S. & Brandeau, K. (2015). Growing up multitasking: the costs and benefits for cognitive development. *Developmental Review.* 35, 5-14.
[70] Lanca C & Saw S-M. The association between digital screen time and myopia: A systematic review. *Ophthalmic Physiol Opt*. 2020; 40: 216–229. https://doi.org/10.1111/opo.12657
[71] Clinton, V. (2019). Reading from paper compared to screens: A systematic review and metaanalysis *Journal of Research in Reading*, Volume 42, Issue 2, 2019, pp 288–325. DOI:10.1111/1467-9817.12269

Thank you for the opportunity to make a submission on Te Ara Paerangi /Future Pathways Green Paper (2021)

Individual Submission by:

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March 15, 2022

Purpose of consultation:

"To create a modern, future-focussed research system for New Zealand. It needs to be adaptable for a rapidly changing future, resilient to changes, and connected; to itself, to industry, to public sector users of research, and internationally. Such a system should reflect New Zealand's unique opportunities and challenges. It would embed Te Tiriti across the design and delivery attributes of the system, and enable opportunities for mātauranga Māori. It will also recognise that research is a global undertaking and seek to stand alongside the best systems in the world."

A. Whole-of-system priorities.

Questions:

1. **What principles could be used to determine the scope and focus of research priorities?**

   A compelling overarching principle is that research broadly conceived should contribute to individual, collective and national well-being. A priority which can be directly derived from this principle is:

   the design and implementation of public systems notably education, that positively impact personal, collective and national well-being, thereby optimising social cohesion.

   We have long-standing equity and excellence challenges in education, which have proven difficult to shift. These can be seen in patterns of differential success in valued outcomes for ākonga and declining performance in some international benchmarks; in indices ranging from engagement, through

educational progress and achievement to those for well-being.[1] Educational success contributes to personal, collective and national well-being outcomes (including in the latter national productivity).[2] However, like the situation in the United Kingdom[3], the field of educational sciences in Aoteaora New Zealand has limited status and impact, it lacks coordination and shared strategic objectives, is fragmented and is underfunded (see Tables One and Two below). Some high level objectives for the system as a whole exist, as mandated in the National Educational Learning Priorities (NELPs), but these are not directly linked to the wider RSI ecosystem.

2. What principles should guide a national research priority-setting process and how can the process best give effect to Te Tiriti?

The process should be 'significant' as defined by Te Arawhti[4] and follow the vision set out for Tiriti-led science in Te Putahitanga[5].

3. How should the strategy for each research priority be set and how do we operationalise them?

Given a research priority which addressed educational priorities as outlined above, we need an agency that provides the capability to operationalise the strategy. Specific education examples of agencies set up to set priorities and funding include the Institute of Educational Sciences (USA). There are also more encompassing models such as the National Research Foundation (Singapore) within which priorities in educational research have been set (eg a 'science of learning' stream), but in Singapore there is also a separate linked agency at Nanyang Technological University dedicated to educational sciences (Office of Education Research, directly funded from MOE Singapore). In terms of the overall RSI system in Aotearoa New Zealand, the question is whether we should have a number of bodies such as the Health Research Council and therefore an educational equivalent, or educational research being a part of an overarching research agency, commission or foundation.

[1] See evidence from national and international reports here: Education Counts Home | Education Counts

[2] See: Cotterell G, von Randow M, Wheldon M. An examination of the links between parental educational qualifications, family structure and family well being 1981-2006. Centre of Methods and Policy Application in the Social Sciences, Technical Report. Auckland: The University of Auckland; 2008; Levin H. The economic payoff to investing in educational justice. *Educational Researcher*. 2009; 38: 5-20; NZIER. 2021. Under-served learners: The economic and wellbeing benefits of improving education outcomes. A report to UP Education; OECD (2010). The High Cost of Low Educational Performance The long-run economic impact of improving PISA outcomes.

[3] royalsociety.org/education Harnessing educational research Issued: October 2018 DES4900 ISBN: 978-1-78252-365-9

[4] Engagement_Summary_110619 (tearawhiti.govt.nz)

[5] Te Pūtahitanga: A Tiriti–led Science-Policy Approach for Aotearoa New Zealand | Ngā Pae o te Māramatanga (maramatanga.co.nz)

A more general social science operational agency, perhaps a return to what was previously a social science CRI, is not likely to deliver what is needed. The problems and opportunities in education require transdisciplinary and cross infrastructure research and development, representing multiple disciplines and methods. Operationalising a priority for education requires a dedicated infrastructure, focused on the complex open and dynamic nature of the system, rather than a possible (and competing) focus for some research carried out by social scientists. Currently, the access to competitive funding for educational research is limited, estimated to be between 1%-3% of the funding available from possible science funding sources (see Table One below). Being able to optimise well-being, through solving our equity challenges requires that focus to drive the research, science and innovation for education, rather than the disciplines(s) drive the research. For this reason, a dedicated body is preferable to enable research focused on the requisite national priority. As noted already, this recommendation is consistent with the Office for Educational Research (UK) proposed by the Royal Society (UK), to address the need to create a coordinated, robust and coherent research focus.

Two features of the current educational research landscape provide an opportunity to realise this operational capability.

1. We have a nascent operational agency, but it is limited in reach. The New Zealand Council for Educational Research / Rangahau Mātauranga o Aotearoa (NZCER) was established in 1934, as an independent research and development organisation, operating under its own legislation since 1945. The NZCER Act 1972 provides a mandate to carry out and disseminate education research, and provide independent information, advice, and assistance. Governance is provided by a Council (Board). It's base funding comes through two lines in VOTE Education. An appropriation grant of $1,452,000 per year, and a dedicated fund for hosting a competitive research fund (The Teaching and Learning Research Initiative - TLRI) of $1,556,000 per year. The last increase on this appropriation for NZCER was in 2005. Even just with a CPI increase on an annual basis the NZCER should be receiving around $2m per year. This represents 15% of total income, with the balance needed to maintain operations achieved through contestable research contracts and sales of products. The TLRI funding is not the only source of research funding specifically for educational research (see Table Two below). But even when added to the evaluation and research expenditure by the MOE and ERO, and with estimates of educational research successfully funded through the existing MBIE and Te Apārangi / Royal Society funds, the total per annum for educational research, evaluation, and research and development is at best estimated to be just below $40M (See Table One and Two below).

2. The educational agencies have embarked on a process of coordination and greater coherence by setting national research priorities. Agency Ministers have been briefed on developments, and there is direction from the

Minister of Education for the three agencies, the Ministry of Education, the Education Review Office and NZCER to develop closer coordination and complementarity. These three agencies are leading a consultation process to set high level goals. It is following a process similar to that which led to the Health Research Prioritisation Framework[6].

B. TE TIRITI, MĀTAURANGA MĀORI AND MĀORI ASPIRATIONS

Questions

4. How would you like to be engaged throughout the Future Pathways programme?
5. What are your thoughts on how to enable and protect mātauranga Māori in the research system?
6. What are your thoughts on regionally based Māori knowledge hubs

NZCER hosts a research fund (TLRI) which is a good model for mātauranga Māori aspirations. It has two pathways for application. One, the Whatua tū aka pathway, reflects commitments to improving equity for ākonga Māori, and supports kaupapa Māori educational research and building kaupapa Māori research capability. Funding assessments follow a process, which first considers projects applying through the Whatua tū aka pathway, then further funding decisions are made for those applications made through the Open Pathway (to which Māori led research and Māori focused research projects can also apply). A parallel pathway for Pasifika led research employing Pasikia methodologies such as Talanoa, is also under development. As noted above these development are associated with a fund that is only $1.5M per annum.

C. FUNDING

Questions

7. How should we determine what constitutes a core function and how do we fund them?

Educational research activities carried through agencies (the Ministry of Education, ERO, NZCER) and through tertiary research institutions represent each of the three functions identified in Te Ara Paerangi and should be considered core to a priority such as the one proposed above. They are illustrated here, largely with examples from the Ministry of Education to support the claim that educational research fulfils core functions, albeit currently in less than optimal ways.

[6] The New Zealand Health Research Prioritisation Framework | Health Research Council of New Zealand (hrc.govt.nz)

Critical research: 'is capability that is essential to New Zealand's functioning as a country.'

Educational research is essential to national functioning as noted above, whether the unit of analysis is the individual, collective or national impact. Within an encompassing principle focused on equitable and excellent education there are critical issues; just two examples are the promotion of positive mental health across the early childhood and school years as part of a life span approach[7], and the development of digital citizenships skills including critical thinking and resilience in the face of mis-dis and mal information, and other digital threats.[8]

However, some of the distinctions usually made when identifying critical research do not adequately describe contemporary educational research and some areas of social science more broadly. For example, knowledge generation and applied research do not need to be mutually exclusive. The new experimental designs and methods of what has been called Design-Based Research[9] focus on solving pressing problems of practice in context, as well as generating new knowledge. In addition, the four big problems for educational science to solve in our equity and excellence objectives are best solved using this complementary focus. These are: the variability in effective practices across the system; the implementation of effective practices at scale (scalability); building the capability at all levels of the system to engage with and apply known-to-be effective practices (capability building); and fourthly the sustainability of each in a dynamic open system. These are pressing problems because some solutions for the challenges and effective innovation are present in the system, but not consistently applied at scale. Such big problems require coordination of different methodologies and R&D sequences between many layers of the system and are not easily placed into categorisations of 'critical research', yet they are critical. Such research and development is more appropriately seen as a fourth category captured with terms such as 'transformational', 'improvement' or 'implementation' science.

These observations can be applied specifically to the Māori medium sector, where the concerns for the role of critical research are compounded further. The role of RSI is especially significant in the light of the overall policy direction to substantially grow Māori medium education.[10]

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[7] Office of the Prime Minister's Chief Science Advisor https://cpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/f/688/files/2020/02/17-08-14-Mental-health-long.pdf

[8] McNaughton, S. (2022). Digital Literacy: a review. Unpublished briefing for curriculum refresh. Ministry of Education; Office of the Prime Minister's Chief Science Advisor https://cpb-ap-se2.wpmucdn.com/blogs.auckland.ac.nz/dist/f/688/files/2020/02/18-04-06-Digital-Futures-and-Education.pdf

[9] Lai, M.K., McNaughton, S., Jesson, R., & Wilson, A. (2020). *Research-practice partnerships for school improvement: The Learning Schools Model*. UK: Emerald Publishing Ltd. https://books.emeraldinsight.com/page/detail/Researchpractice-Partnerships-for-School-Improvement/?K=9781789735727

[10] A new dawn for Māori education | Beehive.govt.nz

Access to general science funding is very limited despite the critical research functions. An analysis (which is now 10 years old) of the Marsden fund awards over 14 years, from 1998 to 2011 is illustrative. Within the half billion dollars of research grants awarded ($584,947,456) just $7,038,656 were awarded to 16 projects with some relevance to early child education or schooling (representing 1.2% of the total Marsden funding - see Table Two below). A similar paucity of critical science funding exists in Australia where in the most recent round of Australian Research Council Discovery project grants (2022), education received less than 1% of approved funds – some $2.5 million of the $258 million allocated.[11] Currently, direct public educational funding for this research function, including the transformational science or design-based approaches noted above, is estimated to be between 1% and 3% of available science funding between $4.8M and $14.5M, including funding via PBRF (Table One below). A limited number of educational research projects access additional funding provided from the philanthropic sector. For example, one of the major philanthropic funders in education, NEXT Foundation, commits between $5M and $15M per year, to between 1-3 projects split between education and environmental projects.[12]

High-priority services: 'provide data input into research or require scientific expertise to function.'

Examples in education include digital learning and assessment tools. These latter are critical for achievement monitoring, and the summative and formative (feedforward and continuous improvement) functions which contribute to valued educational outcomes. The tools need updating as curricula change and as new knowledge is generated about instruction and learning. This is the current state in our system, with a wide ranging and fundamental refresh of the curriculum occurring and the digital platforms for current assessments not being fit for purpose. Of significance here is the opportunity to develop AI and ML supported tools, which the Ministry of Education, together with the NZCER is currently exploring. Expertise exists in the university and private sectors but there is limited R&D funding. The national goal of R&D spend is 2% of GDP, but if the estimate of at best $40M in educational research, evaluation and R&D is considered as a percentage of the overall vote education budget (above $17 billion), it is clear that R&D for educational system performance and innovation is minimal.

Again, these observations can be applied specifically to the Māori medium sector, where the underspend and limited infrastructure for RSI is especially telling.

Databases, collections and monitoring: 'to understand the status and health of resources.'

Educational examples include international assessment data (PISA, TIMMS, PIRLS) as well as national monitoring (NMSSA). There are also data bases

[11] Reported in *The Age* February 25, 2022 (Jenny Gore)
[12] corporate-profile-Emi_edits.indd (nextfoundation.org.nz)

from schools' achievement assessments and from regular surveys such as the wellbeing@school survey (NZCER).

Further comment: **Evaluation and R&D in the Ministry of Education.** A core agency function which is not well represented in Te Ara Paerangi is evaluation and research and development (R&D). These activities are part of the culture of research practices within the Ministry of Education, in relationship to both business as usual, as well as for new initiatives through new budget allocation or other mechanisms. However the culture needs to grow, and the current budget allocation to carry out evaluation and R&D is limited (see Table Two below) and is in turn limiting the building of a robust research culture where the default is ongoing system evaluation as well as pre-planned evaluation for new initiatives and programmes. It is hard to determine the exact amount of funding within the Ministry of Education itself but a current estimate is up to $15M (see Table Two below).

8. Do you think a base grant funding model will improve stability and resilience for organisations? How should we go about designing and implementing such a funding model?

If NZCER is considered a type of CRI, then the questions about the funding are critical to current functioning for the one dedicated and publically funded research agency in education. As noted above, NZCER has two lines in VOTE Education NZCER @ $1,452,000 per year TLRI @ $1,556 per year, with no established cycle of negotiation and no increase since 2005. A base grant funding model might help ensure staffing levels and reduce reliance on winning contract research funding to make up the difference between established funding allocation and operating costs with current capacity.

D. INSTITUTIONS

Questions

9. How do we design collaborative, adaptive and agile research institutions that will serve our current and future needs?

The disestablishment of the social research CRI has meant a lack of a clear 'home' in the research system for social science, let alone educational research (which is based on multi disciplinary social science research and kaupapa Māori and Pasifika methodologies such as Talanoa). As noted above operationalising a priority for education requires a dedicated infrastructure, focused on the complex open nature of the system, rather than a possible (and competing) focus for some research carried out by social scientists. Educational research requires a dedicated overarching organisation which has the requisite functions of being collaborative, adaptive and agile. As stated above, NZCER has the potential. However, it requires an enlarged functional capability to achieve strategic effectiveness with national priorities. The same issues arise as with the CRIs and

Callaghan in that greater linkages and coordination are needed with tertiary research institutions, somewhat like a hub and spokes model.

10. How can institutions be designed to better support capability, skills and workforce development?

If NZCER was to function more like a CRI, coordinated pathways within and between NZCER, MOE and tertiary research institutions are needed. This means mechanisms that link doctoral students with other institutions and agencies. For example: joint Graduate Schools (partnerships between universities and CRIs), public sector Internships/postdoctoral programmes, etc.

11. How should we make decisions on large property and capital investments under a more coordinated approach?
12. How do we design Te Tiriti enabled institutions?
13. How do we better support knowledge exchange and impact generation? What should be the role of research institutions in transferring knowledge into operational environments and technologies?

Having the funding for the impact and transformational functions decoupled from core critical research functions has limited the capability of educational research to impact at a system level and to solve the big problems noted above. Research incentives, funding, capability building (eg curricula and training for doctoral students) and other components of the educational RSI system must be geared around developing the research expertise for designing interventions and solve problems at scale with school communities. The methodologies for this were noted above.[13] They are partnership based and contextualised, and demonstrably able to solve equity issues in educational success, change practices at scale and generate new knowledge. The capability is nascent in NZCER and in some tertiary research institutions. Building this capability requires funding and infrastructure which recognises that partnership based co designing within the educational system is a long term, resource-rich exercise.

Workforce planning is crucial to this, as is a coordinated research-policy interface**.** Possibilities include: providing ministries/agencies with greater ability to fund strategic research to support policy; greater opportunities for academics to connect and contribute to and learn from the policy agenda; direct partnerships via secondments, internships, advisory groups, and panels.

E. WORKFORCE

Questions:

14. How should we include workforce considerations in the design of research Priorities?

[13] Lai, M.K., et. al. (2020). op. cit.

15. What impact would a base grant have on the research workforce?
16. How do we design new funding mechanisms that strongly focus on workforce outcomes?

Work force considerations for capability building and for achieving equity objectives across the RSI landscape require a 'life course' approach. This means a focus on promoting expertise in science through educational pathways and capability building, not just at entrance to tertiary study and through postgraduate training but through early childhood education, and primary and second education. This is especially important for building pathways for Māori and Pasifika students and those from low SES communities.

We know some of the conditions and sensitive periods where differences are likely to be most effective. For example, teacher capability for teaching science is low in the middle and upper primary areas.[14] A shift to more specialist teaching in science (as well as in mathematics and social sciences) may be required. Contingent changes would be needed such as postgraduate level entry into initial (primary) teacher education with pathways for science (and maths) majors through first degrees. But this in turn requires preparing and mentoring teachers who are able to operationalise what is termed the 'local curriculum' in ways that engage and sustain interest in science over multiple years. Another example is developing specific national resources and expectations for appropriate investigative play and teacher scaffolded inquiry in early childhood education through activities that reliably build knowledge and skills.

The issue is not only about incentivising institutions to attract students; the various incentive levers that have been available to use to date have had limited effect, in that marked changes have not occurred in distributions of permanent and leading science positions by gender, ethnicity and SES background.[15] To be influential, major structural changes such as those proposed for PBRF and for research and development funding mechanisms are needed. But these 'pull' mechanisms are too late at tertiary level. The low achievement patterns and differential success rates for Māori and Pasifika students are well established by entrance to tertiary research institutions, and the evidence is that engagement and achievement through schooling (eg in NCEA) are in part determined by how well schools and communities support

[14] eg NMSSA Report 17 Science 2017 - Key Findings (educationcounts.govt.nz); He-Whakaaro-What-can-NMSSA-tell-us-about-student-progress-and-achievement.pdf (educationcounts.govt.nz)

[15] eg Te Whakatutukinga o te Pūnaha Rangahau Pūtaiao me te Auahatanga o Aotearoa Performance of the New Zealand RSI system THE RESEARCH, SCIENCE AND INNOVATION REPORT — 2021 https://mbienz.shinyapps.io/research-science-innovation-report/pdf/research-science-and-innovation-system-performance-report-2021.

language, identity and culture.[16] A collective and coherent response through such mechanisms as specialist teaching in primary school, the 'curriculum refresh' process; as well as scholarships, studentships and internships in and from secondary school are needed.

F. RESEARCH INFRASTRUCTURE

Questions:

17. How do we support sustainable, efficient and enabling investment in research infrastructure?

The comments above point to the need in education to have a more robust, coordinated and sustainable eco system of educational research. A start has been made with an education evaluation, research and research and development strategy in development. But funding and capacity limit the degree to which educational sciences and research can make substantial contributions educational outcomes. The case for markedly increased support has been repeatedly made, most recently in the NZIER (2021) report entitled '*Under-served learners: The economic and wellbeing benefits of improving education outcomes*'.[17] The Report concludes: *There is a large body of literature showing the positive and multifaceted benefits of improving education outcomes. The links between education, the economy, health and social settings indicate that education is one of the more influential policy levers for improving the welfare of New Zealanders now and in the future*.' (p.ii).

The possible mechanisms have been outlined above. They include a nationally agreed strategy for educational research, an expanded agency such as the NZCER to act as a coordinating body with substantially increased funding capacity; systematic changes in the curriculum and pedagogical provisions through early childhood education and the compulsory sector to guarantee equitable pathways into research employment (and specifically given the priority outlined above, in educational sciences).

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[16]eg He-Whakaaro-Importance-of-Maori-identity-language-and-culture-for-akonga-Maori.pdf (educationcounts.govt.nz)

[17] NZIER. 2021. Under-served learners: The economic and wellbeing benefits of improving education outcomes. A report to UP Education.

Table One: **Estimates of educational research access to science funding (percentages)**			
Science Funding[i]	**Allocated Funding ($M)**	**Estimated Percentage $M educational research funding**[ii]	**Comments**
Marsden	85 per annum[iii]	15% of proposals to 'society' **estimate education 1.2%**[iv]	**Royal Society** investigator-led research generating new knowledge
Rutherford (*n*=10 per year)	1.6 per annum	no allocated social science **estimate education 2.7%**[v]	**Royal Society** early - mid career support
Centres of Research Excellence (*n*=10)	50 per annum	no direct social science CoRE Ngā Pae o te Māramatanga ($5M per annum) funds some education related projects[vi]	**MBIE** strategically focused, significant knowledge transfer
Endeavour	216 per annum	5% dedicated to 'society research outcomes' **estimate education <1.0%**[vii]	**MBIE** - impact across economic, environmental, and societal objectives.
National Science Challenges (*n*=11)	680 over 10 years	*Better Start* $34.7M (5.1% of total funding) One of 4 themes is '*successful learning'* **estimate education 1.3%**[viii]	**MBIE** mission-led science based challenges
PBRF	315 per 5 year cycle	**estimate for education 3%**[ix]	**TEC** tertiary sector research funding
Total	Estimate annualised **483.6**	**Estimate education focused 1-3%** **Estimated ($4.8-$14.5)**	

[i] Potential science funding sources for education are taken from MBIE allocation statements. For example, The Endeavour Fund Investment Plan 2019 to 2021 (mbie.govt.nz). A number of more targeted funding sources such as the Health Research Fund have been excluded.

[ii] Education research: research with an explicit focus on the education sector and their communities (early learning through to tertiary).

[iii] In 2020 $84.75M to134 projects 2020 Marsden Fund highlights (royalsociety.org.nz)

[iv] A review of grants made in recent years shows relatively few education related projects received grants. For instance, in 2019 there appeared to be four grants for education research with a total funding of $1.441M. Alton- Lee (2012) estimated over 10 years 1.2% of the total Marsden funding.

[v] 3 awarded over 11 years ($800,000 over 5 years).

[vi] education related projects are identified in the annual report 2020-2021_NPM_Annual_Report.pdf (maramatanga.ac.nz)

[vii] In 2021, 69 new scientific research projects were awarded over $244 million, one with an explicit education focus (early childhood education $1M).

[viii] 2017 funding round for successful learning $2.8M awarded to 10 projects, 2 were education focused projects Successful Learning | A Better Start - National Science Challenge

[ix] The Performance Based Research Fund (PBRF) awards funding on the basis of a quality assessment of the research staff in each eligible institution (55% weighting), the level of external research income from international and domestic government and non-government sources (20% weighting) and the number of PBRF-eligible postgraduate research-based degrees completed (25% weighting. If PBRF funding was allocated to education research on a per capita basis of education researchers participating in the quality assessment as a proportion of the total number of researchers participating the estimate would be $20M. Allocation 2019 to education (excluding possible sources from Māori knowledge and Pacific research and psychology) was $5,304,844 (3% of total). PBRF 2019 Annual report performance allocations (tec.govt.nz)

Table Two: **Agency and Direct Educational R, E & D programme/Activity**[i]	**$M**
International and National Assessments	
International Assessment Studies in Schooling Sector (PISA, PIRLS, TIMSS, TALIS)	3.5
National Monitoring of School Student Achievement	2.5
Programme for International Assessment of Adult Competencies (PIAAC)	0.9 – 1.5
Strategic Research	
Part of the Education, Data and Knowledge (EDK) Branch (Ministry of Education) work programme (Chief Economist and Analysis and Insight group)	2.0[ii]
Mix of small to medium scale evidence related investigations by policy teams in the Ministry of Education (from own staff resources)	Up to 1.0[iii]
Teaching Council	0.1
System level and Programme/Policy Evaluations	
Education Review Office	3.0-4.5[iv]
Ministry of Education School and ECE (includes approximately $1.2m of evaluation in the learning support area in 2019/20)	2.0[v]
Ministry of Education Tertiary Sector Performance and Review Unit R & E work programme	1.3 (approx.) [vi]

NZQA (partly in the nature of Research and Development)	0.1[vii]
Teaching and Learning[viii]	
Teaching and Learning Research Initiative (NZCER)	1.56
Ako Aotearoa	0.74[ix]
The Best Evidence Synthesis programme (primarily Research and Development) MOE	0.57[x]
Operating expenditure associated with school entry assessment development MOE	1.0[xi]
NZCER Government grant (covers a mix of strategic research and research to inform professional practice)	1.50[xii]
Tertiary Education Commission (TEC)	0.5 (approx.) [xiii]
Indicative range for total E, R, E & D investment	**$22.27 to $24.37**

[i] Estimates taken from working paper R. McIntosh, R. Baker and M. Hohepa (2019). Stage 2 Working Paper: Summary assessment of current education research, evaluation and development activity. Estimates from MOE are currently being revised.
[ii] Verbal estimate provided by EDK interviewees
[iii] This is not a firm figure but a provision drawing on feedback from a range of business units.
[iv] Indicative figure provided by ERO interviewees
[v] Indicative figure provided by Ministry interviewees
[vi] Total budget for the unit is $2m but some of this provides for core data collation and analysis which is excluded from the definition of R, E & D. Some of the work of this team could be classified as strategic research
[vii] Figure provided by NZQA interviewee
[viii] The table does not include the Teacher and Learning Innovation Fund) which comprised around $18m to be spent over 5 years) as this Fund ends this year and currently there are no proposals to replace it.
[ix] The figure for research funding in the 2019 financial statements included in Ako Aoteroa's 2019 Annual report. Ako Aotearoa's website states that it is "pausing and reassessing the project funding part of our activities for 2020. We expect to resume this work from late 2021 for funding of projects in 2022,"
[x] Budget figure provided by Chief Adviser Evidence Synthesis, Best Evidence Synthesis Programme.
[xi] Verbal estimate provided by Barclay Anstiss, EDK, Ministry
[xii] This figure is the government grant to the Council. NZCER will also receive government funding through contractual work secured on a contestable basis.
[xiii] This figure primarily comprises market research surveys. TEC advise that they are in the process of enhancing their in-house capacity to do evaluations and have engaged an insights team to "doing significant work understanding our learners, employers and communities and the journeys people take". As a result the figure provided in the table may understate the level of expenditure by TEC in this area in the future.