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INTRODUCTION

The Otago Polytechnic (OP) Sustainable Practice Strategic Framework (SPSF) conveys a simple pledge to "do the right thing" (Mann & Elwood, 2009) via Strategic Objectives for Sustainable Practice (SOSP) (Otago Polytechnic, 2014). Progressing a commitment toward sustainability, the SOSP are:

- to develop sustainable practitioners (articulated for each OP field of study) (Ker, 2017).
- to model evidence-based sustainable practice in our operations.
- to encourage communities and businesses to embed sustainable practice.
- to ensure our actions benefit our communities.

Sustainable practitioners are "able to apply frameworks of sustainable practice (ecological, social, political and economic) to the context of their industry or field of study, in order to challenge existing practices and develop more sustainable ways of operating" (Ker, 2017, p. 112).

It became apparent that although the Framework specified what the objectives meant for Otago Polytechnic last decade, for Otago Polytechnic Auckland International Campus (OPAIC), it was time to re-examine what the SOSP meant from our customer perspectives, and contextually for our international campus. After two years of COVID-19 flux and rounds of online teaching, a lot had changed. What did the SOSP mean now, in terms of climate change, 'post-COVID' (Cherrington et al., 2022a)? What had changed and how?

If developing sustainable practitioners was valuable and a point of difference in the marketplace, then discovering its value-add from our students' perspective would be well worth exploring, to make learning and teaching engaging within a qualification and more meaningful as a point of difference as well as a bridge towards employment. Indeed, the SPSF is superseded by the OP Sustainability Plan 2020–2022 with the intention of *Making Sustainable Practice and Development Core Business at Otago Polytechnic.*

A project-based learning (PBL) process was used, with reflection, reflexive practice, and observations (Cherrington, 2020). The goal was to stimulate a culture of ideation and innovation via individual and group work, to create a 'product' to be used and built upon by subsequent students in any field of study. Feedback from the PBL process built continual improvement (ethics approval AIC85). The intention was a PBL product that would create continuity and tools to guide and inspire new student cohorts to become sustainable practitioners.

A PBL format was used to allow an organic development of a tool or product for sustainable practice that was made by and for learners and fledgling sustainable practitioners. The context was the environment on campus, in an organisation growing commitment to making sustainable practice and development core business (Cherrington, 2019).

PROJECTS VERSUS PROJECT-BASED LEARNING

A project can be a common yet superb way of scaffolding learning and building capabilities; projects are quite different than project-based learning approaches (Bredenkamp et al., 2022). At OPAIC, we are more accustomed to projects than PBL and creation of a project from that learning approach. We used Figure 1 to summarise the key differences between projects and PBL (Maros et al., 2021).

Project approaches	**A project-based learning approach**
-are outcome focused	-is focused on the process
-are teacher-directed	-is student-directed
-can be completed autonomously	-needs collaboration and teacher facilitation
-often lack real-world context	-is founded on real-world experiences and issues
-occur after the teaching and learning	-produces real learning throughout the project
-have projects that lead to the same goal	-creates a student-choice pathway to outcomes

Figure 1. Project versus project-based learning approaches.

Project-based learning is an active, student-centred method of instruction that emphasises students' autonomy, constructive investigations, goal setting, cooperation, communication, and reflection in the context of real-world activities (Cherrington et al., 2021a). It has been studied in a variety of settings and at various levels of education, from primary to higher education (Kokotsaki et al., 2016).

Project-based learning is a new way of learning that utilises a variety of skills essential for success in a contemporary workplace (Bell, 2010). It is meaningful when two conditions are fulfilled. Firstly, learners must see the undertaking as *personally significant*, with tasks that are important to them, so they are motivated to complete the PBL successfully to meet instructional aims. The second condition for meaningful work is e*ssential purpose*; this is met by exposure to authentic learning experiences. In a project-based learning environment, a teacher explicitly teaches and assesses these skills, and students are given numerous opportunities to practise and assess themselves (Larmer & Mergendoller, 2010).

A PBL approach allows students to build capabilities such as cooperation, communication, critical thinking, and technology use, all of which will benefit them in the workplace and in life. These are the specific capabilities that our industry partners are seeking of our graduates. Project-based learning that is well-designed and implemented should build multiple capabilities as the conditions are met (Larmer & Mergendoller, 2010).

Project-based learning is often regarded as a viable and superior alternative to traditional teacher-led instruction. It has a strong positive influence on students' academic achievement when compared to traditional schooling (Chen & Yang, 2019). It is not that project-based learning will totally replace traditional schooling; rather, PBL is valuable in the dynamic environment in which workplaces exist.

When students work together to solve and analyse a problem (Tsybulsky & Muchnik-Rozanov, 2019), then present their findings to an audience (in class, in research forums, or in conferences), it allows them to retain the information and gain the skills they will need in the future (Chen & Yang, 2019).

Project-based learning problem-solving processes support critical thinking, cooperation, issue resolution, interpersonal communication, information and media literacy, and leadership (Chu et al., 2017). The process is creative, flexible, and original (Duchovicova et al., 2019). It also aids in the development of students' abilities,

skills, attitudes, and values, allowing them to comprehend global difficulties in a rapidly changing global economy (Zat'ková & Poláček, 2015). Self-education is a component of project-based learning, which encourages students to take ownership of all parts of their work (Klopfenstein, 2003).

Project-based learning also allows for a deepening and expansion of comprehension, the integration of learning into a full system of knowledge, and the realisation of knowledge's meaning and purpose. Students learn to work independently and collaboratively, creatively planning and completing their work, because the students direct the process. Students take greater responsibility for their work, and overcome obstacles to work with information, present their own work, and correctly express themselves.

It is not that PBL is a quick and easy exercise. However, within a PBL process, students typically justify their choices and will develop a deeper understanding and profound acceptance of other opinions and perspectives as they evaluate their own and others' work (Klopfenstein, 2003). Project-based learning can be a valuable instrument for engaging in the interpretation of educational content and acquiring new knowledge, as well as the development of personal characteristics necessary for collaborating with others and resolving problems (Chmelárová & Pasiar, 2017). It can lead to student mobilisation.

EMBEDDING SUSTAINABILITY

Otago Polytechnic has sustainability embedded in its papers or as indicative content. At OPAIC, the United Nations Sustainable Development Goals, also known as Global Goals (United Nations, 2021), form our framework for sustainable development; they are commonly used in organisations worldwide. OPAIC took a broad definition of sustainability, from creating campus projects to reduce our emissions, to researching and publishing topics about sustainability, to creating Green Office Toitū, which progressed student-based organisational actions that were aimed at mitigating climate change (Bredenkamp et al., 2022).

For applied management students studying Contemporary Issues in Organisations, PBL was used as a tool to explore and re-contextualise Strategic Objectives for Sustainable Practice at OPAIC, in much the same way that most organisations are exploring the practice of sustainability in their workplaces and operations. As a COVID-survival mode gives way to growth strategies, sustainable practice, embedded in all that we do, will further evolve how we do things. There can be no excuse for burning the planet. Emissions continue to rise; the planet is still heating. As avid practitioners of sustainable development, we must decarbonise the economy, urgently (Masson-Delmotte et al., 2021).

From an economic perspective, organisations must always consider the allocation of scarce resources. As our planet becomes more stressed and depleted, resources become constrained; organisations and the people they serve will suffer (Manate & Cherrington, 2021). This is why many organisations begin their sustainability journey by reducing waste in any form. Even simple policies can mitigate impacts and vulnerabilities to climate change, to support adaptation needed for our planet (Pörtner et al., 2022).

By re-examining SOSP for activation at OPAIC, the information and knowledge gained via project-based learning supports the development of sustainable practitioners. The PBL product developed can be activated, then enhanced by new student cohorts, who re-imagine and evolve sustainable practice in any field of specialisation, through the strategic objectives for sustainable practices.

CREATING WORTHWHILE PROJECT-BASED LEARNING

Project-based learning can be built into curricula, or integrated into learning environments in a variety of ways. Teachers must change their roles from directors to facilitators of learning and build their own PBL approaches, which tolerate ambiguity and 'noisy' activity in the classroom (Condliffe et al., 2017). New classroom management skills will be needed to effectively support student learning and the prudent use of technology (Pace et al., 2020). Teachers must trust and believe that their students are capable of learning effectively using this method.

Five components should be activated for successful PBL learning (Larmer & Mergendoller, 2010):

1. **Create a legitimate question** using clear, compelling language to provide students with a sense of purpose and challenge. It should be provocative, open-ended and linked to the essence of what you want pupils to understand; there should be sufficient complexity to create debate without the extremes of disharmony or apathy (Krsmanovic, 2021).

2. **Student choice and participation** develops student ownership over a project; the more voice and choice they have, the better. Devising projects that allow students to choose options appropriate for their style of learning should reflect key cultural and contextual considerations. Learners can choose what topic to study within a general driving question or how to design, create, and present products. To avoid ambiguity or a sense of being overwhelmed, limited-choice tactics can be set, such as presenting a limited menu of innovative product options to guide and focus activities (Owston, 2018).

3. **Innovation and genuine inquiry** can be activated in PBL environments where students follow a path that begins with their own questions, leading to a search for resources and the discovery of answers. This journey frequently ends with the generation of new questions, the testing of ideas, and the drawing of students' own conclusions. True inquiry leads to innovation via a fresh answer to a burning topic, a new product, or a problem-solving solution created by an individual. Students gain fresh insights, encouraged by techniques of questioning, hypothesising, and receptivity to new ideas and viewpoints. These mind-sets are valuable in the classroom and in the workplace (Albrahim, 2020).

4. **Revision and feedback** should be formalised procedurally. This can be done by bringing the class back together on topic. Support and specific feedback stress the value of producing high-quality products and performance. Students must understand that first attempts often lack quality; editing is part of the process, and an inevitable part of real-world employment. As PBL will connect to learning outcomes, students should be educated on how to analyse each other's work using rubrics or other sets of criteria. Adult mentorship can also be used to provide input and perspective, which is extremely relevant to pupils (Lee & Galindo, 2021).

5. **A product displayed in public** becomes more meaningful. When students show their work to a live audience, they are more concerned with the quality of their work. This approach creates legitimacy and develops authenticity. Students not only build capability and replicate professional duties, they can build real-world products that are used by people inside or outside of school (Cherrington et al., 2021b).

THE STRATEGIC OBJECTIVES FOR SUSTAINABLE PRACTICE PROJECT-BASED LEARNING PROJECT

At OPAIC, a Contemporary Issues in Organisations class used a series of in-class experiential exercises to explore the SOSP and what they meant to our campus (Chawla & Cherrington, 2020; Ganeshan et al., 2021). As the 2022 academic year began, the exercises began solely online due to the COVID-19 campus closure. Group exercises explored all four SOSP sequentially in online class-based chats. To focus the learning, each group chose one of the SOSP to collate and explore in depth. This was supported by a project-based learning process, which ran as a continual thread throughout the term. Project-based learning was used to add value to the student learning.

The extensive student discussions, reflection and examination of assumptions using reflexivity were also supported by a senior project student who collated key insights. The PBL process led to ideation and a simple product in the form of an SOSP bullet-point process diagram that could be used and developed further by subsequent student cohorts in any field of study. Note that:

- students at first struggled with the difference between projects and project-based learning.
- students enjoyed the experiential nature of PBL, with their suggestions in the process.
- students needed help to create the product 'forgetting' the tangible output required!

The product was utilised and further refined at as series of campus-wide workshops at OPAIC during Campus Sustainability Week in term 2, 2022. The PBL product became more detailed in four session topics:

1. Greenwashing versus Green-blushing, as corporate communication.
2. Sustainability for Employability, as a transition from OPAIC to the 'real world.'
3. Innovating for Impact, as projects that could begin in students' sphere of influence.
4. Climate Change Action, as defined by the students.

AN INNOVATIVE, PROJECT-BASED LEARNING APPROACH TO IDEATION

Ideation requires some imagination, but it must be structured to draw out the required learning objectives. For PBL, we used back-casting as a tool of innovation to activate and ideate towards sustainable development and actionable recommendations (Delaney, 2015). Back-casting is also a common and efficacious future-thinking applied management tool, used to illuminate "global vision" perspectives for tailored strategic solutions (Kumar, 2012).

By first envisioning a scenario or reality worthy of achieving, a baseline analysis can be created for possible solutions that can be prioritised for action (Kumar, 2009), as in Figure 2. The Sustainable Development Goals (United Nations, 2021) were used as our framework for sustainable development and, in this case, also as a visionary blueprint to guide PBL. We realised that brainstorming alongside a SWOT (Strengths-Weaknesses-Opportunities-Threats) analysis (as a snapshot in time) could shift mind-sets for new modes of sustainable practice in light of climate change, by viewing threats as opportunities (Zhukov & Cherrington, 2020) and by transforming weakness to strengths in our conversational environment (Zaffron & Logan, 2011). The SWOT analysis became part of a structured approach to drive an innovative PBL approach that generated discussion and built buy-in (Kumar, 2012).

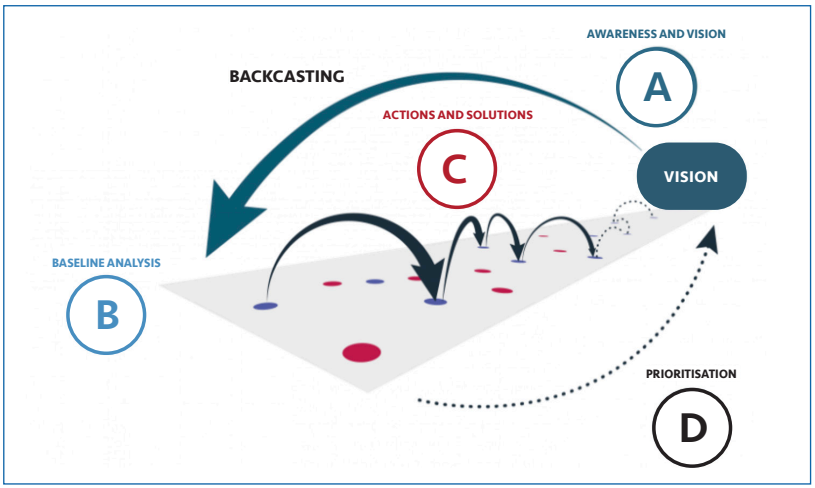

Figure 2. Back-casting from a vision of the UN SDG framework.

An interesting student insight is that, with SWOT analysis and back-casting, sole-proprietorships or small SMEs can produce tailored approaches to act on climate change and emissions reduction for more sustainable operations, even for very specific project-based work (Naviza et al., 2021). Open PBL discussion closed knowledge gaps that can sometimes stymie action.

Innovation can recalibrate risk and accelerate strategy. A seven-step innovation process (Figure 3) can begin with brainstorming or any step in an iterative loop (Kumar, 2012) to realise a PBL product.

Sense Intent	Know Content	Know People	Frame Insights	Explore Concepts	Frame Solutions	Realise Offerings
• Foundation • trends • vision	• Research • tangible • understand	• Research • testing • understand	• Analysis • abstract • observation	• Synthesis • abstract • principles	• Synthesis • abstract • make/create	• Realisation • viable plans • communicate

Figure 3. An iterative process for innovation (Kumar, 2012).

TECHNOLOGY, CREATIVITY AND A PROJECT-BASED LEARNING PRODUCT

Students can experiment with multiple technologies within the project-based learning process by using technology as a means rather than an end. As technology taps into student familiarity with computers, real usage of technology can build engagement. New technology plays a vital role in the learning and teaching milieu as hybrid teaching methods have shown (Nancy et al., 2020). Students can utilise a variety of technologies to display their understanding during the presenting and communication phases.

Not all technology need be computer-based or disruptive. Technological improvement can be realised via process innovation, creating new opportunities from the cheap/fast/good trade-off (Mehl & Fose, 2016) using existing technologies alongside mentorship. Traditional quality processes are based on reducing waste and continual improvement through "Plan > Do > Check > Act" cycles (Deming, 2018). Embedding sustainable practice can transform using continual improvement SOSP processes for OPAIC, as a form of continual communication in

and between terms of student cohorts (Figure 4). Furthermore, SOSP processes can be tested and refined through scholarly peer-reviewed submissions and conference presentations within topic specialisations (Ministry of Education, 2022).

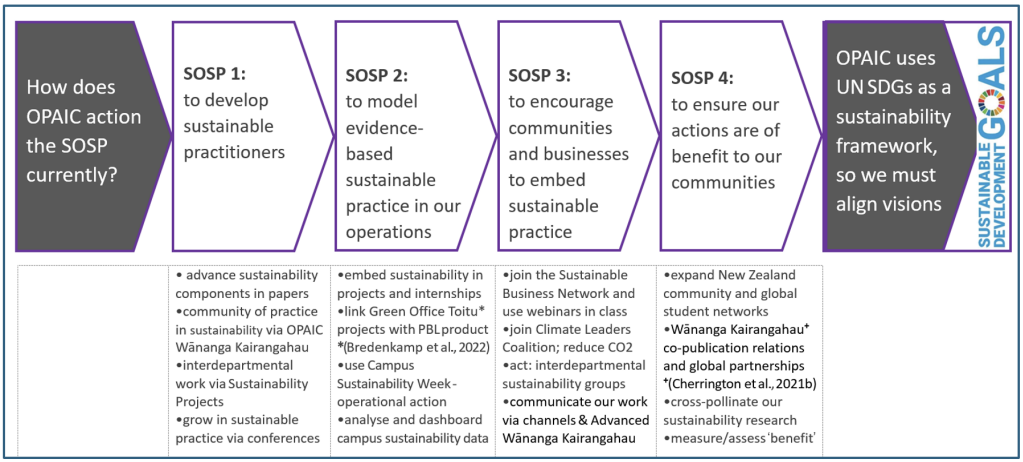

Figure 4. PBL Product: SOSP contextualised as a back-casted, bullet-point process (Version 2).

To have the potential to meet all four SOSP, OPAIC actions must begin with creating sustainable practitioners, who can support sustainable operations within a campus. To that end, the embedding of SOSP in every course within an OP qualification was a thoughtful, mandated process, but it cannot stop there. The true test of our actions will be to extend SOSP 1 and 2 beyond our campus.

Activating SOSP 3 and 4 would benefit businesses and communities, especially after pandemic challenges; climate action could gain momentum with sustainability frameworks (Salahi & Smith, 2021). Our practice of collecting, analysing and responding to feedback from staff and graduates can expand throughout our international networks. Yet, already, our SOSP process product has evolved and progressed mind-sets and potentialities for SOSP activation (Cherrington et al., 2022b). The product works as a means of activating and updating SOSP on campus.

CONCLUSIONS AND FUTURE WORK

Project-based learning is an important method for developing independent thinkers and learners. It is a natural method, where problems evolve through self-enquiry, learning progression and research. The use of a variety of learning tools to solve real-world challenges helps to motivate novel, innovative and creative approaches to learning, while obtaining vital skills needed for succeed in our global economy (Rieckmann, 2018).

In the future, we will not only be judged by future generations on our results, but on equitable sustainable development. This will require the ability to think critically and to collaborate, negotiate, and plan with leadership. By using PBL, we may better equip our students to confront the challenges of the twenty-first century with confidence and a repertoire of abilities they can employ effectively. Project-based learning projects can be a simple, evolving process (Figure 4) but can also frequently create stunning, enormous enterprises designed and presented with the utmost pride and attention.

The PBL exercise reimagined what sustainable practice could mean for our next generation of OPAIC sustainable practitioners, especially in the context of this new dynamic era. Future work will involve integrating our PBL product in interdepartmental learning and campus sustainability initiatives from term to term to create updated versions that scaffold a new appreciation of what the development of sustainable practitioners can mean in the context of the businesses and communities we serve. The answers will unfold between the blurred lines of work and teaching and learning.

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