Annex A: Theory of Change

This Annex to the impact evaluation handbook provides more detail on the theories and research used to inform the development of the Theory of Change and presents the logic model, which is the basis for the survey protocol design.

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PELICAN

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CHALLENGING HABITAT

Theory of Change

A good Theory of Change (ToC) provides an evidenced framework illustrating how actions and activities on board produce short-term outcomes, and how these lead to the aimed for long-term outcomes. In reality, it is not always possible to provide strong independent evidence of the means by which each outcome is produced.

Using the survey protocol developed here, the evaluation programme not only provides evidence for how effectively outcomes are being achieved but also contributes to the evidence base for the ToC itself. The ToC should be considered not as fixed but as something which can be iteratively revised in light of new evidence, whether that be via programme evaluation, or through independent research.

The starting point for the ToC was the vision, mission, and values of Pelican of London Ltd. (PoL). These were used to identify the core outcomes that PoL wishes to deliver and are presented in Box 1.

The ToC also needed to incorporate elements of ocean literacy and marine citizenship alongside those of personal development and towards maritime careers. To achieve this, the ToC was informed by three frameworks:

1) The ASTO theory of change, evidence review & measurement framework (Noble *et al.*, 2017)
2) The ten dimensions of ocean literacy (McKinley *et al.*, 2023)
3) The marine citizenship framework, inclusive of marine identity process theory (Buchan *et al.*, 2024a, 2024b, 2023)

The ToC was additionally informed by research focused on the Pelican of London sail training programme and existing evaluation data (Morgan and Braungardt, 2025).

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Box 1 Pelican of London Ltd. Purpose

Mission Statement:

Pelican of London offers young people from all backgrounds the opportunity to embark on sail training and ocean STEAMS voyages that encourage **personal growth** and **environmental awareness**. Through **hands-on learning**, participants gain valuable **skills** and **experiences** essential for their **future careers**, while nurturing a **deep connection** with and **understanding** of the **ocean**, empowering **ocean advocacy and stewardship**. Pelican of London contributes valuable **data to citizen science** projects and partners in industry and research.

Vision Statement:

We strive to remove barriers to developing **essential life and career skills**, through Sail Training and Ocean STEAMS. Aboard Pelican of London, we **inspire** the next generation of **leaders**, **innovators**, and **ocean stewards**, equipping them with the **confidence, knowledge, and experience** to thrive in their **careers** and make a **positive impact** on the world.

Values:

1. **Empowerment:** We help young people unlock their potential, providing opportunities to develop the skills and confidence to succeed.

2. **Career Development:** We provide practical training that opens doors to employment and further education in maritime and STEAM fields.

3. **Ocean Science:** We inspire young people through hands-on ocean science, encouraging curiosity and a sense of responsibility for the ocean.

4. **STEAM Education:** We integrate science, technology, engineering, arts, and math into our programmes, encouraging creativity and critical thinking.

5. **Teamwork & Resilience:** We challenge young people to work together, overcome obstacles, and grow as individuals.

6. **Equality & Inclusion:** We believe every young person deserves access to opportunities, regardless of their background.

7. **Sustainability**: We advocate and practice responsible stewardship for our oceans and natural resources.

8. **Community & Leadership**: The Pelican of London is not just a ship, it is a place where future leaders are created, one adventure at a time. Onboard, trainees become valued crew members, take responsibility, and practice leadership.

Theory of Change Frameworks

ASTO Theory of Change

The 2017 ASTO ToC provides an evidence-based framework for delivery of self-knowledge and personal development, knowledge and learning, and social skills (Figure 1). The supporting review (Noble *et al.*, 2017) draws on a wide range of literature across outdoors and environmental education to evidence the connections between actions and outcomes. As such, the ASTO ToC forms a strong baseline of the past evaluation programme and for the extended ToC presented here. The evaluation project did not seek to update the evidence base for the ASTO ToC.
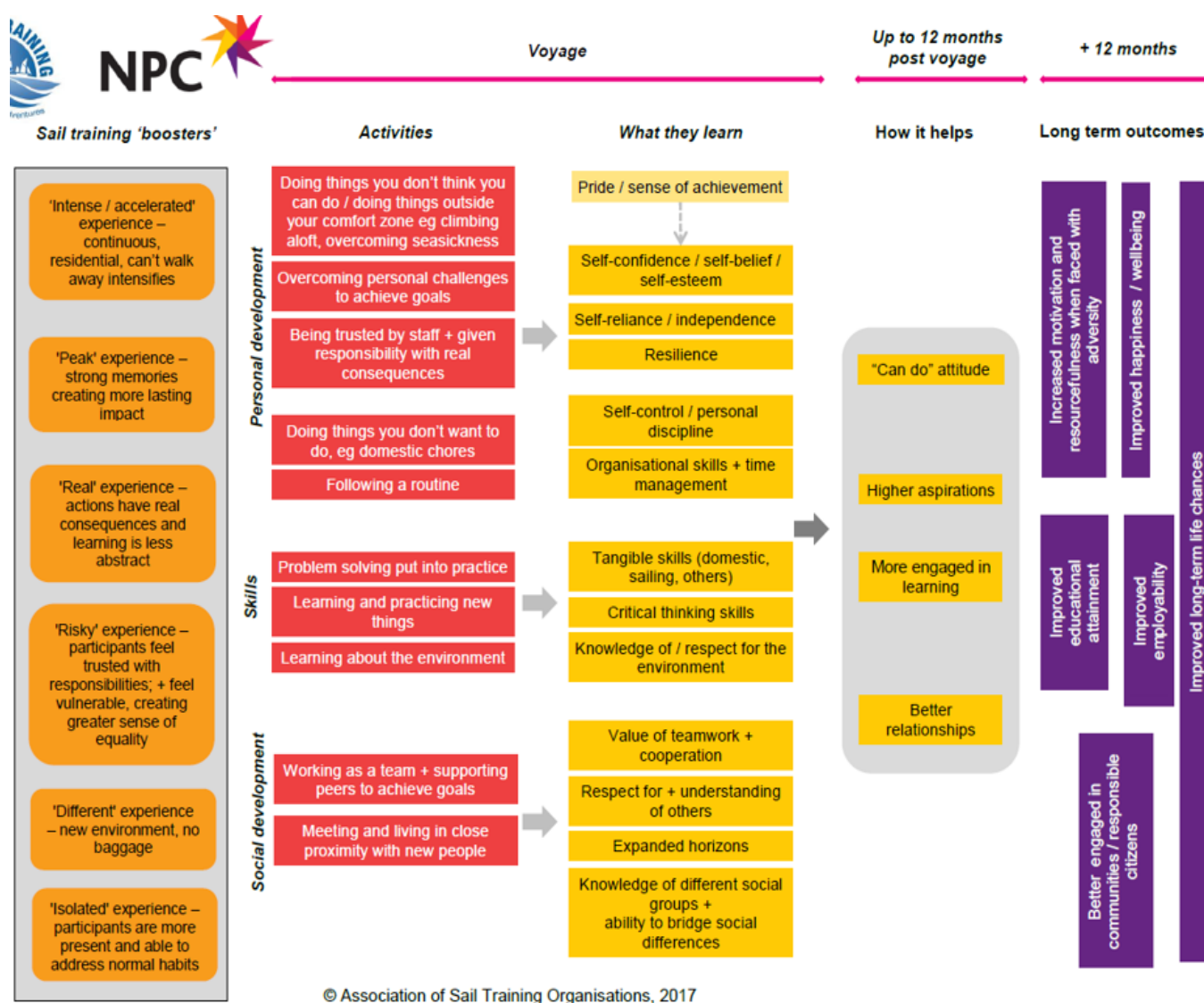

Figure 1 ASTO theory of change. From Noble et al. (2017).

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Ocean Literacy

A core aim of the evaluation is to recognise and measure the contributions that sail training is making towards the development of ocean literacy in young people. The concept of ocean literacy emerged in 2007 (Fletcher and Potts, 2007) and in response to the lack of marine ecological and scientific learning within school curricula. Since then, ocean literacy has been refined and reconceptualised multiple times, driven by its potential connections with marine pro-environmental behaviours and the developing evidence base in that research area. For this project, the most current framing of the ten dimensions of ocean literacy (McKinley *et al.*, 2023) has been adopted (Figure 2).

1) **Knowledge** about ocean topics, ocean decision-making and sourcing information.
2) **Awareness**. Understanding that problems with the ocean exist and potential solutions for those problems.
3) **Attitudes**, perceptions and values towards an ocean issue.
4) **Behaviour**. Decisions, choices, actions and habits with respect to the ocean.
5) **Activism**. Engaging in activities to bring about changes to policy or attitudes towards the ocean.
6) **Communication** about ocean issues with others, e.g. family and friends, between organisations and audiences, within organisations.
7) **Emoceans**. Emotional responses towards the ocean.
8) **Access and Experience**. The engagement someone has with the ocean, whether direct or indirect.
9) **Adaptive Capacity**. A person's capacity to adapt and respond to changing ocean conditions.
10) **Trust and Transparency** in information and knowledge sources, processes of communication and ocean governance.

Figure 2 The ten dimensions of ocean literacy. Adapted from McKinley et al. (2023).

This contemporary framing of ocean literacy is much broader than earlier conceptualisations that were limited to the knowledge that people hold about the ocean as an ecosystem. Some of these dimensions overlap with the frameworks below that lead to marine citizenship, in particular behaviour, activism, emotional connections, and access and experience of the ocean.

Marine Citizenship Framework and Marine Identity

A further aim of this project is to evaluate the recognition and/or development of a sense of responsibility and stewardship for the ocean within trainees. These form part of the concept of marine citizenship: *Exercising the right to participate in the transformation of the human-ocean relationship for sustainability* (Buchan *et al.*, 2023). Marine citizenship is inclusive of ocean advocacy, ocean stewardship, pro-marine environmental behaviours, and engagement in ocean

governance. Evidence from marine citizenship research emphasises the role of ocean experiences for creating positive emotional connections with the ocean (thalassophilia) (Buchan *et al.*, 2024a). It finds these are the foundations for building a value of care and concern for the health of the ocean.

Marine citizenship research has also sought to plug the gaps between intention and action. It is well established by research that there is a gap between knowledge and action, and between values (care and concern) and action, in all kinds of contexts of behaviour change and pro-environmentalism. Buchan presents a framework for individuals developing active marine citizenship (Figure 3). The framework describes a pathway from formative, positive ocean experiences, through emotional engagement with the ocean, towards increasingly deeply embedded connection to the ocean, which ultimately drives marine citizenship.
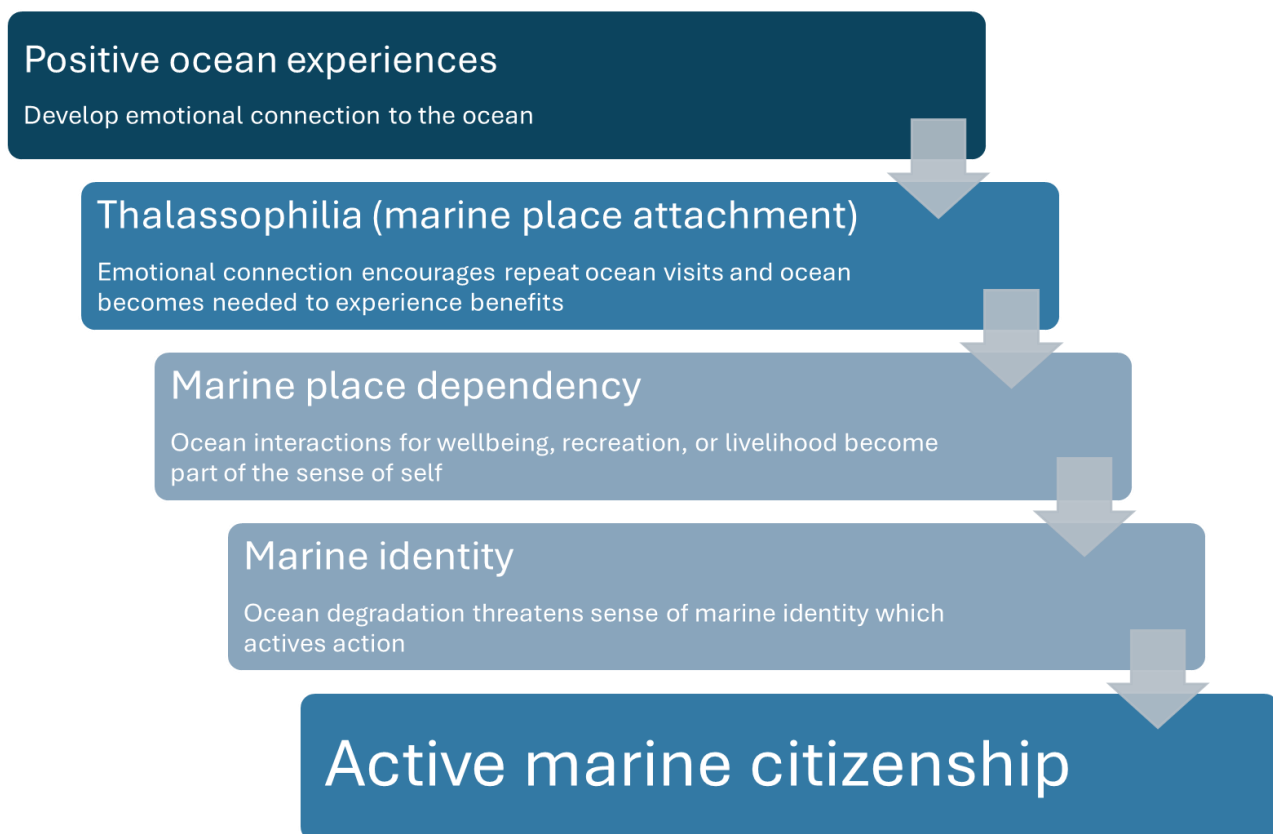
Positive ocean experiences
Develop emotional connection to the ocean

Thalassophilia (marine place attachment)
Emotional connection encourages repeat ocean visits and ocean becomes needed to experience benefits

Marine place dependency
Ocean interactions for wellbeing, recreation, or livelihood become part of the sense of self

Marine identity
Ocean degradation threatens sense of marine identity which actives action

Active marine citizenship

Figure 3 The marine citizenship framework (Buchan et al., 2024a, 2023).

Active marine citizenship is a spectrum from 'thin', focused more on personal impacts and easier actions, to 'deep', engaging with social impacts upon the ocean and more costly or public actions (Buchan *et al.*, 2023). Buchan *et al.* (2024a) found that a person who has formed a marine place dependency engages more deeply in active marine citizenship. Marine place dependency is more than simply enjoying the ocean, the marine environment is needed by a person to fulfil important aspects of their life.

Reflecting the empirical evidence and the importance of deep ocean connections for active marine citizenship, it has been proposed that a marine identity process might be the key to motivating marine citizenship action (Buchan *et al.*, 2024a, 2024b). This is when the ocean has become an important part of the sense of self.

Marine identity process theory recognises the potential role of the ocean in the formation and maintenance of the sense of self and is based upon a well-established psychological theory of identity development (Breakwell, 1993). When identities are threatened, the identity process is triggered to manage information that is new or conflicting with the sense of self (Jaspal and Breakwell, 2014). This is the mechanism which is proposed to be the driver of marine citizenship action when a positive relationship with the ocean is challenged by its degradation.

Identity process theory has four elements which can be supported by place (Buchan *et al.*, 2024a; Twigger-Ross and Uzzell, 1996):

- **Self-esteem:** Positive evaluation of oneself and group
- **Self-efficacy:** Ability to meet situational demands
- **Distinctiveness:** Unique relationship with the marine environment, distinctive from others
- **Continuity:** Emotional connection with the characteristics of place and over time

There is clear synergy between the identity process theory elements of self-esteem and self-efficacy and the personal and skill development outcomes within the ASTO ToC. Distinctiveness is easily conferred by the relatively unusual, unique experience of sailing. Continuity would be particularly evidential through longer-term engagement with the ocean by former trainees, and hence an evaluation of marine identity process requires longitudinal studies.

Logic Model

The frameworks described above have synergies and overlaps and the logic model seeks to reduce duplication. The logic model (Figure 4) is a graphical representation of the ToC, summarising the pathways that deliver the aspired outcomes, together with the corresponding evidence and underpinning theory. The model brings together:

- **Inputs** – these reflect the resources, assets, and skills that underpin every voyage experience. Inputs feed into every activity that occurs in the voyage setting.
- **Activities** – these occur as part of the voyage either implicitly, for example the sensory experiences on being on the water and the changeability of conditions at sea, or explicitly, such as in the case of trainees doing scientific sampling or sail training. Activities directly promote short-term outcomes and the evidence for these connections are drawn from the various frameworks outline above.
- **Short-term outcomes** – these are the most measurable outcomes which align with the mission, values and vision of PoL. Evaluation is primarily designed to evidence the meeting of short-term outcomes but can also include assessment of how well specific activities are the cause of those outcomes.
- **Long-term outcomes** – these include the more sustained aimed for outcomes for trainees such as career prospects and marine citizenship. The connections between the short-term and long-term outcomes are underpinned by the frameworks used in this project and as such have theory and/or empirical evidence to support them. Follow-up evaluation may be able to provide some insight as to the achievement of long-term outcomes but these are more difficult to measure and to attribute to the voyage and short-term outcomes.

Although there are some clear connections between inputs and activities or short-term outcomes, such as the ocean setting and practical ocean science or formative ocean experiences, the inputs should be taken as a whole in enabling the activities and delivering the short-term outcomes. The flow of the logic model identifies clear pathways (arrows) from inputs, through specific activities and the nature of the voyage experience, to short-term outcomes for trainees. It is short-term outcomes and how the activities influence them that are the primary goal for the pre- and post-voyage evaluation. The logic model also indicates which of the underpinning frameworks and evidence that connect the short-term outcomes with the long-term outcomes which are key to the Mission of PoL. The collective evaluation of short-term outcomes together with follow-up evaluation will help to grow an evidence base for the achievement of these long-term outcomes.
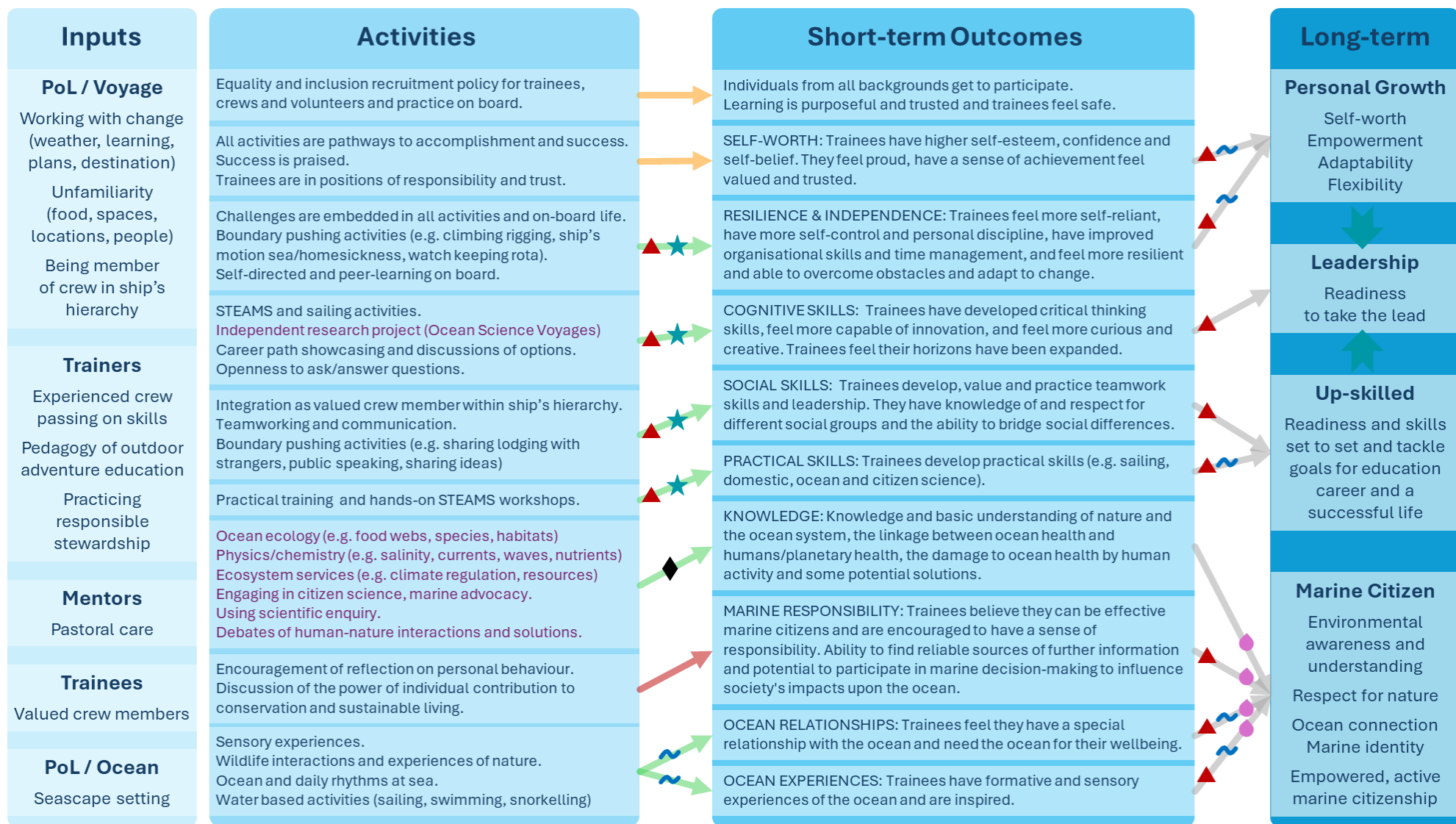
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Figure 4 Logic model presents the new, extended theory of change. Most of the activities are common to all voyages, with the exception of those highlighted in purple: (1) Ocean Science voyages include an independent research project; (2) STEAMS intensity and depth increases between voyage types and duration from Ocean Awareness through STEAMS to Ocean Science voyages.

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