

A Novel, Integrated Curriculum for Dental Hygiene-Therapists, and Dentists

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Abstract

Introduction

In certain communities patients may struggle to find access to adequate dental treatment. One proposed strategy to help meet population need is to train more dental hygiene-therapists. However, established attitudes and hierarchies, along with a lack of clear understanding of different roles within some general practice environments, has led to under-utilised shared-care approaches. Integrating dentists and dental hygiene-therapists in undergraduate education may be an effective approach to promote inter-professional education, dispel inappropriate biases and hierarchies, and nurture team working from an early career stage. As such, we have developed a novel BSc Dental Therapy and Hygiene (BDHT) curriculum, which is integrated with the Bachelor of Dental Surgery (BDS) programme.

Aims

The aim of this paper is to describe how two separate BDHT and BDS undergraduate programmes have been uniquely integrated, and to share areas of best practice.

Design

The BDHT curriculum was developed based on our established BDS programme introduced in 2013 and is novel in two respects:

- BDHT students complete their academic and clinical training jointly with BDS students, and are assessed and trained to the same standards.
- Our patient-centred, primary care clinical training model is designed to prepare BDHT graduates to work under direct access

Results

Key success indicators of the integrated BDHT-BDS programmes are:

- Award of GDC sufficiency.
- 100% BDHT graduate employment.
- 100% BDHT final year pass rate.

Conclusion

Inter-professional education is an established pedagogic approach to inhibit the formation of hierarchy and barriers that impede collaborative care. Our BDHT programme is the first of its kind to embed inter-professional education through the entirety of both the BDHT and BDS course structures and be entirely integrated. Further studies are required to provide quantitative and qualitative data to validate the success of our new integrated training programme. This paper presents our curriculum journey, from conception, to design, implementation, and review. It describes our vision and its relevance for the future of inter-professional dental education.

In Brief:

1. For effective patient-centred care, collaborative practice should be experienced from the beginning of a career in dentistry: undergraduate training.
2. Pressures on course providers from population need and an unstable financial climate mean that an integrated, inter-professional training programme, where hygiene-therapists and dentists train together, may offer an attractive proposition to UK dental schools.
3. We describe a novel, integrated Bachelor of Dental Surgery / BSc (Hons) Dental Therapy and Hygiene undergraduate training programme, successfully graduating two cohorts of BDHT with 100% pass rates and employment, and share our experience and areas of best practice.

Introduction

An ageing population with increasingly complex treatment needs poses unprecedented challenges for healthcare services¹. To meet these challenges, clinicians are expected to provide patient-centred care in a collaborative, interdisciplinary team environment. To facilitate access to collaborative dental care, a range of dentist and dental hygiene-therapist models of shared care have been proposed, which aim to increase the productivity of the dental workforce, optimising efficiency and the time available for dentists to carry out more complex, specialist treatments².

The introduction of Direct Access in 2013 in England permitted dental hygiene-therapists to work without the prescription of a dentist³. Dental hygiene-therapists are now able to carry out a broader range of treatments with increased responsibility, including treatment planning and diagnosis. Nevertheless, despite studies suggesting that oral health inequalities could be addressed by the utilisation of dental hygiene-therapists², many dentists may continue to carry out routine dental treatments that could be referred to a dental hygienist or therapist^{4, 5, 6}.

According to previous reports, barriers to effective collaborative healthcare include; a lack of understanding of each other's roles, establishment of hierarchies, and unfounded preconceptions about each other's place in the provision of care before entering clinical practice.⁷ These ideas can be further confounded by detrimental views held by staff delivering educational programmes^{8, 9} (the hidden curriculum), and according to behaviourist and social cognitive theory, environment heavily influences long-term learning and behaviour^{10, 11, 12}. In order to address these issues in practice, they must be tackled at the earliest stage of their careers i.e., undergraduate training.

In traditional dental undergraduate curricula, student dentists and dental hygiene-therapists are taught on separate programmes, often by different staff. Throughout their training, these students may never encounter one another, yet they are expected to practice collaboratively on graduation. In such a training programme, any understanding of each other's professional roles is serendipitous at best, purely theoretical at worst. Structuring a curriculum such that all learning is shared by the two dental professions and is designed to facilitate inter-professional collaboration from the outset, moves these types of vital precepts from chance to core outcomes of the programme. Indeed, the Sydney Inter-professional declaration states that *"health education and training prior to practice shall contain significant core elements of inter-professional education"*¹³.

In the UK, there are plans to reform dental education and training. This includes identifying novel training pathways, "up-skilling" dental care professionals (The "Skills Escalator"), and a shift towards a multi-disciplinary dental team approach¹⁴. Dental hygiene-therapy training has come under the spotlight in view of NHS England's 2017 workforce planning document¹⁵, and mounting pressure on universities, government and health services to make efficiency savings in a turbulent financial climate. In response, we aimed to address these challenges by developing a BSc Dental Therapy and Hygiene (BDHT) curriculum that is fully integrated with Bachelor of Dental Surgery (BDS) training programme, based in a primary care setting, with treatment planning as the central tenet. By describing our curriculum, we aim to share areas of good practice in an integrated BDS-BDHT programme, from which other schools may be able to consider those elements that would be suitable for implementation in their own programmes.

Aims

As education providers, we have a duty to prepare our graduates to practice within the modern dental workforce. The aims of this new programme therefore were to: (i) prepare graduating hygiene-therapists to work under direct access and able to treatment plan independently and (ii) prepare dentists and hygiene-therapists to offer patient centred care and refer within the dental team. These aims were

specifically achieved by designing an enquiry-based curriculum to develop an understanding and application of biomedical sciences in clinical practice; develop skills in the provision of patient-centred clinical care; and most importantly, integrating BDHT and BDS students throughout their studies.

Design

Integrated BDHT-BDS curriculum design

In 2013, the school's BDS programme changed from a 4 year, graduate entry to a 5 year, undergraduate programme, affording us a prime opportunity to develop an integrated BDS – BDHT training structure. The BDS programme, featuring early clinical experience, is taught through student-centred Enquiry Based Learning (EBL) sessions, supported by plenaries, workshops, and self-directed learning, which follows a spiral structure^{16,17,18,19}. Initially, the BDHT curriculum was designed to align with GDC learning outcomes and scope of practice. Next, shared learning outcomes for both programmes were identified, and for each year, a weekly integrated programme was constructed (Figure 1). Along with BDS, BDHT students took modules in the following categories: Clinical Practice, Integrated and Applied Dental Sciences, Professional Development, Clinical Audit, Inter-professional and community engagement, and Specialist Visits (Figure 2).

Integrated curriculum content was aligned to markers of quality IPE as set out by Thistlethwaite and Nisbet²⁰ (Appendix A). Where elements of clinical practice extended beyond the scope of BDHT, the focus changed from shared content learning, to team-based teaching and learning (Figure 2). Over the three-year programme, integration provided students ample opportunity to discuss shared care, scope of practice, and their roles within the dental team. In the following sections, we will describe the individual elements of our integrated curriculum.

Integrated BDHT - BDS clinical skills and practice

Simulated Dental Learning Environment

Clinical skills acquired in Year 1 were within the scope of practice of both BDS and BDHT, thus, students were integrated in 100% of clinical teaching, learning, and assessments. Each student was paired with a clinical partner; in year 1, BDHT students were paired with a BDS student. Unique to our curriculum, BDS and BDHT students begin patient treatment in year 1. In preparation, students were introduced to clinical dentistry and patient management in the simulated dental learning environment (SDLE). Students were required to pass a capability assessment for all procedures in the SDLE before carrying out that procedure for patients. During Year 2, students shared learning until BDHT had passed all capabilities within their scope. At this point, BDS continued their SDLE education, whereas BDHT, with the exception of remediation and consolidation exercises, progressed to clinical experience for the remainder of their course.

Clinical practice

To simulate general practice, final year students from both programmes were integrated on clinic (Year 3 BDHT, Year 5 BDS). Our primary care based training model^{16, 17, 18, 19} meant that students needed to plan and deliver a course of treatment dependant on the needs of the presenting patient. This structure enabled BDHT and BDS students to practice shared care, referring patients vertically and horizontally within the dental team. Concurrently, they achieved targets for completion of specific procedures and capabilities, and achieved proficiency in a practice setting, as evidenced by completion of Integrated Structured Clinical Examination (ISCE)²¹ and Exit Case presentations at the end of the programme. Learning in a primary care environment ensured that our students gained experience in simulated general practice settings and could treatment plan to their scope, recognise their own limitations, and refer appropriately.

Integrated BDHT-BDS Life sciences

Working under Direct Access, dental hygiene-therapists may be the first point of contact for patients within the healthcare system. Therefore, they must be able to recognise signs of systemic disease, understand the implications of medical problems and prescribed medications on the provision of dental care, be confident in explaining treatment options to patients, and know where and when to refer to the wider healthcare team. This is much like a general dentists' knowledge of specialist areas beyond their scope, such as oral surgery, pathology, and orthodontics.

The Integrated Dental Science (IDS) module in Year 1 introduced students to the basic and clinical sciences that underpin contemporary dental practice. The principles of disease prevention, ionising radiation, and safety of dental materials were explored, to align with the clinical experience they encountered early in the curriculum. In this module, BDHT and BDS students (100% integrated) shared all teaching, learning and assessment. In Year 2, divergence in scope of practice, and the limited amount of time DTH students have to train relative to BDS students, meant that 25% of the life science sessions were dedicated to BDHT students alone. Content focused mainly on the pathophysiological mechanisms, oral manifestations, and recognition of, human diseases (75% integrated). In Year 3, the life sciences were 100% BDHT specific for similar reasons. Sessions were structured in a clinical context via a series of plenaries, forming part of their student-centred learning cases, and focused predominantly on pathology of human and oral diseases.

Integrated BDHT-BDS assessments

Learning outcomes and assessments for the two programmes were mapped to the consensus points determined in the Inter-professional learning consensus paper report¹³ (Appendix B). All assessments were subject to rigorous standard setting using the Angoff and Hofstee methods²², supported by faculty psychometricians. Contributions to these methods from staff teaching on both programmes ensured an ethos of integration and collaborative practice ran throughout all assessment processes, as well as throughout teaching. This was critical not only to the thorough assessment of both BDS and BDHT students, but also to making integration salient to all teaching staff, thus discouraging any barriers to inter-professional education rooted in the preconceptions of staff. Students who failed an assessment were offered a structured remediation programme.

Multiple Choice Questions (Integrated Dental Science)

In Year 1, scientific knowledge was assessed by single-best answer multiple choice question assessments once per term (three sittings annually). Each test comprised 60 questions. All students, regardless of programme, were expected to attain the same score to pass the assessment (same scope, same standard). Assessments were mapped to a blueprint of the curriculum content, and were designed to directly test knowledge of biomedical sciences covered up to that point in the programme. Performance on these tests formed part of the criteria for progression to Year 2.

Progress Testing (Applied Dental Therapy Knowledge)

Progress testing is an established form of assessment in problem-based medical curricula, and provides a longitudinal assessment of the development and sustainability of students' knowledge at regular intervals over the duration of an educational programme²². Progress tests for both programmes were administered on three occasions annually (once per term). Each progress test was standard set to the level expected from newly qualified graduates as outlined by the GDC, and progress indexed by a steady increase in scores

achieved. BDHT students in Years 2 and 3 were required to sit all three tests and their performance of these tests contributed to their progression in the programme. Each test was based on 100 single best answer, multiple-choice questions. The questions were aimed at testing the application, analysis, and synthesis of knowledge rather than simple factual recall. Structured and immediate feedback was provided to the students after each sitting, allowing them to identify gaps in their knowledge and receive support from their academic tutors.

Exit Case Presentations

Year 5 BDS and Year 3 BDHT students were required to prepare an Exit Case presentation to demonstrate competency in clinical treatments they had provided during their placements on clinic. All aspects of patient assessment, treatment planning, and treatment delivery were carried out by the student (working under supervision), and recorded on a clinical database. The students then presented and reflected on the clinical management of their patients in a summative examination, assessed by a pair of examiners at the end of the final year. Shared care was incorporated into the assessment criteria to re-emphasise its importance.

Integrated Structured Clinical Examinations

Final examinations for the BDS and BDHT students included an integrated structured clinical examination (ISCE). Unlike an OSCE, which often tests individual skills on separate stations (e.g. history taking, examination), the ISCE aims to represent the real-life clinical situation more authentically by having longer stations at which students must demonstrate complex combinations of skills on interlinked sub-stations in major clinical disciplines^{21,24}. An ISCE station involves multiple aspects of management on a single patient such as assessment, diagnosis, operative skills, follow-up and referral under the themes of paediatrics, restorative dentistry, periodontal disease and direct access.

Summary of integration

In year 1 our students are 100% integrated with BDS for all of their teaching. In Year 2 they have separate EBL sessions, and approximately 50% of life sciences teaching shared with BDS year 2, but 100% integration of plenaries and SDLE teaching up to their scope. Finally, in Year 3 they have separate daybooks (EBL) and plenaries, but are 100% integrated with year 5 BDS on clinic (4 days per week), also undertaking their ISCE and Exit Case presentations together. Thus the extra training for BDS in years 2 to 5 relates to acquiring clinical skills, in relation to, for example, endodontics and prosthodontics, and the scientific knowledge that underpins them via the teaching techniques we describe.

Results

Two cohorts of the BDHT programme have graduated successfully and the BSc programme was awarded sufficiency by the GDC in 2017. Thus far, 100% of students reaching Year 3 have graduated. In terms of standards, this means that BDHT students have achieved, within their scope, clinical skills and targets set to the same assessment criteria and standards as BDS. Similarly, 100% of students passed their progress tests, Exit Case, and ISCE assessments, with successive cohorts showing increasing scores on average, with higher numbers of students attaining 'Excellent' grades in our second co-hort. These results demonstrate that graduating BDHT students are able to treatment plan, refer and offer shared care, to the same standard (up to their scope of practice), as a graduating dentist, as a result of the described training programme.

Throughout the programme, BDHT students consistently demonstrated competency in clinical assessments, regardless of their experience and qualifications prior to enrolment (unpublished data).

Comparison of student performance in integrated and non-integrated EBL groups (BDHT and BDS *versus* BDHT alone) in Year 1 suggest that when working in integrated groups, student performance significantly improved relative to those studying in non-integrated groups. This effect was particularly pronounced for BDHT students (manuscript under review).

Finally, from our first two cohorts 100% of graduates have been employed in dental hygiene-therapy measured within the first 3 months of graduation, thus already bolstering work force requirements. Follow up studies will be required to demonstrate whether BDHT graduates can contribute to a sustainable and flexible dental work force in the long term.

Discussion

This is the first paper to describe the successful integration of BDHT and BDS programmes, as evidenced by GDC sufficiency, 100% final year pass rate on all assessments and 100% employment. As we are the only UK undergraduate dental school to implement a fully integrated programme, one of our aims was to share areas of best practice and provide guidance to other UK schools, and beyond, developing integrated curricula in order to avoid pitfalls and barriers. Other dental schools in England appear to be in agreement with this model of dental undergraduate education²⁵. Given that all students passed all final year assessments, we can be confident that this has been an effective approach in training students adequately to offer Direct Access. Unfortunately at present, Direct Access is not widely used in England and we consider that legislation needs to change to fully accommodate the skills of a hygiene-therapist. We are gathering data from current and recently graduated students, which will form the basis of future empirical evaluative work with respect to what skills our former graduates go on to offer within the workplace.

For an integrated curriculum to be successful, it is imperative that where there is shared scope, it is taught and assessed to the same standard. Nevertheless, entry requirements are different for BDS and BDHT students (A*AA - AAB at A-level, and ABB, or equivalent, respectively). In Year 1 Integrated Dental Science module assessments, we have observed that the majority of BDHT students perform as well as the BDS students, despite having a broader range of prior qualifications. However, some students achieved assessment scores below the required standard, and required remediation and re-sit opportunities. To address this, we: set up early “red flag” remediation sessions; provided subject specific revision sessions to those who were required to sit an additional IDS assessment; developed a pathway for entry via a foundation year (integrated with human biology students). Following these interventions, student performance in IDS assessments has improved, and all students who reached Year 3 of the course have graduated. To offer further support, we have developed a pre-enrolment on-line short course to allow students applying without traditional A-levels to develop their knowledge of key elements in the first year of the scientific programme, such as basic cell biology, physiology, and biochemistry.

It is well established that staff teaching on integrated programmes can pass on their own biases and misconceptions, consciously or otherwise^{8,9}, of a dental hygiene-therapists role. There can also be fear from a dentist’s perspective that their role could be superseded by hygiene-therapists ‘less well trained’ than themselves^{5,6}. To avoid this pitfall, we conducted staff briefing sessions and curriculum review groups to share scope of practice and the vision of the programme. We also provided lists of scope of practice to be available on clinic for supervisors, and ensured that there was a hygiene-therapist supervising clinical sessions. The perceptions of our staff appear to have changed over time and future work will aim to quantify the experiences of staff and students. It should also be noted with respect to briefings, curriculum review, and changing attitudes that the teaching and administrative demands of the integrated programme were and are met by existing staff. No new appointments were made, and BDHT specific responsibilities such as module leadership and representation were taken on by existing staff.

Limitations of this report include that; the findings may be of particular relevance to graduates in England working under Direct Access, or students training in a primary care model. Implementation may also be more challenging for established dental schools, or schools outside of England working under different regulatory systems. Nevertheless, possible impending changes in legislation across the globe may mean that in the future, elements of our integrated model could provide a point of reference when developing new dental hygiene-therapist training programmes.

As a result of our experience, we make the following recommendations for any school wishing to implement the integrated BDHT-BDS programme we describe:

- Make sure all staff are well briefed in the requirements of a modern Dental hygiene-therapist, understand the scope of practice, and are aware of any unconscious biases they may hold.
- Provide early remediation (transferable study skills and subject specific knowledge) if any science assessment scores are low.
- Provide a pre-enrolment course, or other learning materials, for prospective BDHT students who feel they would like to improve their understanding of the life sciences before starting the programme.

Conclusion

We have described the structure of a unique BDS-BDHT integrated programme that prepares graduating BDHT students to treatment plan independently. Whilst it is noted that there are barriers in the delivery of Direct Access care to patients, it is crucial to train our students to be ready to practice direct access. Our training model has been undertaken and established in a relatively new dental school in England and both BDHT and BDS students were trained in patient centred care and referral within, and outside of, the primary dental teams. This paper offers preliminary evidence that an integrated BDS-BDHT programme can be successful. This course is in its infancy; we now aspire to move forward with further studies to provide qualitative and quantitative data to assess and validate the success of our integrated education model, as well as career pathways beyond the first year after graduation. Future research should be aimed at exploring the relation of undergraduate curriculum design to work force needs and the changing roles of both dentists and dental hygiene-therapists, not only within the UK but across the globe. In any country where there are difficulties regarding access to oral healthcare, an integrated, inter-professional training programme, where hygiene-therapists and dentists train together, may offer an attractive proposition for increasing the number of service providers within the healthcare profession..

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Figures

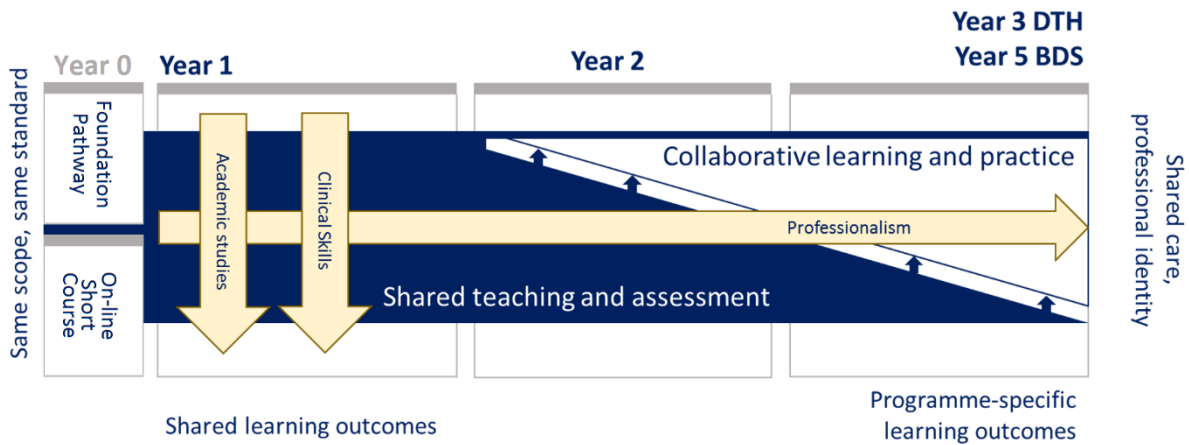


Figure 1: Schematic representation of the structured integration within the Bachelor of Dental Surgery and BSc Dental Hygiene-Therapy programmes at Peninsula Dental School. Yellow arrows indicate core knowledge themes, such as clinical skills and the underpinning academic studies that span both programmes. Professionalism runs throughout both programmes. Blue arrows represent the feed-in of continued shared learning to collaborative practice.

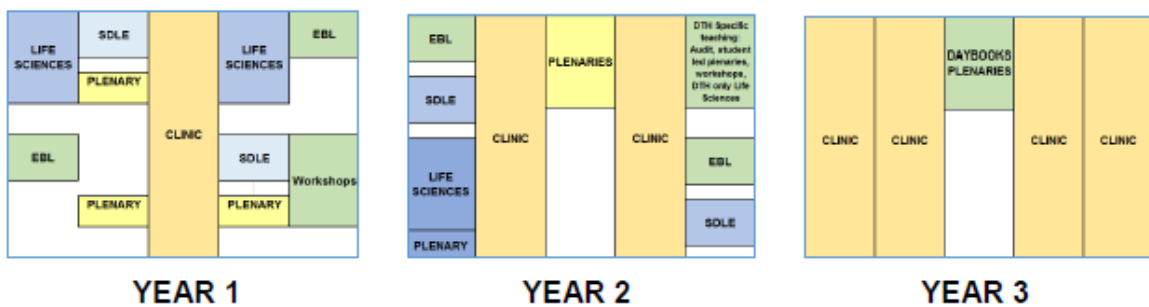


Figure 2: Schematic representation of the structure of the weekly programme for the Bachelor of Dental Surgery and BSc Dental Hygiene-Therapy programmes at Peninsula Dental School.

Appendix.

Appendix A: How markers of quality IPE²⁰ are met in the BDHT programme

Marker of quality IPE	Where is it met in the BDHT programme
Learning is common across professions	All of Year 1 teaching, learning and assessments, both clinical and knowledge based are shared. This continues into Years 2 and 3 of the BDHT programme and Years 3, 4, and 5 of the BDS programme, where the focus develops from its foundations in shared learning, into shared practice
Participants compare and contrast their roles	<p>Enquiry based learning (EBL) cases are designed specifically to facilitate discussion of professional roles between the students, and how shared care could be managed. Students explore their respective scope of practice in dedicated teaching sessions, which can be further explored in self-directed learning and in cross-profession friendship groups. Students can then take their theoretical knowledge of scope and professional roles into practice. Clinical sessions are always run with a mixture of both BDS and BDHT students, where students can practice vertical and horizontal patient referrals and shared care. Early clinical exposure in the Peninsula curriculum means that these habits can be formed from year one of their studies.</p> <p>Furthermore, assessments are constructed to address professional role and scope of practice. Applied knowledge tests feature items structured to test their knowledge of professional roles and scope of practice, and include collaborative practice. Final exit examinations include referral items, and exit-case presentations provide opportunity for the students to explain to examiners how they implemented shared care in their treatment and planning.</p>
Learning is interactive	The curriculum is designed to be interactive at every opportunity. Enquiry based learning sessions are driven by the students (with a facilitator present). Small group life sciences sessions facilitate the discussion of biomedical

	<p>sciences that underpin clinical practice, and typically include multiple formative exercises such as spotter tests and formative multiple-choice questions tests. The students' on-line digital learning environment forums form a large part of the EBL case discussions.</p>
<p>Learning should involve reflection</p>	<p>As part of the professionalism modules that thread throughout the curriculum, students undertake a Regular Portfolio Assessment (RPA), which includes reflective writing, gathering and reflection of multi-source feedback and development of a professional development plan. EBL cases are followed by individual student feedback, giving students the opportunity to reflect on their performance during these sessions. Current research in investigating the effectiveness of immediate reflection after completing a capability is on-going at Peninsula (McIlwaine <i>et al</i>, manuscript in preparation).</p>
<p>Activities include experiential learning</p>	<p>Experiential learning is implicit through the entire curriculum for both programmes; both on clinic, and in academic sessions The importance of tacit learning means the programmes were designed such that students continuously experience collaborative learning and practice from the first to the final day of studies. This is particularly apparent through the clinical partnering of BDHT and BDS students in Year 1, where they are able to explore each other's roles, and see for themselves the equal standards of treatment provided by both sets of students.</p>
<p>Planning involves an inter-professional team</p>	<p>The BDHT programme was designed and delivered by a core academic team consisting of a range of clinicians including hygiene-therapists, dental nurses, and dentists, along with psychologists, psychometricians, and research-active scientists,</p>
<p>Learning outcomes include collaboration between professions</p>	<p>Specifically designed learning outcomes in EBL and daybook cases explore collaborative practice, roles and responsibilities, and scope of practice. These are translated into the clinical environments. Specific assessment items are also included (see appendix B).</p>

Activities should challenge stereotypes	Integration at day one means that students face shared challenges and have the opportunity to see the value of everyone’s contribution, regardless of prior experience. BDHT and BDS students work, socialise, and study together, facilitating establishment of friendship groups, and the students should graduate with an established professional network. Opportunities to explore roles and responsibilities are offered throughout, preventing build-up of stereotypes and hierarchies. The curriculum is designed to espouse, emphasise and embody the message: “Same scope, same standard” .
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Appendix B: Practical experience and direct assessment, both formative and summative, of inter-professional learning outcomes in the BDHT curriculum, mapped to the consensus points determined in the IPL consensus paper report¹³

Consensus point	Practical experience	Direct Assessment
Understanding roles	EBL sessions, SDLE, clinical practice	IPE subject specific ADK and ADTK questions, a team-working module assignment, exit case presentations and ISCE stations specific to shared care and scope of practice.
Inter-professional communication	Day to day in all modules and clinical experience	Clinical targets for shared care and referral letters, exit case presentations, team working module reflective writing assignment, and ISCE stations.
Inter-professional values	EBL sessions, clinical practice, community engagement and team-working projects	Inter-professional values are assessed as part of a reflective writing assignment within team working module.
Coordination and Collaborative decision making	EBL sessions, SDLE, clinical practice	Daily on clinic - working with clinical supervisors, clinical partners, nurses, and referring to and receiving referrals from BDS students.
Reflexivity	All modules and clinical experiences throughout the programme.	Regular portfolio appraisals (part of the professionalism modules) involving reflection on multi-source feedback, critical incidents and personal development plans. Students are also required to reflect on EBL performance feedback grades. In addition, students undertake a reflective writing assignment in the team working modules, and daily on clinic via feedback from clinical supervisors and immediate reflection.
Teamwork	Clinical practice, EBL sessions, SDLE, team-	Students are required to demonstrate their understanding and practice of

	working and community engagement modules.	teamwork during exit case presentations, specifically designed ISCE stations, and reflective writing assignments in team working modules.
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