Bioinformatics Scientist Degree Apprenticeship (ST0649)
Level 7 End-point Assessment Plan (non-integrated)

Introduction and Overview

This document sets out the requirements for end-point assessment (EPA) for the **Bioinformatics Scientist Level 7 Degree Apprenticeship** standard. It is written for end-point assessment organisations who need to know how the EPA for this apprenticeship must operate. It will also be of general interest to Bioinformatics Scientist apprentices, their employers and training providers.

The structure of this apprenticeship is designed to develop the knowledge, skills, and behaviours required by the Standard to ensure that apprentices are appropriately prepared to undertake the EPA and occupationally competent to perform the Bioinformatics Scientist job role.

The Bioinformatics Scientist Standard will **take 30 months to complete**: with the first 24 months being dedicated to the on-programme training/assessment element – leading to a Master's degree; and the end point assessment undertaken in the final 6 months.

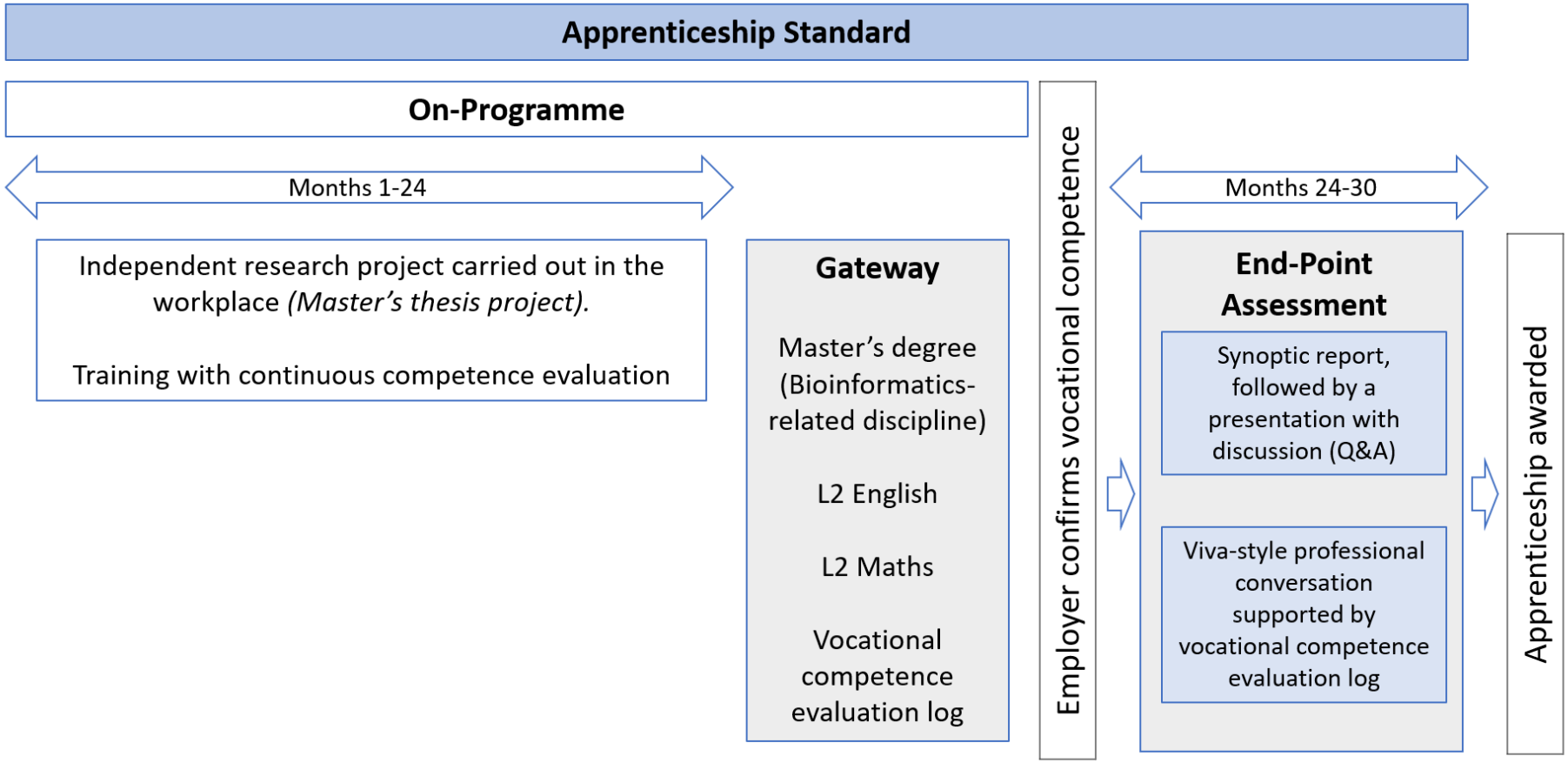
Completion of this Master's degree is a gateway requirement for starting the EPA, along with English and maths at level 2 - achieved either before or during the apprenticeship, and the completion (and sign-off) of the vocational competence evaluation log (log). The employer must confirm that the apprentice has completed the gateway requirements and is ready for the EPA.

The HEI which offers the Master's degree component of the apprenticeship training will be required to be listed on the Register of Apprenticeship Training Providers (RoATP). Those offering the independent end-point assessment for this apprenticeship must be an organisation on the Register of End-Point Assessment Organisations (RoEPAO), which is approved to deliver EPA for this apprenticeship standard.

The EPA consists of 2 distinct assessment methods:

- **A synoptic report, followed by a presentation with discussion (Q and A)**
- **A viva-style professional conversation supported by a vocational competence evaluation log**.

Apprentices cannot complete the apprenticeship successfully without passing the EPA. Performance in the EPA will determine the apprenticeship grade of fail, pass, or distinction.



End-point Assessment Gateway

The EPA should only start once the employer is satisfied that the apprentice is consistently performing at or above the level set out in the standard, the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPA organisation. Employers should take advice from their apprentice's training provider(s).

Master's Degree

Apprentices must complete a Master's degree in a subject related to, or aligned with Bioinformatics, which will provide suitable training opportunity for the apprentice to meet the requirements of the standard.

The type of Master's degree (style/mode of delivery) varies between HEIs, and will be part of the choice made by the employer when selecting a provider for this apprenticeship - for example:

- Master of Science (MSc)
- Master of Philosophy (MPhil)
- Master of Research (MRes)
- Master of Science by Research (MSc by Research)
- Master of Studies (MSt)

The range of Master's degree qualifications may be used allowing employers/apprentices the flexibility to tailor the apprenticeship to meet their needs, whilst meeting the minimum requirements of the apprenticeship standard. All will provide access to taught-course material and support to undertake a significant individual research project in the workplace.

Vocational Competence Evaluation Log (log)

A summary record of on-programme vocational competence evaluation, signed off by the apprentice's employer (normally the apprentice's manager), must be recorded in a log. This reflects the industry practice of competence management through on-going employer competence evaluation.

A log must list what evidence was used to confirm the apprentice demonstrated competence, where it is recorded, how it was evaluated and by whom, against all KSBs in the apprenticeship standard.

There is no need to capture the evidence itself in the log. However, the log must provide a reference to where the evidence is held. Typical evidence may include for example: taught course/module assessment; outcomes from regular HEI/employer supervisory/mentoring meetings; a company workbook; performance review record; certificates of training; and aspects of the workplace synoptic project as assessed during the Master's degree.

The log will be used during the EPA to support the viva-style professional conversation.

This must be completed, signed off and must be provided to the EPAO at gateway in order for EPA to go ahead.

The vocational competence evaluation log should be a written record comprised of a table as shown (in **table 1**.) in the example overleaf. Each row must correspond to one of the KSBs set out in the Apprenticeship Standard, and in appendix one of this assessment plan.

Dates should be noted for when a particular knowledge, skill or behaviour has been taught/learned – and when it has been demonstrated. A pointer to relevant evidence should be noted (for example - Coursework assignment, the MSc thesis, workplace meeting, project report, presentation to colleagues etc). Each entry should then be signed off by the Apprentice's manager.

Table 1. Guideline format for the Vocational Competence Evaluation Log

KSB	Date		Evidence note	Manager's signature & date
Knowledge	**learned**	**demonstrated**		
The technical limitations and the underlying biological and experimental assumptions that impact on data quality.				
Skills				
Recognise and critically review the format, scope and limitations of different biological data				
Behaviours				
The need to be enthusiastic, self-confident, self-aware, empathic, reliable and consistent to operate effectively in the role.				

English and Maths Level 2

Apprentices without level 2 English and maths will need to achieve this level prior to taking the end-point assessment. For those with an education, health and care plan or a legacy statement the apprenticeships English and maths minimum requirement is Entry Level 3 and British Sign Language qualification are an alternative to English qualifications for whom this is their primary language. Apprentices may achieve these either before or during the apprenticeship, but this achievement must be before completing the EPA.

End-point Assessment Methods, Timescales and Location

EPA methods must be successfully completed during a maximum 6-month period. The EPA assessment consists of 2 distinct assessment methods:

- **A synoptic report, followed by a presentation with discussion (Q and A)**
- **A viva-style professional conversation supported by a vocational competence evaluation log**.

The table in appendix 1 shows the KSBs that will be assessed by each assessment method.

Requirements for each assessment method are detailed below.

1. A synoptic report, followed by a presentation with discussion (Q and A)

For the EPA, the apprentice will be expected to produce the **synoptic report** – a significant written report in which the apprentice must reflect on, and summarise the operational context of carrying out bioinformatics-related duties in the workplace.

The report should bring together a summary of their experiences gained throughout the apprenticeship (on-programme and in the workplace), showing *reflective and critical analysis* of how bioinformatics is carried out in the specific workplace *and* broader scientific and operational context of the industry in which the apprentice works.

The **synoptic report** must be 6,000 words +/-10%, excluding tables, figures, references and annexes. The scope of the report must cover, but need not be limited to:

1: Planning, Design and Organisation

The approaches the apprentice used to plan and design bioinformatics work including recognition of resource implications, legal and regulatory compliance, ethics, risk assessment, and other work-based and stakeholder requirements.

2: Review of other practices

There may be aspects of the role of bioinformatics scientist that have more focus in some workplace settings than others. As an apprentice should have broad knowledge and skills across all areas, they should specifically review aspects of their practical experience against what may be required in other bioinformatics roles.

3: Practical implementation

A critical review of the implementation of bioinformatics work and analyses during the apprenticeship, including comment on competent experimental design, recognition of regulated and good working practices and recording of work. In particular, apprentices should reflect on how technical recording in the workplace could be used, or was used in practice, to feed back into the planning and implementation process.

4: Communication and Collaboration

Apprentices should critically review their experiences of timely and concise reporting of bioinformatics work including data analysis, observations and conclusions. As bioinformatics is often carried out in collaboration with scientists in other/related disciplines, they should particularly comment on the workplace requirements, and practical challenges of communicating such scientific information to colleagues.

Apprentices should be allowed 20% of their time to work on the synoptic report and preparation for the presentation and discussion, this could be allocated as a block of time or as a weekly allocation depending upon agreement with the employer.

The **synoptic report must be submitted** electronically *(in Microsoft Word or Adobe PDF formats)* **within 3 months of commencement of the EPA period**.

After submission of the synoptic report, **EPAOs must schedule the presentation and questioning elements, to give an apprentice a minimum of 4-weeks' notice** of the time, date and venue.

The apprentice **must provide the presentation slides** *(in Microsoft Powerpoint or Adobe PDF formats)* **electronically to the EPAO within 2 weeks of the scheduled presentation date**.

EPAOs must ensure that the **presentation and discussion (Q and A)** elements of the EPA are conducted in suitably controlled environments i.e. the necessary equipment must be available e.g. computer and power-point facilities (if required by the apprentice). It is anticipated that EPAOs will use the apprentice's employer's premises wherever possible to minimise costs. The assessment may be conducted face-to-face or via an online platform e.g. video-conferencing. EPAOs must ensure appropriate methods to prevent misrepresentation are in place should an online option be used. For example, screen share and 360-degree camera function with an administrator/invigilator.

The presentation and the questioning elements must take place in the presence of an independent assessor and can include 1 or more technical experts as requested by the independent end-point assessor, from a list of qualified technical experts - created and maintained by the EPAO. The role of the technical expert is to provide a further independent audience for the apprentice to present to. Prior to the Presentation and Q and A the technical expert will support the independent assessor on reviewing the presentation contents, in areas that require more up to date expertise.

- The technical expert in attendance must be independent of the apprentice and the company that they are employed by.
- Technical experts are expected to be freelancers/contractors.
- Technical experts may ask questions during the presentation but may not be involved in input to the grading.

Prior to the Presentation and Q and A, the independent assessor must have reviewed the apprentice's presentation and prepared questions selected from the question bank for the questioning element. However, the questions may be modified to take into account the content of the oral presentation.

Apprentices must give a presentation covering the material included in the synoptic report. The presentation should have: clear title and overview slides; sections covering the 4 main topics of the synoptic report (Planning, Design and Organisation; Review of other practices; Practical implementation; Communication and Collaboration); slide(s) with clear summary observations; and final acknowledgement of any team members of collaborators.

The presentation must take 20 minutes (+ 2 minutes, at the assessor's discretion to allow the task to be completed appropriately).

- Apprentices can use presentation aids i.e. power-point, video clips, flip chart, work products, notes. Presentations should contain a maximum of 30 slides, including title, section and acknowledgement slides (there is no requirement to use 30 slides, but it is suggested that at least 15 slides are used). Apprentices who cannot meet this requirement and need reasonable adjustments can be accommodated, but this should be raised with the EPAO prior to the submission of the slides.
- EPAOs must ensure any reasonable presentational requirements are in place e.g. power-point facilities; apprentices must make any requirement requests to the EPAO at least 2 weeks prior to the scheduled date for the presentation and questioning.
- EPAOs must produce a question bank of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the specifications they contain, are fit for purpose. At the end of the presentation, the independent assessor must ask the apprentice their prepared questions (8 open questions) which should be taken from the question bank; follow up questions, not from the question bank and in addition to the 8 open questions, are allowed to seek clarification.

- Questioning must be completed during an additional 25-minute period (+2 minutes, at the assessor's discretion to allow the task to be completed appropriately).
- Questions must seek to assess KSBs (as detailed in Appendix 1 for this EPA method) that were not evidenced through the presentation and/or to ensure depth of understanding in order to assess performance against the distinction criteria.
- Apprentices may refer to their notes, presentation or presentation aides when answering the questions.
- The presentation and questioning audio should be recorded electronically.

The synoptic report will be reviewed before the presentation date. The presentation slides will be reviewed before the presentation takes place. The presentation will be marked and graded during, and immediately after, the presentation and questioning session. The synoptic report will be marked and graded in the two weeks after the presentation.

The grade for this assessment will be provided to the employer (and may be relayed to the apprentice) 2 weeks after the presentation has taken place.

2. Viva-style professional conversation supported by a vocational competence evaluation log

Apprentices will engage in a one-hour **viva-style professional conversation** with the independent assessor drawn from the end-point assessment organisation. The conversation will be focused on the apprentice's ability to demonstrate that the knowledge, skills and behaviours required by the Standard have been met.

The **vocational competence evaluation log** is completed on-programme and records activities and tasks undertaken by the apprentice during the apprenticeship period prior to the EPA gateway. The log ensures that the apprentice has experienced and documented all required KSBs of bioinformatics practice during their apprenticeship. During the conversation, the apprentice must have the opportunity to refer to the log and evidence referenced within it to evidence their answers. This signed log will be used as the gateway evidence that the employer has confirmed the apprentice has developed all the KSBs defined in the apprenticeship standard.

EPAOs must ensure that the conversation is conducted in a suitably controlled environment. i.e. quiet room away from the workplace, free from distraction and possible outside influences.

It is anticipated that EPAOs will use the apprentice's employer premises wherever possible to minimise costs. The EPAO may employ a technical expert to assist in the conversation process. The assessment may be conducted face-to-face or via an online platform e.g. video-conferencing. EPAOs must ensure appropriate methods to prevent misrepresentation are in place should an online option be used. For example, screen-share and 360-degree camera function with an administrator/invigilator.

Other Requirements:

- The duration of discussion should be 60 (+ 5 minutes at the assessor's discretion).
- The Vocational Competence Evaluation Log should form the basis of the Viva-style Professional Conversation. The format and requirements for the log are set out in the Gateway section above.
- The Apprentice may refer to the Vocational Competence Evaluation Log during the discussion.
- The EPA Organisation will create a bank of questions designed to assess the KSBs addressed by the Viva-style Professional Conversation EPA method. Questions will be asked from this

question bank and, as described above, the EPAO must produce a question bank of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the specifications they contain, are fit for purpose. There will also be the opportunity for the independent assessor to ask follow-up questions.

- The independent assessor must ask the apprentice 8 open questions from the agreed question bank.
- Questions will be 50% competency based and 50% scenario based.

The grade for this assessment will be provided to the employer (and may be relayed to the apprentice) 1 week after the viva-style professional conversation has taken place.

Apprenticeship Grading

Performance in both elements of the EPA will determine the apprenticeship grade of Fail, Pass or Distinction. An apprenticeship Pass represents full competence against the standard. A grade of Distinction means an apprentice is demonstrating competence above the Standard. The grading criteria are mapped to each element of the KSBs in Appendix 1. Both elements of the EPA must be passed in order to achieve professional competence against the Apprenticeship Standard.

The following outlines the combinations of assessment method grades to determine the overall EPA and apprenticeship grade:

FAIL: fail on 1 or more assessment methods

PASS: achieve at least a pass grade in both assessment methods

DISTINCTION: achieve distinction in at least one assessment method

Apprentices will be given their final overall grade 2 weeks after completion of the second assessment method, or by the end of the 6 month EPA period – whichever is earliest. The grade will be provided by the EPAO to the employer, who will notify the Apprentice.

Re-takes/re-sits

Apprentices who fail an EPA method(s) will be offered the opportunity to take a re-sit/retake. The employer will need to agree that a re-sit/re-take is an appropriate course of action. Any EPA component re-sit/re-take must be taken during the maximum 6-month EPA period; otherwise the entire EPA must be retaken. They are not offered to apprentices wishing to move from pass to

distinction. Re-sits/re-takes will not be awarded a grade higher than pass, unless the assessment organisation determines there were exceptional circumstances accounting for the fail. Apprentices should have a supportive action plan to prepare for the re-sit/re-take.

The End-point Assessment Organisations

An apprentice's employer must select an EPAO from the Education & Skills Funding Agency (ESFA) register of apprentice assessment organisations (RoAO), which is approved to deliver EPA for this apprenticeship standard. End-point assessment organisations must use appropriately qualified and experienced staff to conduct EPA. These individuals will be independent assessors who have not been involved in the education or training of the apprentice.

The EPAO, in discussion with the apprentice's employer, must draw up an EPA schedule. It must detail when the **Synoptic Report** must be submitted, the date(s) for the **Presentation & Discussion** and **Viva-style Professional Conversation** and the members of the assessment panel.

Requirements for Independent Assessors, Invigilators and Markers (as applicable)
EPAOs must appoint:

- An independent assessor to administer the Presentation and Discussion (and Q & A), and viva-style Professional Conversation.
- An independent assessor to mark and grade the Synoptic Project Report and Presentation and Discussion (and Q & A), and Viva-style Professional Conversation.
- The same independent assessor should mark and grade both assessment methods.
- Quality assurance staff to undertake moderation of EPA.
- Technical experts (as required) to support aspects of the End-point Assessment. Technical experts may be needed to provide the independent assessor with assistance or clarification regarding the content of the Synoptic Project Report, Presentation and Discussion (Q & A) or the Viva-style Professional Conversation, where the independent assessor requires more up-to-date expertise on a particular bioinformatics or industry/sector-specific topic. Technical experts will not be involved in the marking or grading of assessments.

Technical Experts must meet the following requirements:

- Currently active professionally in a Bioinformatics role in the industry (typically pharma, biotech or contract research organisation) with more than 5 years of experience, or if retired they must have worked within the industry in a bioinformatics role in the last 5 years.
- Be independent of an individual apprentice and the company employing the individual apprentice being assessed and must not be involved in the training of the apprentice.

Independent Assessors must meet the following requirements:

- Be independent of the apprentice, their employer and training provider(s) i.e. there must be no conflict of interest.
- Hold or be working towards an assessor qualification e.g. A1 and have had training from their EPAO in terms of good assessment practice, operating the assessment tools, standardisation and grading.
- Hold a qualification at level 7 or above in a technical discipline aligned to the subject of this apprenticeship standard.
- Have at least 3 years of experience in academic assessment at level 7 or above and experience of competency-based assessment
- Undertake a minimum of 1-days' EPAO standardisation training per year.

Quality assurance staff must hold or be working towards quality assurance qualifications. They must be independent of the apprentice, their employer and training provider i.e. there must be no conflict of interest.

Internal Quality Assurance

Internal quality assurance refers to the requirements that EPA organisation must have in place to ensure consistent (reliable) and accurate (valid) assessment decisions. EPA organisations for this EPA must undertake the following:

- Appoint independent assessors that meet the requirements as detailed in this plan – see above.
- Provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading.
- Have quality assurance systems and procedures that support fair, reliable and consistent assessment across organisation and over time.
- Operate regular standardisation events that enable assessors to attend a minimum of 1 event per year.
- Operate moderation of assessment activity and decisions, through examination of documentation and observation of activity, with a minimum of 10% of each independent assessors' assessments moderated annually.

Assessment Tools and Materials

EPAOs must produce assessment tools and supporting materials for the EPA that follow best assessment practice, as follows:

- Assessment scheme and sample questions (question bank) for Synoptic Project Report, Presentation and Discussion (Q & A) and Viva-style Professional Conversation. The EPAO must produce a question bank of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the specifications they contain, are fit for purpose.
- Documentation for recording assessment evidence and decisions.
- Guidance for independent assessors on conducting the EPA.
- Guidance for apprentices, their employers and training providers on the EPA.

External Quality Assurance

The external quality assurance provider for this apprenticeship standard will be undertaken by the Institute for Apprenticeships.

Implementation

Affordability: It is anticipated that the EPA will not represent more than 15-20% of the maximum funding band for this apprenticeship.

The following factors should ensure the EPA is affordable:

- Ensuring efficiency of assessment e.g. performing assessments on multiple candidates on the same date(s) where possible.
- Using real work projects rather than simulations.
- Carrying out assessments in employer premises.
- Arranging for the presentation and viva-style professional conversation to take place on the same day

Volumes: It is anticipated that there will be approximately 50 starts per year on this apprenticeship.

Appendix 1 – Mapping the End-Point Assessment to the Bioinformatics Scientist (Level 7) Apprenticeship Standard.

The tables below indicate how Bioinformatics Scientist apprentices are assessed to ensure that they demonstrate full professional competence in relation to the Apprenticeship Standard. The outcomes required are the areas of knowledge, skills, and behaviours specified in the Apprenticeship Standard.
The required methods of end-point assessment are as follows:

- **A synoptic report, followed by a presentation with discussion (Q and A) (SR)**
- **A viva-style professional conversation supported by a vocational competence evaluation log. (PC)**

The evidence of learning/professional competence presented is assessed against the assessment criteria as the measure of professional competence required by the Apprenticeship Standard at level 7.

Apprentices will need to achieve a pass against all of the KSBs, for each assessment method, in order to achieve an overall grade of pass

Apprentices will need to demonstrate that they meet all of the distinction criteria for all of the KSBs for at least one of the assessment methods in order to achieve an overall grade of distinction.

A. Assessing knowledge – Apprentices will need to demonstrate all knowledge to achieve full professional competence.

Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
A topic aligned with the life science field, and the core experimental platform/data generating technologies in the chosen field.	SR	Does not meet the pass criteria	Knowledge of a topic aligned with the life science field, and the core experimental platform/data generating technologies in the chosen field is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been applied to select and communicate the most appropriate technologies for a research project. Can explain how the chosen topic relates to other technology areas in a broader life science context, and can articulate opinion on how future changes in technology may impact on the field.

Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
How research is conducted in bioinformatics and within the broader context of interdisciplinary life sciences.	SR	Does not meet the pass criteria	Systematic understanding of how research is conducted in bioinformatics and within the broader context of interdisciplinary life sciences is demonstrated	Meets the pass criteria and with evidence that this knowledge has been applied in the context of research design. Demonstrates critical reflection, including explanations of thinking towards implementation of workable solutions, with reference to best practice.
The technical limitations and the underlying biological and experimental assumptions that impact on data quality.	PC	Does not meet the pass criteria	Knowledge of the technical limitations and the underlying biological and experimental assumptions that impact on data quality is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been used to critically evaluate experimental or analytical methods. Can explain the risks to downstream data analysis an interpretation of using poor quality data, and suggest options for mitigation strategies.
Details of omic-scale/big-data-driven life science making use of core platform technologies.	PC	Does not meet the pass criteria	Knowledge of omic-scale/big-data-driven life science making use of core platform technologies is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been applied to select and communicate the most appropriate technologies for a research project. Can explain the rationale for selecting a particular platform technology, including the relevant consideration of scientific benefit and suitability for working practices.
The responsibilities of working in production/industry environments managing scientific data – including regulated environments (good practice, and IP/confidentiality requirements).	SR	Does not meet the pass criteria	The role is underpinned by a specialised understanding of the responsibilities of working in production/industry environments managing scientific data – including regulated environments (good practice, GxP) and IP/confidentiality requirements.	Meets the pass criteria and evidence that such knowledge has been used to carry out work correctly and professionally. Can identify the consequences and impact of failing to follow correct working practices, regulatory guidance or regulation – including impact on the

				whole business and/or external stakeholders.
Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Current approaches for modelling and warehousing of life science data.	PC	Does not meet the pass criteria	Knowledge of current approaches for modelling and warehousing of life science data is demonstrated.	Meets the pass criteria and with evidence that that such knowledge has been critically applied in practice. Can explain the rationale for selecting particular data warehousing technologies, including relevant consideration of scientific benefit and future impact of data scalability.
Requirements for responsible, legal or ethical access and use of biological data, including general data protection (GDPR) considerations, identifiable personal genomic & healthcare data, and geographic biodiversity-related data concerns.	SR	Does not meet the pass criteria	The role is underpinned by a specialised understanding of the requirements for responsible, legal or ethical access and use of biological data, including general data protection (GDPR) considerations, identifiable personal genomic & healthcare data, and geographic biodiversity-related data concerns is shown.	Meets the pass criteria and with evidence that such requirements have been considered and data has been used appropriately and professionally. Can explain areas of risk and potential for non-compliance in working practices, and the decisions and processes that are in place to manage them.
Ontologies and their use.	PC	Does not meet the pass criteria	An understanding of ontologies and their use is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been applied, and the rationale for selecting suitable ontologies can be explained. Demonstrates critical reflection on the limitations of current ontologies, including where future developments could impact positively on scientific impact.
Retrieval and manipulation of biological data, including data mining, from public repositories.	PC	Does not meet the pass criteria	In-depth understanding of methods for retrieval and manipulation of biological data, including data mining, from public repositories is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been used to obtain useful data with critical review of data limitations. Can explain the processes of compliance with data access requirements and who

				data availability impacts on scientific and business practice.
Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Techniques to integrate, interpret, analyse and visualise biological data sets.	PC	Does not meet the pass criteria	Knowledge of techniques to integrate, interpret, analyse and visualise biological data sets is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been critically applied to innovate and improve research practice and communication. Can explain the rationale for selecting particular technical solutions, including the relevant consideration of scientific benefit and suitability for working practices.
Bioinformatics analysis methodologies and expertise in common bioinformatics software packages, tools and algorithms – including workflow management tools.	PC	Does not meet the pass criteria	In-depth understanding of methods of Bioinformatics analysis and expertise in common bioinformatics software packages, tools and algorithms – including workflow management tools - is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been critically applied, and the rationale for selecting suitable methods can be explained. Articulates how selection of analytical methodologies can optimise working practices and deliver greater scientific impact.
Common bioinformatics programming languages; algorithm design, analysis and testing.	PC	Does not meet the pass criteria	Knowledge of common bioinformatics programming languages; algorithm design, analysis and testing is demonstrated	Meets the pass criteria and evidence that that approaches have been rationally-selected for use, including suggestions for alternatives that could be used and achieve the same objectives.
The use of suitable version control tools, software sustainability practices and open source software repositories.	SR PC	Does not meet the pass criteria	Knowledge of the use of suitable version control tools, software sustainability practices and open source software repositories is demonstrated	Meets the pass criteria and with evidence that such suitable tools have been selected with understanding of the impact of this choice on working practice, along with the risks to continuity of working practice that may arise if such solutions are not utilised.

Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Licensing limitations on the use of bioinformatics software and data such as open source, commercial and academic usage restrictions.	SR	Does not meet the pass criteria	Systematic understanding of licensing limitations on the use of bioinformatics software and data such as open source, commercial and academic usage restrictions is demonstrated	Meets the pass criteria and with evidence that licensing and usage restrictions and risks have been considered and software/data resources used appropriately in professional practice. Can explain the technical and data analytical impact of software availability due to licensing restrictions, and the potential business impact of non-compliance.
Database design and management, including information security considerations and big-data technologies.	SR PC	Does not meet the pass criteria	In-depth understanding of database design and management, including information security considerations and big-data technologies is demonstrated	Meets the pass criteria and with evidence that such knowledge has been applied to generate solutions that have positive impact on working practice. Can explain the risks of information-security breeches and the decisions and processes put in place to mitigate risk.
Relevant big-data and high performance computing platforms including Linux/Unix, local and remote High Performance Computing (HPC), and cloud computing.	PC	Does not meet the pass criteria	Knowledge of relevant big-data and high performance computing platforms including Linux/Unix, local and remote High Performance Computing (HPC), and cloud computing is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been critically evaluated and applied to generate solutions that have positive impact on working practice. Can explain how data and analytical requirements inform decisions about HPC, and articulates the (scientific and/or business) consequences of incorrect use of HPC technology.
Application of statistics in the contexts of bioinformatics and life science data analysis.	PC	Does not meet the pass criteria	Systematic understanding of the application of statistics in the contexts of bioinformatics and life science data analysis is demonstrated	Meets the pass criteria and with evidence that such knowledge been critically evaluated and applied to the selection of statistical tests.

				Can demonstrate a clear understanding of the importance of using appropriate statistical approaches for the data.
Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Statistical and mathematical modelling methods, and key scientific and statistical analysis software packages.	PC	Does not meet the pass criteria	In-depth understanding of statistical and mathematical modelling methods, and key scientific and statistical analysis software packages is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been applied achieve analytical insight into data, and the impact of the method selection is effectively communicated. Explains the impact on down-stream decision making when statistical analysis is carried out incorrectly.
General data science approaches to life science problems, such as machine learning and artificial intelligence (AI).	PC	Does not meet the pass criteria	Knowledge of general data science approaches to life science problems, such as machine learning and artificial intelligence (AI) is demonstrated.	Meets the pass criteria and with evidence that such knowledge has been applied in professional practice to improve data analytical capability. Can explain how data science approaches relate to other technology areas in a broader life science context, and can articulate opinion on how future changes in technology may impact on the field.
The importance of data governance, curation, information architecture and ensuring interoperability.	SR	Does not meet the pass criteria	Knowledge of the importance of data governance, curation, information architecture and ensuring interoperability is demonstrated	Meets the pass criteria and with evidence that such knowledge has been applied in professional practice. Can articulate the importance of data governance, curation and interoperability to the continued development of bioinformatics technologies and the impact of this in the broader life science context.
Differences in the knowledge-base of diverse audiences, and the most appropriate means of effectively	SR	Does not meet the pass criteria	An understanding of the differences in the knowledge-base of diverse audiences, and the most appropriate means of effectively	Meets the pass criteria and evidence that knowledge has been used to critically evaluate and adapt practice for broader

communicating scientific and technical information.			communicating scientific and technical information is evident.	impact when communicating technical methodology or analysis results. Able to explain how they have used knowledge effectively to help others understand complex data or process.
Knowledge	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Communication models and techniques which can be employed in a collaborative research environment to effect change at individual, team and organisational level eg. active listening skills, teamworking, influencing and negotiation skills.	SR	Does not meet the pass criteria	Knowledge about communication models and techniques which can be employed in a collaborative research environment to effect change at individual, team and organisational level eg. active listening skills, teamworking, influencing and negotiation skills is evident.	Meets the pass criteria and evidence that knowledge has been used to critically evaluate and adapt practice or innovate for broader impact when communicating technical methodology or analysis results. Can provide examples of when they have effectively communicated technical information in a team context which has influenced others and impacted positively on decisions or working practices.

B. Assessing skills – Apprentices will need to demonstrate all skills to achieve full professional competence.

Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Work with multi-disciplinary colleagues to design life-science experiments that will generate data suitable for subsequent bioinformatics analysis.	SR	Does not meet the pass criteria	Professional practice demonstrates effective working with multi-disciplinary colleagues to design life-science experiments to generate data suitable for bioinformatics analysis	Meets the pass criteria and demonstrates that they are capable of contributing to the enhancement of bioinformatics professional practice. Can give examples of when they have influenced the design of projects to have broad ranging scientific impact
Provide guidance to experimental scientists on data generation methodology	SR	Does not meet the pass criteria	The capacity to provide guidance to experimental scientists on data generation	Meets the pass criteria and with evidence that they are capable of influencing colleagues to develop experimental

and handling to ensure the quality of data produced.			methodology and handling to ensure data quality is demonstrated	approaches to achieve greater scientific impact. Can provide evidence of when they have identified key colleagues or external stakeholders and brought them on board with decisions or outcomes to ensure data quality
Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Recognise and critically review the format, scope and limitations of different biological data.	PC	Does not meet the pass criteria	Critical thinking skills are demonstrated in the review of different types of biological data	Meets the pass criteria and demonstrates that they are capable of adapting working practices for greater scientific impact. Demonstrates the application of formal and documented decision making processes in the review of data.
Define the required metadata to be collected for specific data types and analytical approaches.	PC	Does not meet the pass criteria	Metadata requirements for different data types and analytical approaches can be clearly defined.	Meets the pass criteria and with evidence that critical evaluation of metadata options has provided improved opportunities for subsequent analyses.
Design and implement appropriate data storage formats and associated database structure.	PC	Does not meet the pass criteria	Skills have been demonstrated in the design and implementation of appropriate data storage formats and associated database structure	Meets the pass criteria and demonstrates that they are capable of applying the best methods for greater scientific impact. Can explain the rationale for selecting particular data storage technologies, including relevant consideration of data security and future impact of data scalability.
Choose appropriate computational infrastructure and database solutions - including internal or external/cloud resources.	PC	Does not meet the pass criteria	Skills have been demonstrated in the selection of appropriate computational infrastructure and database solutions - including internal or external/cloud resources.	Meets the pass criteria and demonstrates that they are capable of applying the best technology to balance cost, analytical speed and scientific quality. Articulates how new or future computing technology could be used to compliment current infrastructure to have a positive impact on the work they do.

Store and analyse data in accordance with ethical, legal and commercial standards, including checking who has access.	SR	Does not meet the pass criteria	The ability to appropriately comply with ethical, legal and commercial standards for the storage and analysis of data has been demonstrated.	Meets the pass criteria and with evidence of leadership in risk management and compliance in professional practice. Can explain the risk of non-compliance and can provide examples of positively promoting compliance by others.
Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Curate biological data using suitable metadata, ontologies and/or controlled vocabularies.	PC	Does not meet the pass criteria	Skills have been demonstrated in the curation of biological data using suitable metadata, ontologies and/or controlled vocabularies.	Meets the pass criteria and demonstrates that they are capable of applying the best methods to maximise the impact of data. Can explain how the rational selection of data for curation has enabled improvements to data analysis.
Make use of suitable programming languages and/or workflow tools to automate data handling and curation tasks.	PC	Does not meet the pass criteria	Skills have been demonstrated in the use of suitable programming languages and/or workflow tools to automate data handling and curation tasks.	Meets the pass criteria and demonstrates that they are capable of applying the best technology to improve data-analytical speed and quality. Can provide critical comparison of technical options and examples of specific impact on scientific process or business.
Maintain a working knowledge of a range of public data repositories for biological data.	PC	Does not meet the pass criteria	The capacity to maintain a working knowledge of a range of public data repositories for biological data is demonstrated	Meets the pass criteria and with evidence they can apply such knowledge in the rational selection of data repositories in practice. Can demonstrate an awareness of the future development plans of key data resources used, and how they might impact on current use.
Prepare data for submission to appropriate public bioinformatics data repositories as required, being aware of IP and/or ethical and legal issues.	PC	Does not meet the pass criteria	Skills have been demonstrated in the preparation of data for submission to appropriate public bioinformatics data repositories as required, with awareness of IP and/or ethical and legal issues.	Meets the pass criteria and demonstrated by appropriate data submission in practice, including recognition of the risks of non-compliance.

				Can explain the data submission and compliance requirements to colleagues and external stakeholders.
Carry out data pre-processing and quality control (QC) to prepare datasets for bioinformatics analysis.	PC	Does not meet the pass criteria	The ability to carry out data pre-processing and quality control (QC) to prepare datasets for bioinformatics analysis has been demonstrated	Meets the pass criteria and with evidence that they are capable of applying the best methods to maximise the impact of data. Can explain the consequences of poor QC on subsequent data analysis.
Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Determine the best method for bioinformatics analysis, including the selection of statistical tests, considering the research question and limitations of the experimental design.	SR	Does not meet the pass criteria	Critical thinking skills are demonstrated in the selection of the best method for bioinformatics analysis, including the selection of statistical tests, considering the research question and limitations of the experimental design.	Meets the pass criteria and demonstrates that they are capable of applying the best methods for greater scientific impact, and the rationale for selecting suitable methods can be explained. Can provide critical comparison of technical options and examples of specific impact on scientific process or business.
Identify and define appropriate computing infrastructure requirements for the analysis of such biological data.	PC	Does not meet the pass criteria	Skills have been demonstrated in the identification or definition of appropriate computing infrastructure requirements for the analysis of such biological data.	Meets the pass criteria and with evidence that the selected computing solutions have a positive impact on the speed, reliability and accuracy of analysis. Abe to recognise future infrastructure capacity issues and be able to suggest alternative technologies to overcome them
Apply a range of current techniques, skills and tools (including programming languages) necessary for computational biology practice – and;	PC	Does not meet the pass criteria	Skills are evident in the application of current techniques, skills and tools (including programming languages) necessary for computational biology practice	Meets the pass criteria and demonstrates that they are capable of critically selecting and applying the best methods for greater scientific impact. Can explain why alternative methods were not used, but reviews appropriate literature and resources to ensure new

				skills are sought as required by the field of work.
Contribute to (where appropriate, lead) research to develop novel methodology.	SR	Does not meet the pass criteria	There is evidence of contribution to, or leadership of research or the development of novel methodology	Meets the pass criteria and with evidence that they are capable of influencing colleagues and scientific innovation, contributing to the enhancement of bioinformatics professional practice. Proactive in contributing new ideas for research and demonstrates initiative in taking ideas forward when appropriate.
Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Build and test analytical pipelines, or write and test new algorithms as necessary for the analysis of biological data.	SR	Does not meet the pass criteria	Skills have been demonstrated in building and testing analytical pipelines or writing and testing new algorithms as necessary for the analysis of biological data	Meets the pass criteria and with evidence that that they are capable of innovation, contributing to improvements in operating efficiency for the analysis of biological data. Able to critically evaluate pipelines/algorithms they have developed, comparing their outputs to previously implemented approaches.
Document all data processing, analysis and implementation of new methods in accordance with good scientific practices and industry requirements for regulatory process and IP.	SR	Does not meet the pass criteria	The documentation of data processing, analysis and the implementation of new methods is complete and effective, and reflects best practice to a professional standard.	Meets the pass criteria and with evidence of compliance in professional practice, as well as evidence of supporting compliance from others and managing the risks of non-compliance. Able to define appropriate methods for documenting data processing and discuss challenges in implementation of such approaches.
Interpret the results of bioinformatics analysis in the context of the experimental	SR	Does not meet the pass criteria	Skills are evident in the interpretation of the results of bioinformatics analysis in the	Meets the pass criteria and demonstrates that they are capable of interpreting,

design and, where necessary, in a broader biological context through integration with complementary (often public) data.			context of the experimental design and, where necessary, in a broader biological context through integration with complementary (often public) data.	deriving insight from, and communicating complex data in a biological context that leads to greater scientific impact.
Obtain data sets from private and/or public resources – considering any legal, privacy or ethical aspects of data use.	SR	Does not meet the pass criteria	Skills have been demonstrated in obtaining data sets from private and/or public resources – with consideration of legal, privacy or ethical aspects of data use.	Meets the pass criteria and with evidence of compliance in professional practice, as well as evidence of supporting compliance from others and managing the risks of non-compliance. Demonstrates a clear knowledge of the requirements for compliant data use, and can design and implement measures to ensure data is used appropriately.
Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Carry out the analysis of biological data using appropriate programmatic methods, statistical and other quantitative and data integration approaches – and visualise results.	PC	Does not meet the pass criteria	There is evidence of effective analysis of biological data or use of appropriate programmatic methods, statistical and other quantitative and data integration approaches – or visualisation of results.	Meets the pass criteria and demonstrates that they are capable of selecting and applying the best methods with clear rationale, to produce analysis results that generate insight and scientific impact. Can explain the rationale to colleagues, whilst being able to provide critique of the chosen methods compared to other potential choices.
Communicate and disseminate bioinformatics analysis and results to a range of audiences, including multi-disciplinary scientific colleagues, non-scientific members of management, external collaborators and stakeholders, grant/funding bodies and the public as required.	SR	Does not meet the pass criteria	Professional practice demonstrates effective communication or dissemination of scientific methods or results.	Meets the pass criteria and with evidence that they are capable of contributing to the enhancement of bioinformatics knowledge amongst others that has the potential to have broad ranging and transformational impact on research and business. Can demonstrate how they have communicated a set of findings to a wide range of audiences using methods that

				take into account the level of subject knowledge of each audience.
Supervise and mentor colleagues and peers to develop bioinformatics knowledge relevant to their specific life science subject experience.	SR	Does not meet the pass criteria	Effective supervision or mentoring skills are demonstrated with either colleagues or peers in the workplace.	Meets the pass criteria and with evidence that they are capable of contributing to the enhancement of bioinformatics professional practice in others. Can provide an example of where they have had a positive impact on the bioinformatics working practices of a colleague/peer.
Skill	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Communicate orally and in writing, and collaborate effectively with interdisciplinary scientific colleagues, and management functions to monitor and manage people, processes or teams.	SR	Does not meet the pass criteria	Professional practice demonstrates effective communication or collaboration with interdisciplinary scientific colleagues, and management functions to monitor and manage people, processes or teams.	Meets the pass criteria and with evidence that they are capable of contributing to the enhancement business and working practices in a professional bioinformatics working environment. Understands the impact and consequences of communication breakdown and can provide solutions to ensure the potential for these to occur is minimised.
Manage their own time through preparation and prioritisation, time management and responsiveness to change.	SR	Does not meet the pass criteria	Professional practice demonstrates effective self-management of time, responsiveness to change or the balancing of priorities.	Meets the pass criteria and evidenced by continued effective scientific contributions. Able to describe effective planning timelines for projects, indicating risk periods and potential responses to reduce the impact of such risks.

C. Assessing behaviours – Apprentices will need to demonstrate all behaviours to achieve full professional competence

Behaviour	Method of assessment	Assessment criteria **Fail**	Assessment criteria **Pass**	Assessment criteria **Distinction**
Professional standards in the workplace in relation to: ethics and scientific integrity, legal compliance and intellectual property, respect and confidentiality, and health and safety.	SR	Does not meet the pass criteria	Professional practice shows evidence of consideration of ethics and scientific integrity, legal compliance and intellectual property, respect and confidentiality, and health and safety to a professional standard	Meets the pass criteria and has also demonstrated that they are capable of innovation in professional practice that has the potential to have broad ranging and transformational impact.
The need to continuously develop their knowledge and skills in relation to scientific developments that influence their work, ensuring they continue to provide relevant analyses, including emerging techniques where appropriate.	SR	Does not meet the pass criteria	Professional practice demonstrates engagement in continuing professional development of their knowledge and skills in relation to scientific developments that influence their work, enable continued provision of relevant analyses, including emerging techniques where appropriate.	Meets the pass criteria and has also demonstrated that they are capable of innovation in professional practice that has the potential to positively impact on their contribution to efficiency, cost or research impact.
The ongoing need for awareness of technical advances in the broader scientific field that may present opportunities for personal and / or organisational development.	SR	Does not meet the pass criteria	Professional practice is informed by an awareness of technical advances in the broader scientific field that may present opportunities for personal and / or organisational development.	Meets the pass criteria and has also demonstrated that they are capable of recognising opportunity to apply new techniques or analytical approaches that will have a positive impact on working practices.
The wider context (policy, economic, societal, technological, legal, cultural and environmental) in which scientific research operates, recognising the implications for professional practice.	SR	Does not meet the pass criteria	Professional practice appropriately reflects the wider context in which scientific research operates to a professional standard	Meets the pass criteria and has also demonstrated that they are capable of relating such wider issues to operational aspects of their professional practice, including identifying risks and challenges.
The need to be enthusiastic, self-confident, self-aware, empathic, reliable	SR	Does not meet the pass criteria	Professional practice demonstrates the personal qualities of enthusiasm, self-	Meets the pass criteria and has also demonstrated that their personal

and consistent to operate effectively in the role.			confidence, self-awareness, empathy, reliability and consistency to a professional standard.	qualities reflected in professional practice have a positive impact on working relationships with others
The requirement to persevere, have integrity, be prepared to take responsibility, to challenge areas of concern, to lead, mentor and supervise.	SR	Does not meet the pass criteria	Professional practice demonstrates the personal qualities of perseverance, integrity and a willingness to undertake leadership responsibilities to a professional standard.	Meets the pass criteria and has also demonstrated effective influence, leadership or mentoring that has had a positive impact in the workplace.