

Periodic Assessment of Research, Development, Artistic and Other Creative Activities VER 2026

Final Report of the Biological Sciences Sub-panel

Preamble

This document sets out the characteristics used by the Biological Sciences Sub-panel of VER2026 to classify research outputs into each of the five quality levels defined under Article 10 of Directive No. 03/2025. It is intended to assist universities and public research institutions in understanding the standards and expectations applied during the assessment, and to support them in preparing stronger submissions in future cycles.

Outputs were assessed on three criteria as specified in the Directive: originality, significance, and rigour. The following descriptions reflect how those criteria translated into observable qualities across the outputs reviewed, drawing on the collective judgement of all sub-panel members.

An important cross-cutting consideration applied throughout the assessment was the contribution of the submitting institution's staff to the work. Where a listed author from the submitting institution held neither a first, co-first, corresponding, nor senior authorship position — and where the majority of remaining authors were not from Slovakia — this was taken to indicate a limited intellectual leadership role on the part of the submitting institution. Such cases were factored into the quality level assigned, as the Sub-panel considers it important to distinguish between institutions that are generating and leading research and those that are participating in the work of others.

Review articles were assessed under the same criteria as primary research outputs. However, because they do not by their nature generate new empirical findings or advance

novel methods, they were generally considered to lack the originality required for the higher quality levels. The Sub-panel notes that review articles are less well-suited to this assessment scheme and recommends that future calls consider appropriate guidance or restrictions on their inclusion. In particular, a certain degree of originality can be considered for systematic reviews with meta-analyses. In this case, although data comes from existing literature, the contribution of the authors in terms of originality is higher compared to scoping reviews or opinion papers.

Finally, when assessing Social Impact and Creative Environment, the Sub-panel took into account the level of funding available to each unit, recognising that research capacity and the scale of achievable impact are partly dependent on available resources.

1. Output Quality Levels: Characteristics and Differentiators

The five quality levels and their defining features are described below. For each level, the typical characteristics of outputs placed in that category are outlined, together with the requirements an output needed to meet and the key factors distinguishing it from adjacent levels.

(a) World-Leading

Typical characteristics

Outputs at this level were characterised by exceptional originality and the introduction of genuinely novel concepts, questions, or methods with the potential to reshape their field at a global scale. The work demonstrated a clear step change in thinking — setting new international benchmarks rather than incrementally advancing existing knowledge. Methodological rigour was of the highest standard. The submitting institution's staff member held a primary intellectual leadership role, typically as first, co-first, last, or corresponding author, on work that was substantially driven by their institution.

Requirements

- Exceptional originality: the output introduces ideas, questions, results, or methodologies that are genuinely new and paradigmatic for the scientific field at the international frontier.
- Significant and demonstrable influence on the field at global level, with potential to redirect research directions or establish new areas of enquiry.
- Methodological rigour of the highest standard, with results that are robust and intellectually coherent.
- Clear intellectual leadership by the submitting institution, evidenced by first, co-first, corresponding, or senior authorship — and, where the work is collaborative, a meaningful and identifiable contribution from the Slovak team.

Key differentiators from Internationally Excellent

The decisive factor distinguishing World-Leading from Internationally Excellent outputs was transformative impact. World-Leading outputs did not merely advance or extend the field — they redefined it or established new directions that others in the field are likely to follow. Additionally, institutional leadership was clearer and more central at this level: the submitting institution's researchers were not simply participants in work led elsewhere but were identifiable as primary intellectual drivers of the output.

(b) Internationally Excellent

Typical characteristics

Outputs at this level were generally of very high quality and contributed substantive, original advances to the international state of the art. They demonstrated clear intellectual contribution and methodological robustness and were of genuine importance to the international research community. In some cases, these were outputs in which the Slovak author contributed as a valued collaborator in a strong international team, rather than as the

primary lead, and the output as a whole was of world-leading quality, counterbalancing the final mark; in such cases, the level assigned reflected the institutional contribution rather than the intrinsic quality of the work alone.

Minimum Requirements

- Original and substantive contribution to the international state of the art, with clear novelty beyond incremental advancement.
- Methodologically robust, with well-designed studies, sound analytical approaches, and reliable conclusions.
- Meaningful contribution by the submitting institution's staff, typically in a key authorship position (first, last, or corresponding), or as a substantive contributor in a collaborative output.
- Demonstrable influence on or recognition within the international research community.

Key differentiators from World-Leading and Internationally Recognised

Considering the same level of author contribution, compared with World-Leading outputs, Internationally Excellent work was of high quality and genuinely influential internationally but did not represent a transformative step change. It strengthened and extended the field in significant ways but did not typically redefine its direction or establish new global benchmarks. Compared with Internationally Recognised work, the key differentiators were greater originality, higher ambition in the questions asked, stronger methodological sophistication, and a more substantive intellectual contribution by the submitting institution's researchers.

(c) Internationally Recognised

Typical characteristics

This was the most common quality level observed across the submissions. Outputs at this level presented credible, well-conducted research with a meaningful contribution to their field but were distinguished from higher levels by more modest originality, lower ambition, or a more limited contribution from the lead institution's staff. Many represented solid, competent studies with sound experimental or analytical design, but either addressed questions of modest novelty, made only incremental advancements, or produced results that were inconclusive or insufficiently distinctive to reach a higher tier. Student-led work of good quality often fell into this category.

Requirements

- Credible methodology and a meaningful, if limited, contribution to the field.
- Sound study design and appropriate analytical or methodological approach.
- Some degree of originality or novelty, even if the overall contribution was incremental rather than substantial.
- Results and conclusions accessible and relevant to the international research community, even if the scope of interest was narrower.

Key differentiators between the higher and lower levels

The boundary with Internationally Excellent was defined primarily by degree of originality, intellectual ambition, and the significance of the contribution. Internationally Recognised outputs were solid but uninspired — they pursued questions and approaches that were well-established in the field, without pushing meaningfully beyond existing knowledge. The boundary with Nationally Recognised work was defined by international relevance: outputs at this level were credible and accessible to a broad international audience, even if their impact on the field was modest.

(d) Nationally Recognised

Typical characteristics

Outputs at this level were solid in terms of their basic approach but made only a very limited contribution to advancing knowledge beyond the national or local context. Many took the form of studies applying existing — and sometimes outdated — methodologies to a different system or a narrowly defined question, without sufficient methodological innovation to be of wider relevance. To give some examples, several were very small in scope or involving limited sample sizes, narrow taxonomic or geographical focus, or highly niche questions without a clear explanation of their broader value. Some review papers for which the Slovak author held a middle-author role also fell into this category.

Requirements

- Solid basic methodology and a clear, if modest, contribution within the research community.
- Relevance to disciplinary developments at national level, even where international novelty or impact was limited.
- Sound presentation and logical structure, though without substantive methodological or conceptual innovation.

Key differentiators from Internationally Recognised and Below National Standard

The primary differentiator from Internationally Recognised work was the scope of relevance and impact, which remained largely national rather than extending to the international level. Outputs here were often competent case studies of local or narrowly focused questions that would be of limited interest outside a single subfield or region. The differentiator from the lowest category was that these outputs, while modest, still demonstrated a recognizable and coherent scientific contribution, with sound basic methodology and a clear research rationale.

(e) Below the Standard of Nationally Recognised Work

Typical characteristics

Outputs in this category were characterised by notable weaknesses in one or more of the three core assessment criteria. The most common issues were: very limited originality or novelty, with the work largely reiterating what was already available in literature; significant methodological weaknesses or insufficiently rigorous analytical approaches; or a scope so narrow and specialised as to be of minimal interest to any audience beyond a highly localised niche. Several outputs in this category gave the impression of publishing for its own sake, without substantive new findings or evidence of intellectual leadership. Some outputs written in Slovak — even after machine translation — addressed questions of very limited general interest and lacked the ambition or design quality expected for nationally recognised research.

Requirements for this classification

- Outputs were placed in this category when they failed to meet the minimum standard for Nationally Recognised work. This required the presence of one or more of the following:
- Lack of meaningful originality: the work largely repeated or reiterated previously published approaches or findings without substantive new contribution.
- Notable methodological weaknesses or insufficient rigour that undermined the reliability or validity of the findings.
- Negligible contribution to knowledge, with results of little or no relevance to any research community beyond a very narrow niche.
- Absence of intellectual leadership from the submitting institution, with no discernible contribution distinguishable from incidental participation.

Key differentiators from Nationally Recognised

The key differentiator was the absence of a recognisable scientific contribution. Nationally Recognised work, while modest, still advanced knowledge in some discernible way. Outputs below this standard either failed to produce meaningful new findings, lacked the methodological quality to support their conclusions, or addressed questions of such limited relevance that no substantive contribution to scientific understanding could be demonstrated.

2. General Observations on Research Outputs

In addition to the quality level descriptors above, the Sub-panel wishes to draw attention to several broader observations arising from the assessment of research outputs. These are offered in a constructive spirit, with the aim of supporting institutions in strengthening their research profiles.

Overall quality

A substantial proportion of the outputs submitted was internationally recognised or above, which is a strong achievement for the field. The Sub-panel was impressed by the standard, breadth, and quality of the outputs overall. Most outputs were freely available as open-access articles, which is highly commendable and increases their visibility and broader usefulness. That said, quality varied considerably across institutions and across individual researchers within the same institution. In many cases, a small number of high-quality outputs was accompanied by a longer tail of more modest work, suggesting that depth of quality — rather than the mere existence of excellence — is the principal challenge for many units.

Originality and ambition

The strongest outputs were those that pursued new angles or addressed genuinely novel questions, rather than reproducing well-established approaches in a slightly different setting. The Sub-panel encourages institutions to foster a research culture that prioritises intellectual ambition and depth. The less compelling outputs were, in most cases, those where novelty was most limited — notably studies applying existing and sometimes dated methodologies to marginally different systems, without sufficient methodological innovation to merit a higher classification.

Collaborative networks

The Sub-panel noted that international collaboration, while present, was often limited in scope. Although for some institutions the contribution of Slovak authors in the outputs was substantial and resulted in a leading role among coauthors, a considerable proportion of outputs were either internally authored — with collaborators predominantly from within the same institution or country — or showed Slovak researchers listed as middle authors in large international teams, indicating participation rather than leadership. The Sub-panel encourages institutions and the relevant authorities to consider mechanisms that support Slovak researchers in building broader, and more leadership-oriented, international collaborations. Extending networks meaningfully beyond Slovakia and its immediate neighbouring countries would strengthen the international standing of the research produced.

Thematic focus and critical mass

The research topics covered were relatively concentrated in many institutions, particularly for those with limited staff. While focused investment in specific areas is a reasonable strategic choice for institutions with limited resources, a minority of units appeared to be attempting broad coverage across too many topics simultaneously. Units with limited staff and funding may benefit from concentrating on fewer research areas in order to build the

critical mass and depth of expertise needed to produce internationally competitive outputs consistently.

Review articles

Review articles were assessed under the same criteria as primary research outputs. Because they do not, by their nature, generate new empirical findings or advance novel methods, they were generally considered to lack the originality required for the higher quality levels. An exception to this are systematic reviews/meta-analyses, where the contribution in elaborating literature data to answer specific questions indicate a higher degree of originality. Institutions are encouraged to prioritise primary research outputs that demonstrate an original scientific contribution.

3. Social Impact: Assessment Standards and Observations

Social impact was assessed across four aspects of equal weight, as defined in Article 11 of the Directive: (i) the application potential of the underpinning research; (ii) the degree of social impact; (iii) the link between the underpinning research and the social impact; and (iv) the quality of evidence of social impact. The following describes the standards applied and observations arising from the submissions.

Standards applied

The Sub-panel applied the five-tier quality scale (Excellent, Very Good, Good, Satisfactory, Unsatisfactory) to each of the four aspects independently. In line with the Directive, case studies describing only potential social impact without demonstrated achieved impact, or those describing purely academic impact, were rated Unsatisfactory across all aspects. The level of funding available to each unit was taken into account when assessing what could reasonably be expected in terms of the reach and scale of impact.

Characteristics of Excellent Social Impact submissions

- To achieve an Excellent rating across the social impact aspects, submissions were expected to satisfy all of the following:
- Original research with novel findings as the underpinning basis for the claimed impact.
- A clear and convincing causal or contributory link between the research and the societal change described.
- Direct and demonstrable benefits to identifiable beneficiaries — whether society at large, specific communities, policy processes, public health, the environment, or other defined groups.
- Diverse and independently verifiable sources of evidence substantiating the claimed impact.
- Evidence presented in clear and measurable terms, with quantifiable metrics used wherever possible.

General observations

Although the quality of Social Impact submissions was variable, the contributions showed an interesting and inventive diversity. Many case studies demonstrated strong, thoughtful efforts to make a real-world difference, with some impressive achievements that were clearly and demonstrably beneficial — in some cases to Slovakia as a whole or to specific regions, and in others to audiences with global relevance. Both national and international scopes of impact were considered positive and commendable.

However, several submissions fell short in one or more aspects. Common weaknesses included: vague or insufficiently documented links between the underpinning research and the declared impact; reliance on a single source of evidence without independent corroboration; and case studies that described promising research or potential future applications rather than achieved, real-world impact. Submissions in which the societal

benefit was presented in purely academic terms — such as citations or conference invitations — did not satisfy the requirements for this domain.

Institutions are encouraged to strengthen future Social Impact submissions by identifying concrete beneficiaries, tracing the pathway from research to impact with precision, and providing a range of independently verifiable evidence sources, using quantitative indicators wherever the nature of the impact permits.

4. Creative Environment: Assessment Standards and Observations

Creative environment was assessed across four aspects of equal weight, as defined in Article 12 of the Directive: (i) strategic direction and scientific profiling; (ii) workplace conditions in terms of staffing; (iii) degree of collaborations and their contribution; and (iv) overall sustainability of the workplace. The following describes the standards applied and observations arising from the submissions.

Standards applied

The Sub-panel applied the five-tier quality scale to each of the four aspects independently. As with Social Impact, the level of funding available to each unit was taken into consideration, particularly when assessing the scale and ambition of strategic plans and the scope of collaborative networks. Units operating with modest resources were not penalised for limitations that were clearly resource-driven rather than reflective of a lack of ambition or strategic thinking.

Characteristics of Excellent Creative Environment submissions

To achieve an Excellent rating, submissions were expected to satisfy all of the following:

- A clear and coherent description of the unit's strategic development of research during the assessment period, articulating how research directions evolved in response to scientific developments and institutional context.
- An explicit and convincing account of how research directions are related to staffing strategy — including recruitment priorities, staff development, and support for early-career researchers.
- Demonstrated evidence of a supportive environment for staff at all career stages, with mechanisms in place to retain talent and promote professional growth.
- A clear description of the unit's collaborative network, with evidence of outcomes arising from those collaborations — not merely a list of partners, but an account of what the collaborations have produced.
- A credible and forward-looking account of the unit's sustainability and strategic trajectory, demonstrating that the conditions for continued creative and scientific activity are in place for the coming period.

General observations

As expected, the different institutions showed a wide range in the quality, culture, and focus of their research and teaching environments. The Sub-panel was impressed that most institutions made substantial research contributions despite receiving only relatively modest funding, and the research culture generally appeared to be supportive and collegial.

Several submissions provided strong, well-evidenced accounts of their strategic direction, staffing approach, and collaborative activity. The most compelling creative environment forms were those that told a coherent story — explaining not only what the unit does, but why, and how its people, partnerships, and resources are aligned to a clearly articulated scientific mission.

Weaker submissions tended to list activities or name partners without explaining the outcomes or strategic significance of those activities. A common gap was the absence of a meaningful account of how staffing decisions relate to research strategy. The Sub-panel also observed that some units described collaborative networks that were predominantly internal or limited to a small number of well-established domestic partners, without sufficient evidence of engagement with the broader international scientific community.

Finally, the Sub-panel notes that some institutions may benefit from focusing their stated strategy on fewer, more clearly defined research areas, rather than attempting to articulate an all-encompassing mission. Units that demonstrated a clear scientific identity and a focused strategic vision generally produced more convincing creative environment assessments.

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