

Innovation and evaluation in the context of a changing paradigm in education

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Abstract

Evaluation involves a specific form of educational research and aims primarily at developing and improving the reality in which it operates. It is a transforming practice that requires the activation of the most relevant cultural, social and political wherewithal of the context in which it works in order to have a deep impact. From the methodological standpoint, modern evaluation incorporates new logics that enable it to adapt to changing needs and addresses emerging spaces, such as educational innovation.

Thus, evaluative thinking contributes to new learning by providing evidence to map and monitor the progress, successes, failures and roadblocks in innovation as it unfolds. It involves thinking about what evidence will be useful during the course of innovative activities and establishing the range of objectives and targets that allow its progress to be determined. It is also considered one of the best strategies to develop a new form of teacher training and professional development.

Here we provide a description of and a reflection on the different stages in the evaluative cycle of educational innovation from a dynamic viewpoint.

Key words: educational innovation, evaluation, research, transformative practice, training, professional development.

1. Educational innovation

The 2013 report by the Organisation of Economic Cooperation and Development (OECD) entitled *Innovative Learning Environments* cited innovation as a key factor in today's societies and economies and added that within the conceptual framework of the modern view of innovation, we must simultaneously analyse what we learn and how we learn.

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In its most modern conception, education is viewed as the major underpinning of educated, prosperous societies. At the same time, there is a growing sense that educational practice at the start of the 21st century does not match the real needs of students who have to plan for the future and prepare for the transition to a complex, ever-changing society. It seems as though education were persisting in keeping alive a kind of school that prepares students more for academia than for real life. In this context, innovation is the most powerful emerging element in the story of modern education. A new educational perspective is perceived as thoroughly necessary in order to make students capable of meeting both their own needs and those of the contemporary world and of being able to successfully deal with the new challenges.

Innovation is the cornerstone of the process of rethinking how educational systems and pedagogical practices should evolve in the future and establishing what students and society should truly be offered in order to ensure their full realisation (Barber, Donnelly & Rizvi, 2012).

Nonetheless, we should not confuse the character of educational innovation in the 21st century with it in other innovative moments in the past. This time, innovation is a global systemic action which is committed to the system as a whole and the entire educational community. Or, as Lyn (1997, p. 47) quite accurately put it when trying to establish the intimate nature of the new approach: "Innovation implies a fundamental, original and disruptive transformation of the core tasks of an organisation. Innovation profoundly shakes up the structures and permanently changes them."

This perspective means accepting that innovation cannot be an isolated phenomenon disconnected from the environment or one that simply entails introducing mere methodological or technological changes. We cannot stay with the mere liturgy of innovation but instead must be ambitious and change the overarching objectives of the educational system and consequently the very worldview of education. In short, innovation strives to profoundly transform educational systems and with them the nature of schooling and school practice itself.

In teaching practice, educational innovation includes everything from simple – but not simplistic – school improvements, often carried out in vulnerable contexts, to profoundly transformative approaches which break schemas on how education is managed or how learning takes place. Even though it is an emerging practice at this point, it is obvious that innovation is not a new phenomenon. Education has always been surrounded by cyclical processes in which a great deal of effort has been invested to try to improve the efficiency of the school world or introduce new narratives into it. What signals the difference between today and previous cycles is the holistic nature today, which necessarily implies generating synergies among all the factors operating in an educational system, enlists the commitment of all the agents participating and constructs and guides its action based on the absolutely intrinsic and necessary association between the innovation processes and evaluation.

Modern innovation can under no circumstances be the simple linear application of ideas on previously defined educational problems. Instead, innovation processes in the 21st century have to be closely tied to processes of social, personal, institutional and cultural change. As Hannon points out (2009, p. 1): "The reforms in schools today and the efforts at improvement are wholly

inadequate on the scale of what young people need to prepare to live properly and sustainably on our planet within the new century. Any new paradigm for education has to deal with the holistic transformation of all the institutions at all their levels.”

2. Educational evaluation

In its most up-to-date definition, educational evaluation is a specific way of ascertaining and relating to reality, in our case the educational reality, in order to learn about it in-depth and try to guide its construction process while favouring changes and improvements. In short, it is a transformative praxis which, in order to have a profound impact, has to activate – just as with innovation – the cultural, personal, social, institutional and political triggers in the context in which it acts. We have commonly defined it as a process of information collection geared at issuing merit or value judgements on a subject, object or intervention which is relevant in education (Mateo, 1998). We could also add that this practice should necessarily be associated with another decision-making process aimed at improving or optimising the object, subject or intervention being evaluated. Nonetheless, this definition has become insufficient today; it is eminently descriptive, technical and clearly static. It must be further fleshed out if we want to capture the dynamism of the realities and relations implied in educational phenomena.

Examining knowledge and evaluative practice in the world of education means doing it based on a reality which encompasses the same uncertainties, changes and schisms that are found in the science of education. This confers a highly complex nature on evaluation in that it must be carried out simultaneously in its theoretical and practical dimensions, in the unstable, multi-faceted terrain of educational action and social change.

From the methodological perspective, evaluation entails the principles of researching, constructing instruments, collecting data and educational measurement. Nonetheless, evaluation goes beyond each of these activities and ends up constituting a universe unto itself; it acts with its own logic and performs one of the most transcendent and influential activities in social and educational life.

Its development is essential for improvement and innovation of all spheres of education: systems, programmes, services, teachers, students, etc. And evaluation is what makes educational measurement, information collection and the kind of scientific construction sought significant and meaningful, not the opposite. If these processes are to be truly relevant, all of them have to be immersed in the logic of education and become conceptually indebted to it. By this we simply want to highlight the instrumental, subsidiary nature of these activities with regard to the core of this universe to which we are referring, the universe of evaluation, and the fact that all of these elements must revolve around a process with a personality of its own: the process of constructing evaluative knowledge. The profound ties between the nature of evaluation and the specific technical characteristics must be stressed within this conceptual framework; they must then be applied to construct a specific kind of knowledge derived from evaluation: axiological knowledge (Rul, 1992).

From this vantage point, evaluating always means the act of establishing the value of something, and in order to do this, it is not enough simply to collect evaluative information or statistically analyse it based fundamentally on numerical dissection. Instead, the information must be interpreted, critical action must be exercised, referents must be sought, it must be contextualised, alternatives must be analysed, non-simplified visions of the innovations evaluated must be offered, etc. More than anything else, evaluation will entail creating an evaluative culture where this new form of knowledge can be properly located.

With everything discussed thus far, we have not forgotten the act of power that is involved in assigning a value to things, acts or interventions. Evaluation legitimises the value of certain kinds of educational practices over others, and it consequently discriminates what has social and educational value versus what will not receive any kind of consideration in the immediate future. Evaluation guides the educational activity in such a way that if it is not undertaken responsibly, it can pervert the basic objective of evaluation and thus, more than guiding what we are doing, it is conditioning the educational community as a whole. Without the shadow of a doubt, evaluation exerts its influence from the very moment when the elements and objectives to be evaluated are pinpointed and determined.

Consequently, the complexity of evaluative action is coupled with the important share of responsibility associated with the exercise of evaluation and, as Kvale (1990) pointed out, it irremediably takes on connotations of an act of power. There is a kind of parallelism with Yuval Noah in *Homo deus. Una breu història del demà* (2016), where he speaks about the drama that may occur in the future because of the fact that intelligence and consciousness may definitively be developed separately with the onset of artificial intelligence. Evaluative and axiological knowledge have also gone through periods when their evolution has been viewed separately. Axiology is the consciousness of evaluation; it is the beacon that should illuminate it. It is also what legitimises the overall design of any of its processes.

3. New trends in evaluation

Evaluation has traditionally been conceptualised as a linear process, and within this process, the very definition of the programme to be evaluated is what essentially determines the design and methodology to be used. All of this entails a static, predetermined view of the phenomenon of education which is in no way aligned with emerging innovative processes and has clearly dimmed their possibility of being applied.

Having reached this point, I believe that we should include reflections on the new emerging approaches to evaluation and the fundamental theories behind them. From these new perspectives, new ways of viewing evaluation are emerging, especially when applied to innovation, whose unique and dynamic nature requires the application of new logics in the execution and analysis of its processes. In this context, what is called *evaluation of development* appears as a new approach to studying educational practice in situations of change and innovation.

3.1. *Evaluation of development*

Development-oriented evaluation has appeared in the context described above; it is a new approach to evaluation particularly designed when acting in innovative projects. Patton (2011, p. 28) describes evaluation of development as “intentionally targeted at innovation projects and defined as an extension of the summative/formative repertoire that is focused on using evaluation within the innovation process, such that both the pathway and the destination are considered simultaneously, and it analyses the situation as it develops through rigorous research processes, yet with the clear intention of using the data in a comprehensive way in order to report on the innovation within the context of its own process.”

From this perspective, evaluation is envisioned as a process which is itself dynamic and flexible, specific to each context and actively involving all the stakeholders operating in the system. The new nature of the process necessarily implies that it must be iterative and cyclical, which allows it to gradually determine the nature of the evaluation in the specific innovation at hand.

3.2. *Evaluation of development and evaluative thinking*

The concept of *evaluation of development* is closely tied to the concept of *evaluative thinking*. This latter concept is expressed masterfully in a publication of the International Development Research Center (Bennet & Jessani, 2011, p. 24), which states: “Evaluative thinking is a way of thinking, of seeing the world dynamically, by questioning, reflecting, learning and modifying. Evaluating thinking is an inherently reflective process which strives to resolve the creative tension between the quality of an action as it happened compared to the quality expected of it. It allows us to precisely define what we should learn, how to collect the information that allows us to analyse the quality of learning and the means we have to change and improve. In short, evaluative thinking is essentially learning for change.”

4. **The innovation-evaluation binomial**

Innovation and evaluation are an indissoluble binomial within the context of modern education. Innovation’s credibility is grounded upon its ability to create parameters of successful action within the context of a society that is not only complex but also unpredictable. The very lack of knowledge of future needs forces us to modify and constantly redirect innovative projects as the design and implementation of their processes moves forward.

The worst scenario for innovation is generating the sense of a lack of referents, that it is a one-off product not associated with a global movement, that the goal is to justify oneself, that there is no need to check to what extent it is properly geared at a specific, important objective and failing to justify any of its achievements. Blind and bereft of credibility, innovation is utterly sterile.

This situation sparks the need to symbiotically associate the binomial of innovation and evaluation. As we have seen, evaluation meant as evaluating thinking is no longer justified essentially as an instrument of control. The crux

of its action is generated by proving its ability to properly guide the construction of educational knowledge.

On the other hand, any innovation must show that it properly achieved its objectives, as Bernholz (2011, p. 1) quite succinctly states: “Give something new and prove that it works”. In today’s societies, change is spurred through two kinds of drives: trust in the stakeholders who are supposed to carry it out, and their need to show results that brook no doubts and are comparable.

All of this obligates us to encourage the combined use of innovation and evaluation. Working on both in a simultaneous, coordinated fashion leads to two highly desirable effects: first, evaluation guides innovation and endows it with credibility, and secondly, innovation substantiates and brings visibility and meaning to evaluation. This joint, coordinated use requires new logics in its application; we can no longer refer to existing manuals or previously established guidelines on how to execute an innovation programme or an evaluative action.

In this new context, evaluation should merge with innovation from the very start. Evaluation’s potential is notably increased when it is positioned as an integral part of the innovation process and thus substantially contributes to its development and evolution.

Without the shadow of a doubt, evaluation is the cornerstone upon which innovation is built from a systemic perspective. Its action should be constantly negotiated and provide well-reasoned reflection to the system as a whole. As Drucker (1985, p. 8) notes: “Innovation implies more hard work than brilliance. It requires knowledge and sometimes a certain ingenuity. It requires the ability to focus on facts and to manage innovation. More than anything, it requires dedication and the acquisition of systematic practice in the innovation processes.”

We concur with Earl and Timperley (2015, p. 7) when they argue that: “A successful innovation can force its parameters to change quickly in response to the uncertainty and complexity of the context in which they act, but these changes will never be random. The leaders of any innovation act by intelligently combining creativity and discipline, which allows them to effectively react in highly diverse, changing conditions. More than acting in a disorderly way, disciplined innovation means constantly defining the problems, scanning the horizon, analysing situations, monitoring progress, creating contingency plans and providing constant feedback to the innovation process in order to achieve the sought-after improvement.”

If we frame innovation and evaluation within a powerful, shared, iterative process, we will manage to organise and reorganise the new ideas once they have been subjected to evaluative analysis, and with this mutual enrichment the innovators will be better poised to interpret them properly and transfer them in an utterly rational way to the intervention processes. Once again, Earl and Timperley (2015, p. 16) shed light on the nature of what we are presenting here when they say: “The power of the joint work between innovation and evaluation comes precisely from the depth of thought that emerges from the interface of evidence-based generative ideas on the deliberate process of learning for change. We should view action as work based on not separate processes but ones that are connected through strong relations of shared work which involves all the key stakeholders (innovators, administrators, participants, facilitators

and evaluators), the only way to understand and influence innovation as it unfolds.”

5. The innovation/evaluation process: Prior factors

If we want to establish the innovation/evaluation process understood as a strategic action that should be designed jointly, not as if they were two separate elements, we will logically be forced to focus and refocus educational action iteratively and constantly. This requires us to previously outline certain factors which should be clarified before designing the process associated with evaluation of innovation:

a) To define innovation.

One of the first tasks we have to deal with is to describe in a detailed, comprehensive way everything that the innovators are trying to do, which necessarily and firstly entails clearly establishing the theoretical framework within which the innovation is situated. In order to be effective, this framework has to allow the evaluation to be properly formulated and must meet the corresponding need for responsibilities.

We will know whether the description is complete if it clearly helps establish the pathway forward, if it describes the expected progress and if it mentions the truly important evidence that must be collected in order to support the quality of the innovation and be able to evaluate it. Because of its very nature, innovation does not follow a predetermined path (it would not be innovation if it did). We have to view it more as a flow which has to be continuously adapted and readapted as the associated evaluation provides us with information that advises continuing in the same direction or making changes.

An initial theory of action should be formulated which brings meaning and significance to the overall innovation. This theory, which will logically be tentative, should at least allow us to interpret the entire set of elements involved in the innovation in the specific context in which it should take shape and gain solidity as a theory, such that it should allow us to construct a comprehensive educational narrative in line with the nature and purposes of the innovation.

In this stage, the evaluation can help clarify the description of the innovation; assist in identify its objectives; participate in explaining the theory of the action; capture powerful, relevant evidence in order to evaluate the gradually emerging results; and enrich the strategic thinking which is so essential for the constant adaptation and re-adaptation of the innovation process.

b) To determine the stakeholders involved and their degree of participation/involvement.

In the new conception of innovation, the agents who are interested in/affected by the innovation with different levels of participation/involvement cannot play a secondary role as mere spectators. All the groups involved should participate in the innovation without any kind of excuse or underestimation.

It is fully evident that their commitment, expressed by participating actively in the innovation, provides a much deeper, more diverse and richer

view of the innovation. And we are no longer referring to the importance of their participation in the evaluation processes; instead, their contribution to them is utterly essential because they considerably expand such a necessary factor as the degree of authenticity of the innovation. Generally speaking, we know that guaranteeing the agents' participation – in both the innovation and the evaluation – increases their commitment with regard to what they can contribute, which obviously affects them and is essential to securing their support in all decisions, especially in the most compromising ones which have to be taken stemming from the implementation of the innovation.

In today's world, involving the key agents in the milieu in the innovation and evaluation processes is an absolutely essential step if we truly aspire to implement any kind of innovation. These agents' intervention gives it credibility and sustainability in the most immediate future.

c) To acknowledge the contexts.

The difficulty of interpreting texts without their contexts is clear. Educational innovation moves in contexts that are extremely complex, broad, diverse and ever-changing. All of this forces us to think about innovation in the sense that those in charge of the innovation cannot be divorced from what is happening in the educational systems around them. They have to remain aware of the key referents in the system, which can provide relevant information on the local and international systems in order to properly interpret their needs and especially determine the movements that characterise the axes of the change. None of this is possible without generating synergies among all the agents operating in the system. Thinking about the actual innovation as an isolated action circumscribed to a single school without the pooled efforts of other innovative schools (with which to exchange experiences), the public administration or the broader setting (local, international, etc.) is tantamount to condemning the innovation to superficiality and irrelevancy.

Modern innovation needs to generate intervention designs that are flexible and capable of adapting to dynamic, emerging educational realities on which a wide range of forces act which are not easy to interpret without cooperating with other more informed agents.

All of this forces us to modify the logics applied to the processes and those that guide them. These modifications particularly affect the role of the different agents involved in the innovative process. Thus, the evaluators have to permanently leave behind their classic "role" as controllers in order to become agents who essentially help interpret the information in complex systems instead of measuring specific results. In this new framework, interpretation becomes a core factor for the success of the innovation and essentially consists in an iterative process of gathering all the participants' points of view and deciding jointly on the data needed to truly make the change and improvement processes meaningful.

d) To identify the purpose of the evaluation within the context of innovation.

Finally, we should clearly establish the purpose of the evaluation within the framework of innovation. First, the innovators have to accept the importance of evaluation in innovation. As Gates (2013, p. 1) asserts: "Without the feedback provided by precise measurement, innovation is condemned to be

an alien, erratic product". Evaluative thinking, as a new principle inspiring evaluation, has an inherent, fundamental value in the development of innovation, but it is clear that the evaluation should abandon obsolete traditional practices in order to focus its main purpose on providing evidence that can lay the groundwork for the required feedback on the innovative processes, which thereafter should be recurring.

Negotiating this new territory is no easy task. It means forcing the key agents to spend a great deal of their time clarifying the production conditions of the process, establishing and sharing the evaluation purposes, especially in the aspects of innovation where there are discrepancies among the different agents. Nonetheless, it is clear that if the evaluative ingredient is not brought into the innovation, it will lose credibility.

We could summarise the contribution of these factors in terms of the quality of the innovation as follows:

- Defining the evaluation precisely will give the innovation relevancy.
- Determining the key agents and enlisting their involvement will give it sustainability.
- Properly recognising the contexts will bring interpretative capacity.
- Integrating the evaluation into the innovative process will guarantee its credibility.

Resolving all of these factors in advance will facilitate the evaluative action, which will take shape in the process we present below. Even though we are presenting it sequentially here for purely expository reasons, it is obvious from all the elements outlined so far that the process must be iterative.

6. Stages in the evaluative cycle of educational innovation

Having defended flexible, adaptative evaluative models to analyse the innovation does not mean that they are not properly planned processes. In reality, this means applying systematic, iterative models that move back and forth in a clearly intentional fashion. In our explanation, we shall follow the model of Earl and Timperley (2015, p. 23-33). Because of its simplicity and clarity, it can serve as a guide to establish the basic stages in the evaluative process:

6.1. Identifying the evaluative questions

Identifying the questions that can best help us get the most relevant information produced at any given time for a specific context is perhaps one of the most difficult yet important challenges for the evaluators to solve. Two kinds of questions which we should be capable of formulating and specifying were traditionally considered. These questions are directly related to the short and long term:

- What do we need to know about what is happening in order to take the best decisions in the short term?
- Are the questions specific enough?

– Are they focused on the matters which the key agents consider the most important and most relevant in the long term, in order to detect whether the innovation is moving forward in the right direction?

Given the unpredictability of the innovation (because of its very nature), the two kinds of questions should include the possibility of adding questions on the unintentional consequences of the innovation.

Deciding on the best questions, in the opinion of the experts, is an art in itself, even a science. It requires them to be considered carefully and even negotiated with the key participants both to ensure that they point towards the most explicit needs of the innovation and so that the objectives stemming from them are likely to be achieved within the timeframe allotted. Failing to consider these factors can render the evidence which we eventually decide to collect meaningless, such that it does not contribute to guiding the innovation in the best direction.

6.2. Collecting the evidence

Systematically collecting evidence provides the basic platform from which the evaluative questions can be answered. Over time, experts have developed many technical information-collection mechanisms: document analyses, narratives, standardised tests, questionnaires, discussion groups, digital technologies and, more recently, all the possibilities derived from big-data analysis.

These processes generally call for some technical knowledge within the field of evaluation. However, in essence, what must be required is that the evidence should be high enough quality so that a precise, adequate representation can be made from it that helps yield a profound understanding of the facts within broad explanatory frameworks and that properly guides decision-making.

6.3. Organising and analysing the evidence

Once the evidence has been collected, the next step is to decide how to organise and analyse the information collected according to the evaluative needs of the innovation. There are quantitative statistical techniques or standard qualitative analytical techniques which we can use, but there are no standard evaluative models that can serve universally for any evaluation.

The evaluation of innovation will be a bespoke process which must be designed for every situation; after formalising the evaluative model, the analysis techniques that we deem the most appropriate will be applied.

Evaluative questions are seldom simple (if they are, there is no need to apply a systematic, ambitious evaluation); they are generally complex and require far-reaching, in-depth analyses in order to grasp the nature of the phenomena evaluated.

6.4. Internalising the interpretation of the information in the process of constructing knowledge

The next step is a truly enormous leap within the evaluative process. It entails going from the comfort zone of the empirical to constructing the abstract. This leap forces us to become aware that all the observations that emerge from the analysis of the evidence have virtually no value unless we are capable of transforming them into useful knowledge to properly guide the innovation and endow the innovative actions with meaning and significance.

As Senge (1990, p. 14) notes: “Working with data and information implies heavy mental lifting which leads to personal viewpoints, yet it also means capturing and organising ideas systematically, such that they transform the information into actions full of meaning and facilitate its public, transparent interpretation”.

In this section, we have introduced and developed the familiar notion of “knowledge construction”. Nonetheless, in our milieu, it is still an emerging, sophisticated idea. As is common, here we relate it to the analysis of how learning takes place within individuals, but we also set our sights on how this learning is simultaneously transformed in the social context, where it develops into shared culture thanks to the internalising action of the evaluation. This is one of the essential objectives of innovative approaches.

6.5. Mobilising the new knowledge

The knowledge generated by the innovation should be used both extensively and intensively. Sharing and mobilising the knowledge essentially means creating new learning environments with the mission of projecting them both locally and universally so that others feel intrigued – and implicated – by our ideas.

By this we are not saying that the goal is simply to share what we have done or tout our achievements. Mobilising knowledge means getting more people involved in broader innovative processes that are offshoots of the original one and developing new proposals in order to activate the existing knowledge and transform it into new socially shared innovations.

6.6. Sustainability

One of the problems that innovation has had to address is determining its sustainability, that is, our ability to retain it over time with the right quality level. From our particular vantage point, we believe that an innovation can be considered fully sustainable when we are capable of incorporating it into an institution’s usual routines and when its agents fully internalise it as a new yet sufficiently consolidated mental habit. However, if we expand the concept, we should also consider sustainability in terms of our ability to ensure that it remains faithful to the program as it was originally defined, as well as the real possibility of guaranteeing the resources needed for it to continue in the future.

Finally, at a higher level, we can also conceptualise sustainability as the capacity to integrate the innovation into the set of theoretical principles that not only provide us with the possibility of constructing a story but also pave the way

for transferring its principles to other contexts. Designing an innovation in new and different developments means guaranteeing that it will survive over time.

7. Epilogue

I wanted to conclude this article with several final considerations. No one can avoid the resistance sparked in innovators to the mere idea of subjecting their projects to evaluative processes.

Many innovators consider evaluation more a formal straitjacket than an active ingredient that helps the development of the innovation.

Likewise, evaluators do not always have the capacity to act synergistically with innovators. They are mainly concerned with working in contexts with no constraints and feel more secure applying previously formalised evaluative models than in open-ended, uncertain situations, as innovative processes frequently are.

Working together means sharing belief systems, values and working styles. Generating a relationship that leads to this situation is a proactive process which incorporates actions such as asking, listening and trying to understand the different perspectives in order to better take advantage of the knowledge and expert views contributed by others.

In this sense, Earl and Timperley (2015, pp. 34-37) recommend applying three overarching principles, which will serve as the closure to our reflection:

1. *Being open to ideas for improvement.*

As Preskill and Beer (2012) note: “Those who are interested in experimenting with social innovations have to be ready to take risks and accept problems and mistakes. They have to accept that they will have to live with uncertainty and that even if they were wonderfully thought out, their plans will have to be tinkered with as the circumstances around them change.”

2. *Being pragmatic.*

This means knowing how to create teams and consolidate them over time, pushing them to develop the capacity to work together and direct their efforts towards the most ambitious objectives of the innovation, yet without losing the capacity to exploit the minor discoveries that emerge in the course of implementing the innovation.

3. *Being capable of negotiating.*

This means being able to negotiate and renegotiate, as many times as needed, with everyone involved, given the vital importance of collective, interdisciplinary work in innovation.

As Blackwell et al. (2009, p. 1) state: “Interdisciplinary innovation emerges from the positive effects that result from leaping over the narrow, rigid boundaries into which we organise knowledge. [...] Oftentimes it is the case that the right knowledge we need to solve a problem lies outside the scope of the conceptual framework where the problem itself is situated, and this is why interdisciplinary innovation is one of the essential instruments of the future.”

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