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Commentary (17):

The Gift of Interdisciplinarity: Towards an Ability to Think across Disciplines

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They didn't know it was impossible so they did it.
Mark Twain

Keywords: Interdisciplinarity; complexity; giftedness; creativity.

Don Ambrose's "Borrowing Insights from Other Disciplines to Strengthen the Conceptual Foundations for Gifted Education" provides an opportunity for reflecting on both the potential and difficulties inherent in interdisciplinary research. In effect, the different ways of conceiving giftedness as an object of interdisciplinary research can inspire challenges and ways of thinking and doing in other disciplines or pluridisciplinary fields of study. Although psychology and education remain the central disciplines involved in the study of giftedness and gifted education, Ambrose rightly extends the range of disciplines affected by the complexity of this issue. The disciplines related to this topic to a greater or lesser extent are: anthropology, ethics, philosophy, history, economics, and sociology. The multidimensional complexity of giftedness necessitates an open and holistic perspective that cannot be reduced to a single disciplinary root. The ability to open up to other disciplines and to disciplinarity as an entirely separate object of reflection is the focus of this article.

Interdisciplinarity is an epistemological, theoretical, and methodological issue that exists both within numerous disciplines and can be studied across them (Darbellay & Paulsen, 2008; Frodeman et al., 2010; Klein, 1990). In turn, interdisciplinarity fosters theoretical and practical advances in a particular field of study, in this instance studies of giftedness. The following questions arise in this regard: What are the specific challenges of interdisciplinarity and what is the nature of these processes involving the decompartmentalization of disciplinary boundaries? In this context of relative indisciplinarity what role does the idea of *discipline* still play in relation to disciplinary imperatives? Does engaging in interdisciplinary research represent an opportunity for researchers to make use of and/or develop cognitive abilities and original practices? Is interdisciplinarity a fashionable and automatic approach that all disciplinary and non-disciplinary researchers practice without difficulty, or does it require certain talents and specific skills? I will give priority to this second exploratory approach. I will also attempt to demonstrate that it is not the function of the interdisciplinary researcher to be at the service of the established disciplines and accompany their internal advancement. Instead, I will try to show that the interdisciplinary researcher has surpassed this ancillary position considerably to creatively develop abilities, concepts, tools, and methods that enable the interdisciplinary researcher to go beyond disciplinary limits and to produce new knowledge.

Although the majority of researcher profiles remain rooted by necessity and moreover, entirely legitimately, in a "home" discipline, something that makes sense in an academic context organised on a disciplinary basis, the fact remains that transgressive practices are also emerging and driven by researchers who are distancing themselves intentionally from the security of the discipline with a view to inventing new ways of thinking.

To echo the quote from Mark Twain presented as an epigraph to this article, this pioneering spirit, characterized by risk-taking, is found in scientific practice. Indeed, despite the fact that it would appear difficult or even impossible to implement at times in view of the resistance to change that it faces, it is practised on an everyday basis. The interdisciplinary researcher is without doubt a pioneer who proclaims a new way of producing knowledge without creating an additional discipline. The interdisciplinary researcher is akin to the aviation enthusiasts of the late 19th and early 20th centuries who, through their successes and failures, helped to write the first page of aviation history (Nova, 2011, p.10).

With a measure of ignorance, considerable confidence, extreme perseverance and a healthy appetite for risk, early aviators invented ingenious machines, prototypes of winged cars, gliders and vehicles mounted on giant umbrellas fitted with engines. Through the adventures that are recounted with delightful humour in the opening sequence of Ken Annakin's 1965 film *Those Magnificent Men in their Flying Machines or How I Flew from London to Paris in 25 Hours and 11 Minutes*, explorations and productive failures were transformed into successes. Although nobody is obliged to achieve the impossible (*ad impossibilia nemo tenetur*), we sometimes encounter innovators who make the impossible possible. This talent consists of innovating beyond disciplinary conformism by adopting a "Why not?" attitude. Bachelard (1934) decoded innovation in three complementary stages: it involves starting from the central idea of disciplinarity to demonstrate the advantages and limits, from which the conditions associated with its exceeding are revealed; once the threshold of a discipline has been crossed, it is possible to update a variety of interdisciplinary researcher profiles which are reflected in a desire to go beyond disciplinary boundaries. Beyond this variety of identities and practices, I will also pinpoint some of the abilities required to allow free rein to interdisciplinary talent as a high creative potential.

Crossing the disciplinary threshold

The process of the disciplinarization of knowledge is an intrinsic aspect of the history of the modern university which contributed to the fragmentation and division of the disciplines which make up the scientific field in its entirety. This specialization movement offers relative autonomy to each institutionalized discipline. The latter represents a sub-space, within which a community of disciplinary researchers is distributed. These researchers control each other and themselves in such a way that they maintain the effect of the enclosure of their intellectual territory (Becher & Trowler, 1989). In fact, the researchers acquire and reproduce a "disciplinary habitus" (Bourdieu, 2001, p. 86) that regulates ways of thinking about the concepts and methodological skills characteristic of a given scientific community. This process of habituation to good disciplinary practices is the bearer of a symbolic value that lends it a certain "hypnotic power" (Bourdieu, 1998, p. 48), with which the members of the discipline identify through self-hypnosis and a more or less homogenous group spirit. The attempts at differentiation and identification with other disciplinary groups may be penalized through a call to order compliant with the principle of conformism.

The pupil or disciple (*discipulus* in Latin) is a person who follows a master and displays allegiance and obedience. A disciple submits to the need for the 'discipline' (*disciplina*), the whip of cords or chains used as an instrument of penitence, control and self-discipline. This spirit of disciplinary concentration, which is entirely legitimate and strongly legitimized in university institutions, is necessary for the development of knowledge within all disciplines and, at the same time, generates a proportional inability to give consideration to other points of view and/or problems that lie outside the disciplinary field of vision. In this case, strict disciplinarity is akin to a kind of "inattentional blindness" described by Mack & Rock (1998) and further exemplified by Chabris and Simons's (2011) invisible gorilla in *The Gorilla Experiment*. In this test of selective attention carried out with the help of a short video, the task consists in counting the number of passes made among three players from a basketball team wearing white t-shirts playing in the same space and at the same time as another basketball team of three players in black t-shirts and also playing among themselves. In principle, the test subjects manage to find the correct answer, i.e. five passes, without any major difficulty. When the video voice-over follows up with the test subjects by asking them whether they have seen the "gorilla", a considerable number of them are surprised and find themselves caught unaware (In general, 50 percent of the test subjects do not notice the gorilla). When the video is replayed, a person disguised as a black gorilla beating his stomach and slowly crossing the field of vision is very plain to see. The attentional focus on the players in white t-shirts completely eliminates the visual evidence of the gorilla's passage that dominates the action when viewed on screen. The experiment suggests that strong concentration on a particular task generates a blind spot and makes people block out an essential and highly original element of the experience: they fail to notice a perfectly visible stimulus. In the cognitive field, the problem is not inattention. The conspicuity of an object, idea, concept or method that is likely to attract attention in the cognitive field is dictated by the excessively disciplined view of the researcher who deploys almost all abilities in fulfilling a single routinized task. By the same process, hyperdisciplined researchers stop themselves from perceiving theoretical or practical elements of one or more other disciplines existing alongside their own—even when an interdisciplinary perspectives and reflection could potentially enable advancement in their own field.

The intention here is not to denigrate disciplinary effort, necessary for the development of knowledge, but to illustrate the fact that this mode of knowledge production is not the only one. It is necessary but insufficient in that it does not represent the diversity of research practices located between and beyond disciplinary divides. Of course, the threshold of disciplinarity should, be developed; however, it should be simultaneously reflected on and exceeded.

The diversity of researcher profiles

The disciplinary researcher is productive and largely valued in the university context. However, this is merely one researcher profile among other possible ones that are admittedly less significant in terms of quantity. This observation was confirmed by a research study I conducted in the Swiss university context, *Analyzing Interdisciplinary Research: From Theory to Practice* (Swiss National Science Foundation, application n° CR11I1_143816, 2014-2015). This multiple case study involved the analysis of interdisciplinary research practices in various fields (ecology, ethics, health, sustainable development, digital humanities, medicine) while focusing particularly on the way in which interdisciplinarity is implemented by researchers in different academic contexts. Ten university centres or laboratories were selected for participation on the basis of their acknowledged involvement in interdisciplinary research in Switzerland. A total of 66 selected researchers in these 10

centres participated in the survey that was based on a mixed methodological filtering mechanism involving mainly qualitative methods. The survey included a questionnaire (65 respondents), semi-directed interviews (30, i.e. three per case) and one focus group per case (10 focus groups involving between four and seven researchers).

The selection of the survey participants took into account the criteria of differences in academic status, disciplinary affiliations, gender, and age. Without going into the details of the results of this research project that covered the multiple dimensions of interdisciplinary work (institutional, theoretical, epistemological, methodological, collaborative, publication, and evaluation of research), I would like to highlight one of the study's analytical dimensionsconcerning the researchers' reflections regarding their disciplinary affiliation and identity when undertaking disciplinary research. Our study succeeded in demonstrating a seemingly contradictory tension between relatively stable and institutionally acknowledged disciplinary identities, on the one hand, and more hybrid and mobile interdisciplinary identities that have yet to gain any form of academic recognition, on the other. Having established the sometimes paradoxical effects of the researchers' identities, we recognized different types of identity profiles ranging from that based on the claimed affiliation to a single discipline to more interdisciplinary and even indisciplinary profiles.

This gradual categorization does not make any claim to being exhaustive or to covering all cases that could arise along the broad spectrum of experience of interdisciplinary research. Instead they are prototypical profiles in the sense of the theory of the prototype (Rosch, 1973), whose practitioners should be considered as more or less representative. Indeed, the affiliation to a given profile or profiles should be understood in terms of a "more or less" rather than "all or nothing" logic. These profile types may be identified, as follows, on a continuum ranging from disciplinarity to indisciplinarity (Sedooka et al., 2016). The first profile is the relatively traditional one of the disciplinary researchers: (a) who explicitly display their affiliation to a recognised academic discipline (sociology, psychology, medicine) while also engaging in an open dialogue with other disciplines. The spectrum then broadens to include those researchers who make an explicit claim to adopting an interdisciplinary approach without presenting a single pre-established disciplina

ry identity. Here we can identify the hybrid profiles (b) of researchers whose academic trajectories result in the intersection of two or more former disciplines (for example, psycho-sociology or socio-anthropology). These researchers also establish themselves on the basis of a new (inter-)disciplinary identity through the hybridization of two or more disciplines. Pushing this breakdown of disciplinary boundaries further, it is possible to identify increasingly – in particular among young researchers – a thematic profile type (c), in which the researchers do not identify with a discipline but a thematic field of interdisciplinary studies that often cuts across several disciplines or sub-disciplines (for example gender studies, migration studies, visual studies, giftedness studies). Rather than follow a more traditionally disciplinary academic trajectory, these scholars allow their thematic focus of interest to direct their research, teaching, and publication activities. In the same vein, a new researcher profile is emerging which we designate as (d) "interdisciplinary natives," in the sense that its practitioners develop an interdisciplinary trajectory without any fixed disciplinary roots and their studies are carried out in scientific fields which include a broad range of different disciplines. In a way, these researchers were born within and with a culture of interdisciplinarity. Without limiting ourselves to an age or generation

effect, it is also possible to identify a complementary profile of migrant researchers (e) (interdisciplinary migrants) who are well-recognized and have an established original discipline but progressively open up to interdisciplinarity through borrowing, circulation and transfer between the disciplines over the course of their academic careers. In effect they construct their identity through changes and transformations from one discipline to another, successive migrations, and conceptual, theoretical and methodological nomadism (Andler & Stengers, 1987; Darbellay, 2012). At the extreme end of this spectrum of the different profiles that deploy variations, transformations, and repositionings of varying degrees of originality with respect to disciplinarity, we have, finally, the indisciplined researchers (f), who work resolutely outside of all disciplines and try to avoid all disciplinary sclerosis (Legay, 1986; Loty, 2005). They defy disciplinary boundaries with a view to enfranchising and liberating themselves from the disciplinization of knowledge.

These different profile types, identified here for exploratory purposes, contribute each in their own way to the defence and illustration of the interdisicplinary work necessary for the production of new knowledge. They are embodied in the trajectories of researchers who live the identity-based paradox on an everyday level, a process that involves existing within one's own discipline, interdiscipline, or indiscipline while remaining open to the other. Testimonies from researchers surveyed demonstrate the plurality of disciplinary identities that exist within interdisciplinary research practice conceived as dynamic, individual, and collective processes. Finally, the (inter-)disciplinary identities of the researchers are defined at the intersection of different parameters: from their basic education (disciplinary, bidisciplinary, multidisciplinary, or interdisciplinary) to their theoretical and methodological skills, the specific details of their academic and professional trajectories, and their personal interests. As it emerges and exists the identity of each researcher is shaped by many internal and external variables. Between similarity and dissimilarity, the question arises about what basically enables these different profiles to be similar in the sense of a family resemblance. What are the shared values, abilities, and characteristic cognitive operations practised by all researchers who are located in, between, and beyond disciplines? How would they allow us to outline an ideal type or meta-profile of the interdisciplinary researcher who would manage to express high potential for scientific creativity, and therefore participate in the renewal – or re-establishment – of complex fields of study like giftedness as explored by Ambrose and others?

Interdisciplinary talent, innovative abilities

The consideration of the abilities specific to interdisicplinary work is linked in part with the need to educate new generations of researchers who are open to engaging in complex thinking with a view to solving theoretical and practical problems that cannot be dealt with from a monodisciplinary perspective (Lyall & Meagher, 2012; Stokols, 2014). It is not a question here of providing a reference work or exhaustive list of the required and standardized abilities, but of presenting some transverse abilities conducive to interdisciplinarity, taking into account the epistemological and institutional obstacles that still arise very frequently on the paths of researchers who take the risk of venturing beyond disciplinary limits. Apart from motivation and courage, the following three aptitudes characteristic of interdisciplinary researchers may be noted here:

- the taking into account of the complexity of the theoretical and practical problems to be resolved;

- an ability to move away from a disciplinary point of view and share the values of openness, empathy, and tolerance; and, finally,
- an aptitude for creative work which enables the invention of new concepts, theories and methods.

Complexity, values, creativity – these are the three core concepts used for outlining a prototypical meta-profile of the interdisciplinary researcher.

Complexity

As Ambrose correctly reminds us, it makes sense to draw all of the conclusions from the evidence clearly demonstrated by the theories of complexity. If you define a biological, psychological, social, or anthropological object of study as a complex system, you start from the – observation-based – principle that the object or phenomenon is composed of different parts or variables that interact constantly. The object is considered as a plural and dynamic totality that cannot be reduced to the simple addition of its parts. It constantly changes through contact with (psycho-socio-anthropological) contextual elements and presents emerging properties.

For example, if we consider giftedness as a complex phenomenon, we establish an epistemological basis from the outset, according to which several variables (genetic, individual, collective, social, historic) interact in a non-linear manner of thinking. A holistic and integrated understanding alone will enable us to capture, describe, and understand the links constructed among these multiple dimensions. In this context, the researcher – or group of researchers in a collaborative variant of interdisciplinary research – cannot reduce giftedness to one of its constitutive dimensions. This epistemological rigour should be maintained throughout the research process while avoiding any eventual regression into disciplinarity that would involve the re-fragmentation of the object of study to focus on just one of its dimensions. In effect, epistemological pluralism is the guarantee of the diversity of disciplinary points of view deemed relevant and that should be activated together for tackling complex problems.

The interdisicplinary researcher, who is endowed with great sensitivity to cognitive diversity (Page, 2007, 2010), could be described as a polymath who is capable of mastering a series of disciplinary inputs and integrating them into a holistic vision. Metaphorically speaking, the interdisicplinary researcher could be related to the chameleon that has the ability to adapt to a new environment by transforming itself to enter the system. Through differentiation, the disciplinary researcher develops in the specialized area in a targeted way. The specialist, who displays less adaptive ability in moving away from a field of specialization compared with the non-disciplinary researcher, can develop optimally in a university environment that is entirely beneficial but encounter difficulties in the face of complex and multi-dimensional problems that cannot be reduced to a monodisciplinary point of view. Without espousing to a primary and caricature-like Darwinism, the strictly disciplinary researcher evokes images of the panda, koala, or anteater, whose hyperspecialization reduces its chances of survival when the problems to be solved become more complex due to diversification (Durand, 2008). For example, the panda finds itself at an evolutionary impasse due to the excessive specialization of eating only bamboo. Although the panda does not have many rivals for this food source in its own territory, it is highly dependent on the forest context that surrounds it and is threatened

with extinction in the event of food source scarcity. Similarly, the koala only eats a certain kind of eucalyptus leaf and the giant anteater has evolved into a highly specialized creature by developing a long and narrow face to satisfy its taste limited to ants.

When people or animals rely on a single type of food or intellectual substance, they sometimes specialize to the extreme; in doing so, they prevent themselves from discovering new opportunities. In contrast, by feeding on a variety of scientific cultures, interdisciplinary researchers liberate themselves from the *path dependence* that is characteristic of disciplinary habituation. Based in institutional contexts propitious to interdisciplinarity, interdisciplinary researchers are able to submit concepts, theories, and disciplinary methods to a process of cognitive dehabituation, change point of view, and adapt to complex situations.

Values

The recognition of complexity, cognitive diversity, and epistemological pluralism expresses the right to the co-existence of different forms of knowledge, not only disciplinary but also interdisciplinary and indisciplinary forms. In opposing attempts to impose the hegemony of one form of knowledge over another, it is important to defend the value of "cognitive justice" (Visvanathan, 1997) among seemingly incommensurable scientific cultures. This egalitarian treatment involves the establishment of dialogue and decompartmentalization of disciplinary knowledge for the development of a more equitable, sustainable, and democratic science. This message of tolerance among researchers with different disciplinary horizons rests on communication practices that are rooted in a capacity for empathy—not mere sympathy among researchers.

The adoption of a sympathetic approach involves feeling emotion about and interest in a different perspective while remaining within oneself and without changing one's ego-centred perspective. Thus the communication between disciplines is a simple reciprocal, face-to-face exchange and linear transmission of information from a multidisciplinary perspective. Reinforcing the encounter with the other disciplinary perspective with empathy (Berthoz & Jorland, 2005) consists in experiencing the emotion, interest, and point of view of several other researchers and putting oneself in the other's place. This process necessitates "mental rotation" as described by Berthoz and Jorland, a displacement/duplication or decentring of self towards the other in such away that one can see a problem from someone else's perspective and from a new angle. This capacity for empathy is one of the conditions for the successful shift from multidisciplinary communication (an exchange through the juxtaposition of points of view) to a dialogic interdisciplinarity that sets out to exceed and integrate knowledge. Cognitive justice, tolerance, and empathy are three values upon which an interdisicplinary work ethic must be founded.

Creativity

By endorsing a complex idea and promoting the values of cognitive justice, tolerance, and empathy in the dialogue among disciplines, interdisciplinary researchers cannot be content with applying standard concepts and methods. On the contrary, they are encouraged to put creative abilities into action. This link between creativity and interdisciplinarity has already been illustrated (Darbellay et al., 2014), which focused on the case of serendipity as a creative process with a high scientific value. In this article, my co-authors and I demonstrated how the decompartmentalization of disciplines, the capacity for decentralization, and the spirit of openness to the unexpected are intrinsic components within work of researchers who

position themselves beyond and between disciplines. These researchers display a certain cognitive plasticity/flexibility that is considered as the ability to change their point of view, be tolerant of ambiguity, and make new connections between seemingly disparate ideas, concepts, or methods. Through combined processes of divergence (generation of non-conformist ideas, innovation, originality) and convergence (critical analysis, selection, integration), the creative researcher succeeds in developing intellectual products and/or practices that are both original and tailored to their context (Lubart, 2003).

The interdisciplinary process brings facts of "bissociation" (and its derivatives *trissociation* and *multissociation*) as described by Koestler (1964, 1978) into play. Thinking in terms of bissociation means making use of a cognitive ability (the Latin verb *cogitare* "to think" derives from *coagitare* "shake together and mix"), consisting of shaking up seemingly incompatible disciplines that initially clash and separate but eventually link up, combine, and reformulate. This process for the generation of new and interdisciplinary knowledge is particularly visible in the mechanisms deployed for the borrowing and transfer of concepts, theories, and methods from one discipline to another (Darbellay, 2012). These are "fortuitous contaminations" as demonstrated, for example, by Dumas (1999) in his study of the productive overlaps among Freudian psychoanalysis, physiology, and thermodynamics and those among molecular biology, anatomy and physiology. These "conceptual migrations" (Fedi, 2002) of *travelling concepts* (Bal, 2002) are powerful operators of creativity between and beyond disciplinary space and time.

The strategies for borrowing, transfer, and nomadisms are implemented concretely using analogies and metaphors between ideas, concepts, and theories belonging to different disciplinary fields. The analogical process in the sciences is justly contested by scientific orthodoxy when it is reduced to extraordinary comparisons or simple plays on words that claim to take the place of demonstration (De Coster, 1978). However, the analogical process emerges as heuristically productive if it enables the extrication of similarities of relations and resemblances without claiming identity or equivalence between the compared terms, fields, or disciplines. This heuristic potential of metaphorical language is explained perfectly in Ambrose's contribution and merits the sustained attention of all those interested in the conception of interdisciplinarity as a creative processes.

With reference to La Fontaine's fable *The Grasshopper and the Ant* (Delessert & Piguet, 1996), it could be said that the researcher-ant (who does not borrow any ideas, concepts, or methods) develops legitimate strategies for disciplinary conservation or conformism while the grasshopper-researcher develops his ability to borrow and transgress the boundaries between disciplines at his own cost and risk instead.

The ideal interdisciplinary researcher with high creative potential could be defined as the potential or realised combination of the ability to think in complex ways based on an ethic of interdisciplinarity and substantiated in creative acts of disciplinary decompartmentalization through borrowing, transfer, and productive metaphors of a new knowledge. The deployment of these linked abilities expresses the particular talent of all interdisciplinary researchers. Apart from personal aptitudes, the researcher is not born as interdisicplinary but can become so through the development of the above-presented abilities. The renewal of disciplinary or pluridisciplinary fields – such as the study of giftedness – should be able to rely on these types of researcher profiles, that already exist and have been discovered by some or for those who await education as a new generation of researchers that

complements the disciplinary researchers and contributes to the development of a new style of thinking (Darbellay, 2015).

Conclusion

In order to enable researchers to exercise their interdisciplinary talent individually or as members of a group, it is essential to consider the possible obstacles and difficulties they may encounter. Naïve optimism has no place in this debate in that the epistemological and methodological obstacles are a reality experienced during attempts made at establishing dialogue between the disciplines. Each discipline has its own language, tools, and methods that create specific conditions for its further development and also represent pre-existing cognitive structures that must be negotiated in the interaction with other disciplines. The obstacles to interdisciplinary work also prove to be institutional in nature when researchers who attempt to go beyond disciplinary limits are confronted with a university system that promotes disciplinary careers and models evaluation and promotion procedures on the basis of an institutional organization consisting of faculties, departments, disciplines, and sub-disciplines.

It is also necessary to take into account the power relations and disciplinary egos that aim to maintain the academic territories in relationships characterized by incommunicability. This blindness vis-à-vis the disciplinary other prevent us from discovering new research horizons and seeing the "gorilla" emerging as a new idea in our cognitive field that we do not manage to see. Or as specialist researchers with narrowing fields of study, we resemble other metaphorical figures facing extinction like the panda, koala, grasshopper, and ant. In the competitive relations between specialists, the progress achieved by a group is sometimes accomplished at the expense of the others, and they eliminate each other in the manner of the grasshopper who eats the ant. It is precisely in the unplanned relations created at the interface between specialisms that innovation is born. Mauss (1980/1934) explained this potential very well:

> Now the unknown is found at the frontiers of the sciences, where the professors are at each other's throats, as Goethe puts it (though Goethe was not so polite). It is generally in these ill-demarcated domains that the urgent problems lie. Moreover, these uncleared lands are marked. … This is where we have to penetrate. … first because we know that we are ignorant, and second because we have a lively sense of the quantity of the facts. (p. 364)

Knowing that we don't know and accepting the role of ignorance as a means of opening up the frontiers of disciplines and scientific progress are two attitudes characteristic of the epistemological vigilance that underpins the development of the *savoir-faire*, *savoir-être* and *savoir-devenir* (ie. knowledge of how to do, be and become) of researchers. It is also important to strengthen institutional support in this spirit and to value the profiles of researchers whose high interdisciplinary creative potential asks only that it be substantiated in action. It is also important to strengthen and promote pedagogical training and innovation for researchers motivated by interdisicplinary work by allowing them to develop their abilities in the areas of creativity, dialogue, and theoretical and methodological integration.

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