From Challenge-Based Learning to Relational Coordination: An Interdisciplinary Educational-Research Collaboration in Medical Journalism Education

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Abstract- Interdisciplinary collaboration (IDC) faces several long-standing challenges including poor teamwork, resistance to socialization, inadequate attention given to learners' abilities, incomplete reporting, lack of quality methodology, and vague understanding of reflexivity. In an attempt to tackle these challenges, the purpose of this case study was to report an interdisciplinary educational-research collaboration (IDERC) involving two faculty members (NS and SA) from different departments who were simultaneously instructing a master's student (St) in two separate courses. The methodology involved addressed the learning needs of St in two concurrent courses as well as fulfilling particular research activities. A few different reflection-gathering tools were adopted to elicit the two participants' (SA and St) views on the impacts of the IDERC. Thematic analysis of SA's interview concerning her experiences with the IDERC indicated that she was motivated by a range of personal, educational, and research factors. It also showed her positive outlook on how a similar IDERC could benefit faculty members and students as well as knowledge development. SA also went through the reasons why educators may be hesitant or resistant to deal with IDC. When probing St's experiences with the IDERC incorporated inside his class tasks and an open-ended questionnaire, he not only highlighted the educational and research outcomes he gained, but also mentioned how he was influenced by the instructors' socialization behavior. Regarding the requirements of an IDC, St's main focus was on successful implementation and prioritizing efficiency. Suggestions are provided as to how this collaboration can be extended to larger contexts.

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Introduction

Collaboration among individuals from various academic disciplines aims to address complex issues, strengthen the integration of perspectives, and leverage diverse expertise. Collaboration across disciplines often carries a positive and fruitful connotation, and sometimes it is considered an inseparable part of academic activities. During interdisciplinary collaboration (IDC), assessment, goal development, and coordinated service delivery take place, involving significant contributions from all team members (1). Since interdisciplinary educational and research endeavors can foster a more creative and motivating learning environment, they frequently lead to the discovery of talents and inner knowledge. Moreover, they play a significant role in comprehensive, continuous,

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and socially impactful learning within the academic context (1).

Despite the effective roles of interdisciplinary collaborations, these activities have always faced various challenges. One of these challenges is decision-making and planning regarding the type of research collaboration. In many cases, activities are either initially conducted separately with minimal interdisciplinary integration or gradually move toward separation and division due to reduced attractiveness of collaboration.

Some major challenges in IDCs, as discussed in various studies, include:

- 1. *Weak teamwork in medical education*: Practitioners in medical education have considered weak teamwork as a reason for hindering scientific authority advancement (2).
- 2. Resistance to socialization in curriculum development: Curriculum developers in interdisciplinary activities have witnessed team members' resistance to socialization, even though this characteristic is vital for interdisciplinary education (3).
- 3. *Current definition of interdisciplinary higher education*: Interdisciplinary higher education is still primarily defined based on its educational features rather than the abilities students acquire (4).
- 4. *Lack of comprehensive and accurate reporting*: Inadequate reporting and lack of high-quality methodology limit the evidence for implementing interprofessional education (3).
- 5. Unclear understanding of reflection: Many individuals have an ambiguous understanding of reflection, especially in qualitative research, which has not been thoroughly explored (5,6).

The overall goal of the current study was to design and implement an interdisciplinary educational-research collaboration (hereafter IDERC) across two courses from different departments to enhance the learning outcomes. As the IDC-related theories have been practically followed during the implementation of this project, they are initially introduced below.

Theories pertinent to IDC in literature

Interdisciplinary and collaborative education and research create an innovative learning environment and stimulate new ways of thinking and engaging in activities to enhance the knowledge and competencies of each individual. The process of interdisciplinary and collaborative research can strengthen critical thinking and creative awareness among researchers, contributing to more comprehensive, sustainable, and socially impactful learning in university education and research (1,7,4).

For interdisciplinary research, various studies have proposed an approach called *Challenge-Based Learning*. This concept primarily stems from Vygotsky's sociocultural theory and is suggested by authors as a unique form of problem-based learning where real-world challenges are central. Instead of using the term *problem*, the term *challenge* is preferred. Elements of experiential learning and project-based approaches are also embedded in this form of learning (8-11).

Some researchers view IDC more broadly by introducing the concept of Relational Coordination Theory. They believe that in education and research, individual specialized roles should be complemented by adaptive approaches to problem-solving. This perspective implies a preference for 'conceptual' collaboration (as opposed to 'instrumental' one) through which participants merge their specialized viewpoints. Relational Coordination Theory refers to the 'mutual reinforcement process of communication for task integration'. Other studies that have delved into this theory in a specialized and comprehensive manner define it as follows: Relational coordination is a mutually enhancing process among individuals who come together for common goals. By leveraging their relational coordination abilities, individuals can effectively contribute to joint problemsolving through repeated, timely, and precise interactions, while respecting one another (12-15).

Another component that plays a role in the success of IDCs is belief in the *interconnectedness of sciences*. If individuals participating in interdisciplinary activities believe in both internal and external interconnectedness among disciplines, they are more likely to achieve successful, creative, and sustained results (16-18).

Another prerequisite for successful interdisciplinary work is *valuing and understanding the principles of teamwork*. This involves believing that team members share collective responsibility in decision-making, each contributing to a common goal, and following consistent protocols. However, communication and collaboration among team members can sometimes lead to overlaps in contributions. Team members should recognize and accept these phenomena. The importance of teamwork among faculty members and other educators has also been highlighted in various interdisciplinary and crossprofessional studies (19-21).

Purpose of the present study

The current study originally aimed to obtain results

from an IDERC. Considering the aforementioned challenges and efforts to address or modify them, this study reports on an IDC involving two faculty members; NS (Nasrin Sayfouri) and SA (Shadi Asadzandi), from separate departments. The activity started with a student's (hereafter St) need to conduct database searching for a research activity in the "Principles of English Academic Writing" course (taught by NS) during a master's program in medical journalism. Since St also took Information Database Searching course in the same term, with the consent of the relevant course instructor (SA), his learning and skill exercises were integrated across both courses. In essence, combining activities in this IDC initially occurred due to the student's needs for skill acquisition.

The research questions were as follows:

- 1. What were the participants' experiences toward the IDERC?
- 2. How could the results of this IDERC play a role in mitigating the above-mentioned IDC challenges?

The findings of this study can shed light on the lessons learned regarding how to address the aforementioned challenges in an IDERC activity for individuals engaged in such endeavors.

Materials and Methods

Reasons for establishing the IDERC

The present research is a case study on IDERC conducted using qualitative methodology during winter 2022. The participants in this study included a faculty member (SA) from the Department of Medical Library and Information Science at School of Health Management and Information Sciences, Iran University of Medical Sciences, as well as a (then) master's student in Medical Journalism admitted in October 2021(St).

The founder for this IDERC is the principal investigator of this project (NS), who is a faculty member in the English Language Department at the School of Health Management and Information Sciences, Iran University of Medical Sciences. The plan involved teaching Principles of English Academic Writing course to St. According to the course plan, during the final weeks of the classes, the process of conducting a short review study aiming to provide a fruitful opportunity for St to practice academic writing was supposed to commence between NS and St. Several class assignments and the final project were integrated into the activities related to the review study. To start performing his collaboration, St needed to determine the search syntax firstly and then use it to search for relevant studies in databases.

These two important and determining stages in conducting the review study were not related to NS's expertise. To address this challenge, collaboration with a colleague from the Department of Medical Library and Information Science was necessary. Considering that the student was concurrently taking Search Strategies in Information Databases course, the instructor of that invited (SA) course was to incorporate the aforementioned processes of database searching into the regular educational activities and exercises of her classes with St. With her acceptance to take part in this endeavor, a collaboration with the approach of *challenge-based* learning was basically initiated.

The educational and research activities of the IDERC and the process of experience gathering

The procedure of the IDERC entailed some steps presented chronologically below:

1. Online team teaching on search syntax writing

During this session, to help SA become acquainted with the research aspect of IDERC, firstly, the purpose and the subject matter of the review study were described. The two instructors identified the keywords to be used in the search syntax while St was listening. In the meantime, St was instructed to participate in the discussion, express his ideas, and finally all came up with a relevant search syntax.

2. Relevant activities in the classes of Search Strategies in Information Databases:

More details are needed to be presented about these classes since they constituted the core setting for the direct educational quota of the present interdisciplinary (ID) teamwork. The available recorded online classes, run by SA, show that the ideas related to syntax writing and the involved search strategies were discussed and practiced during four class sessions altogether amounting to 76 minutes. The following summary of an interview transcription with SA shows how tutorial was carried out during those sessions:

"We had been involved in working on search databases and search strategy writing when St talked to me about the need for doing a systematic search for the review study. To become more acquainted with the subject matter, I contacted NS. While explaining, she offered me to take part in the research undertaking since the job was a systematic review and my involvement could allegedly enhance the validity, integrity, and trustworthiness of the findings. I willingly accepted as, after all, the activity could also enrich the learning outcome of my classes due to St's interest in doing the search processes. In one online session with NS and St, the required key words were selected, and a tentative search syntax was prepared. Subsequently, during a couple of class sessions with St, searching in the databases was done while St was entirely and devotedly engaged in the procedures. I had initially informed him that all his cooperation in that section of the course would be considered as active class participation and a formative assessment of his total performance.

3. St's asynchronous reflection-based homework tasks on his experiences with the IDERC in the classes of Principles of Academic Writing in English:

While IDERC was going on, St was asked to write down his asynchronous reflection-based homework tasks concerning his views *on the impacts of the IDC and the lessons he learned therein*. These pieces of writing were regarded not only as a data source containing impacts of IDC on St's learning, but also as some writing tasks used for a part of formative assessment of St's writing proficiency development required for his total score calculation.

4. Face-to-Face NS-SA interview on the procedure and impacts of the IDERC

After completing the aforementioned activities, NS proceeded to conduct a 39-minute face-to-face interview with SA. The purpose of this interview was to gather SA's opinions and feedback on the overall impact of the work. The interview guide consisted of open-ended questions, which touched upon SA's overall perspective on the context and value of the IDERC, as well as the positive and negative aspects of the collaboration. SA was also asked to provide insights on the potential effects that similar IDERCs could have on education and research. Table 1 shows different activities conducted on this interview.

These activities demonstrate the existence of *Relational Coordination* between the two instructors as they mutually attempted to enhance collaboration processes to achieve common goals (12,13,6).

	Table 1. The activities carried out on the interview with 5/1					
No.	The activity	Details of the procedure				
1	Asynchronous interview transcription by St	The transcription of the interview mentioned above was assigned to St to help him acquire the skills of transcribing, thematic analysis, and, more importantly, provide his contribution so as to attain the role of co-authorship for the present study.				
2	Asynchronous thematic analysis of interview transcription by St	NS attempted to extract the themes from a few pages of the interview transcription as a sample. She emailed the file to St and asked him to continue the activity until the end of the content.				
3	NS and St's online session to reach consensus over the thematic analysis	Following the completion of the thematic analysis, they discussed the whole analysis in one session until consensus was reached over the whole coding process and the final themes				
4	The three contributors' focus-group online session with the chief focus on double-checking the coding process and the resulting thematic analysis with SA	An online session was held in which the above-mentioned extracted themes of the transcription were reviewed with SA. They all double-checked the ideas and themes and reached an agreement on the extracted points.				

Table 1. The activities carried out on the interview with SA

1. A questionnaire for St to elicit his experiences about the impacts of the IDERC

The final and the most decisive stage for eliciting and gathering St's views on the value and impacts of the IDERC was organized at the end of the semester when St was asked to provide open-ended responses to a semistructured questionnaire. The questions were so carefully designed that his answers could make a progression with his previous ideas. The type of analysis performed on his answers was, therefore, *framework analysis* (5). The topic of each question basically constituted a theme by its own right. The results of the framework analysis were reviewed with St after completion, and the discrepancies were addressed.

Reflexive nature of the methodology

It should be noted that due to the need of the qualitative research methodology, NS decided to make any attempt to welcome all the subjectivity the two participants might encounter and to provide recording tools for the activities. This allowed them to transform all the subjectivity involved into objectivity or rigor (6). To do so, they were constantly involved in a reflexive dialogue throughout the project, which pushed them into confronting, modifying, and refining their interpretations of the data produced by themselves during the courses of

the reflections and the meetings. In this orientation, the participants were made conscious by NS that explaining the details of the steps of the methodology, the context, and the interpretations could provide *concreteness*, which, in turn, could help enhance the *confirmability* and *transferability* of the findings. The paragraphs below may depict how their particular type of reflexivity was observed all the way through the collaboration.

NS, the principal investigator, attempted to act as the unbiased cognizant mind while supervising the activities and handling the obligation of helping the two participants convey their genuine views and attitudes generously and without restrictions. She oversaw both performing and coaching the collaboration and refrained from expressing her attitudes or judgments during the evolution of the activities whereas St and SA were supposed to evaluate all aspects of the IDERC through their reflections and interviews. The two participants, however, were absolutely willing to cooperate in the activities, including preparation for the design of the study, reflecting their experiences during focus-group discussions or individual sessions, and taking part in any required online/in-person sessions for the purpose of adequate opinion elicitation.

As the purpose of maintaining reflexivity in qualitative research is in fact *rigor* enhancement, a particular form of *triangulation* was in fact adopted in this study during the elicitation of the participants' views. To do so, the same questions were asked from the two participants at different intervals to help them recount their genuine experiences. This strategy could boost the *confirmability of the findings* and the *replicability of the methodology*.

As the chief target of all these actions was St's learning needs fulfillment, utmost attention was paid to his learning and his reflections. All the discourses during group and individual sessions were so carefully progressed that, during tutorials, as much training facets were included as possible. Surprisingly, NS and SA, while following their turns to embark upon their disciplinary-related tutorials, were automatically in harmony with the coherent progression of the discourse although no direct schedule had been arranged for this harmony. Regarding St's reflection gathering, it was attempted to encourage him to express his views asynchronously in as many words as possible. For his first two written reflections, he was asked to write his views under the general title of 'lessons learned' during the IDERC process.

While designing the format of the prompts to elicit actual and sufficient data about the impacts of the IDERC, different intentions were considered, including going deeper into St's consciousness, complying with triangulation, and designing a more appealing sketch to prevent boredom. To do so, for his final written reflection, a tentative framework was suggested to him being designed based on the themes found in his earlier reflections. He was thus asked to write his final views in line with, but not limited to, various types of learning he acquired including, *search strategy learning, research methods learning, academic professionalism learning*, and *English language learning*. As the mentioned types of learning constituted a framework for his writing, the analysis made was a framework analysis.

Results

To show the results of the study, the two research questions are answered below. The results of all the analyses made on the participants' views are illustrated in Tables 1 and 2. The two tables are designed to show the answers to both research questions.

First research question: what were the participants' experiences toward the IDERC?

The analysis of the data related to the participants' total views showed that their reflection contents could be classified into two major parts including A) *their own personal experiences with the IDERC* (Table 1), and B) *their critical views on any IDC as a whole* (Table 2). According to the tables, the ideas produced by the participants tended to be analyzed with different coding process. As the codes were so crucial for understanding the experiences and categorizing the underlying ideas, they were all inserted inside the tables.

Themes	Sub- themes	Categories	Sub-categories	Codes
				Personal interest and curiosity on a totally alien topic
SA's numerous incentives for	NAEducation-based incentivesNAResearch-based incentives		NA	The comparative English-Persian nature of the studies The interdisciplinary nature of the enterprise The new experience of working with non-medical departments
accepting the collaboration			NA	Enhancing knowledge in an unfamiliar setting Enhancing knowledge in own field due to the need to make knowledge adjustments for an unfamiliar setting Publication of interdisciplinary studies can lead to more citations. The value of collaboration in two research studies NS and St's great interest in and clear understanding of the topic [which could bring about rich study designs]
				Its relevance to our research topic
	Acquaintance with the use of <i>qualitative</i> methods learning field of medical journalism	use of <i>qualitative</i> <i>research methods</i> in the field of medical		Its theoretical foundations
			NA	Its design considerations
				Its data collection techniques
				The impacts of rigorous reflexive methodology on the robustness and credibility of the findings the intricacies of the analytical process
		Familiarization with hands-	how to derive meaningful insights from qualitative data	
			on demonstrations of content/thematic analysis	data interpretation data coding
		procedure	theme extraction	
St's multiple learning outcomes				Detecting the role of topics in determining the priority and relevance of databases The potential of finding valuable articles beyond prestigious journals
	NA	Search strategy learning	NA	Noticing the possibility of searching in the built-in searc engines of top journals Learning how to formulate search queries, identify relevant keywords, and utilize databases for comprehensive information retrieval
	NA	Publication practices learning	NA	Approaching future research studies with a more comprehensive and inclusive mindset learning how to go through the process of identifying suitable and relevant journals for a manuscript Realizing the formatting requirements of a target journal Realizing the importance of a journal's scope and metric
	English language learning Realizing the importance of some academic writing features		NA	clarity
		1		structure
		U		coherence
				familiarizing with effective academic communication development
St's views on the	NA	Helped developing academic socialization	NA	cultivating a sense of value and self-esteem
instructors' academic		αταατημε συταμέζαμοη		showing the necessity of active participation and being engaged in discussions and procedures
socialization demeanor	NA	Supported higher-order cognitive skills	NA	facilitating knowledge retention stimulating mental ability Enhancing critical thinking skills
	NA	improved learning outcomes	NA	through receiving direct feedback on writing

A. The Participants' personal experiences with the **IDERC**

As it can be seen in Table 2, SA has had both

educational and research incentives to take part in the collaboration. It is also shown that St, apart from answering to the mentioned learning types of frameworks, has expressed more learning development with respect to *publication practices* and the instructors' *academic socialization demeanor*.

B. The participants' critical views on any IDC as a whole

Table 3 illustrates the variety of ideas SA and St have developed when they were asked to go through the impacts of any such IDERC that can be implemented in higher education.

Second research question: How could the results of

the IDERC play a role in mitigating the mentioned challenges?

By delving into Tables 2 and 3, the topics of the challenges of IDC above can be presented as: *scientific authority, socialization, what students gain in ability, effective practices, quality methodology,* and *observing reflexivity*. Next section discusses how these topics which have previously been considered as the challenges in IDC have been covered by the participants' views.

Themes	Categories	Codes	
	Impacts on faculty members	A higher level of collaboration among <i>interdisciplinary faculty</i> members compared with <i>intradisciplinary ones</i> [in the school she works]	
	Impacts on students	Causing attraction for other academic members More encouraging and exciting for the students compared with traditional instruction More fruitful involvement of master degree students compared	
SA's positive attitudes towards any similar IDERC		with PhD ones [due to being younger and having more time and energy] Development of scientific collaboration networking	
	Impacts on knowledge development	Promotion of <i>scientific authority</i> Creation of new research horizons [as this collaboration motivated SA to come up with a related topic in her medical education career] An initial step toward scholarship [due to being involved in	
St's views on the		experiencing novel educational circumstances] Intimate familiarity with the syllabus	
requirements for an efficient IDC	Requirements for the instructors	Helping students to understand the connection between topics and assignments	
SA's views on educators'	Lack of <i>desire</i> for novel teaching/ learning methods	Might be due to low interest in one's career Might be due to low dedication to one's career	
unwillingness for IDCs	Lack of <i>openness</i> to novel teaching/ learning methods	Might be due to self-centeredness, stinginess with information giving, or lack of having that soft personality to embrace wisely anything happening during the job	
		Distribution of responsibilities among the involved collaborators irrespective of their positions and titles	
SA's recommendations	Ways to expand IDC in medical professions	Taking measures to spread out inclination toward interdisciplinarity Creating fruitful collaborations among departments of basic and clinical sciences	

Table 3. Results of the analysis of the participants' critical views on any IDC as a whole

Discussion

The results of the thematic analysis of two different interviews with SA concerning her views mainly on the context and value of the whole activity showed that her incentives to accept the collaboration consisted of the following personal educational and research stimuli (Table 2).

1. Challenges in providing examples for teaching and practice: SA had consistently faced challenges in providing examples for teaching and practicing information database searching during her educational career. Given the diverse interests of

students, when St conducted exercises related to his proposed topic, his learning outcomes enhanced. Consequently, the teaching process became more satisfactory for both the instructor and the student.

2. *Research Dimension of Participation*: SA's consent for involvement in this collaboration was also driven by the research aspect of the undertaking. The culmination of this activity would lead to two research endeavors: the mentioned literature review and a qualitative research project within the current study. SA would contribute to both research efforts.

The findings of this study, depicted in Tables 2 and 3 indicate that the five challenges observed in the related

literature have been dealt with by the participants as explained below:

Scientific authority

SA's viewpoint that one of the impacts of a similar IDERC is promotion of scientific authority (Table 3) addresses Ahmady et al.'s claim that lack of IDC deters promotion of scientific authority (2). According to our study findings, robust research-oriented IDC can create new research horizons and enhance scientific collaboration among interdisciplinary faculty members to a greater extent when compared to intradisciplinary approaches.

Socialization

Our findings demonstrate that highly interested educators can naturally socialize and act in a humane manner. Their actions have a significant impact on the learners' confidence and self-esteem, ultimately influencing their learning outcomes (Table 2).

What students gain in ability

St's learning outcomes in Table 2 are in line with what Spelt *et al.*, classified in their systematic review as knowledge of disciplines, knowledge of interdisciplinarity, higher-order cognitive skills, and communication skills. The methodology we followed was originally intended to be leaner-centered (4), but it turned out to be learning-centered after all. The instructors were aware of what St needed to learn in each discipline at any given moment. They successfully created a rich learning environment by engaging students with questions and encouraging his participation in discussions.

Regarding the number of learners, we admit that having only one student in the two courses is the limitation of our study. However, a couple of studies recommend small group learning in ID education (3). They claim that learners in small groups find more opportunities to develop collaborative practice competencies and deal with problem solving, independent responsibility for sharing learning, information, and respect for others (3).

Effective practices

A glance at Tables 2 and 3 shows that, apart from the answers our study might have provided for IDC challenges, the effectiveness of our practice can be attributed to employing authentic learning materials and learning environments. These real-time activities can be essential in enhancing the preparation of learners in roles, providing opportunities for reflection and investigation, and creating formal and informal opportunities to assist in direct learner engagement.

Quality methodology

Our main intention in developing this current report is basically to illustrate how the details of the methodology of an interdisciplinary enterprise can be exhibited so that the procedure can be comprehended and replicated by interested individuals. Throughout the study it was illustrated how theories of IDS, namely, *challenge-based learning* (8-11), *relational coordination* (12-15), *interconnectedness of sciences* (15,16,17), and finally *valuing and understanding the principles of teamwork* (19-21) have been followed and observed in this study.

Observing reflexivity

Education is a field that encompasses the intricate mental, psychological, and emotional aspects of human beings. It primarily deals with subjectivity rather than objectivity. A skilled educationalist should possess the ability to navigate through this subjectivity to uncover the underlying objectivities. Our qualitative study followed a methodology to attain this goal.

What reported is about a case study carried out on the procedures and effectiveness of an IDERC in medical journalism education. Some recommendations are provided below on how the activity can be extended to a larger context.

One obstacle that might hinder successful IDC in medical education is the current power relations among medical professions, which impede the development of effective and adequate socialization needed for any collaboration. Interestingly, some of the ideas shared by SA in her interview are recommendations that can contribute to the progress of IDC. (Table 3).

To achieve interdisciplinary faculty development, it is necessary to provide formalized training. This training will help faculty members develop a shared understanding of IDC and equip them to address various challenges, such as managing tensions, hierarchical barriers, and cultural differences. Additionally, faculty members need to be aware of the dynamics involved in interdisciplinary learning.

One way to promote consciousness-raising among faculty members is to organize workshops or training sessions. These sessions will be specifically designed for those who are interested in interdisciplinary education or research. One important aspect of this training is developing effective communication skills. By learning the language used in different disciplines, faculty members will be able to negotiate meaning, resolve epistemological differences, foster shared understanding, and effectively communicate cognitive advancements to a wider audience (4).

One possible way to move forward is to establish more collaboration among interdisciplinary faculty rather than solely relying on intradisciplinary members (as shown in Table 3) who teach different courses to the same students within a single academic semester. By fostering communication and cooperation between faculty members who work with the same students during a specific semester, we can uncover the significant interdependencies and connections between the various courses. This, in turn, opens opportunities to form temporary or semester-long collaborations aimed at enhancing, enriching, and solidifying student learning or training. Notably, successful educational collaborations may also pave the way for research collaborations. If such collaborations take place within any institution, the positive outcomes and benefits will likely extend to other sections or departments as well.

More IDCs promote greater credibility of the existing interdependence among different disciplines, which can culminate in the creation of interdisciplinary majors in health. This promotes professionalism, along with knowledge augmentation, enhancing a culture of teamwork, and developing interdisciplinary research projects, among other things (2).

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