EMBEDDING FINTECH-SPECIFIC CONTENT IN HIGHER EDUCATION

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Abstract

Fintech is one of the most talked about topics in the finance industry in this era. Still, the change or increase in the market share of fintech companies is relatively small compared to that of other conventional financial services. To help the fintech industry, universities with academicians can play a vital role by introducing fintech-specific content. The most essential element in teaching fintech-specific content is teaching finance and technology (Hendershott et al., 2021). Regarding this, during the last few years, many top universities have taught fintech-specific courses in undergraduate, graduate, and executive programs. This content seeks to prepare specialists from the field who can strengthen the fintech industry better. For now, no specific curriculum or teaching format is taught by fintech as this is a fast-changing industry, and the curriculum needs to be adapted accordingly (Thomas & Milner, 2023). The authors are interested in understanding the critical elements regarding the content that must be introduced in these programs. This paper aims to build a structure for the universities to follow if they want to teach courses in fintech-specific content. To achieve this goal, the authors will collect information and conduct the content analysis on the profile of fintech-specific offered by the top 20 universities in the world and on the literature focusing on fintech-specific content. In addition, there will be a discussion on the pedagogical approaches suggested for higher education institutions building interdisciplinary programs like fintech-specific content programs.

Keywords: Integration, Disciplinary Grounding, Interdisciplinary Communication, Critical Awareness, Teamwork, Fintech Studies

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1. INTRODUCTION

The fintech industry is a disruptive innovation that has significantly affected traditional financial institutions' operations in the last decade positively and negatively. This disruption was due to unique features such as innovative technology, high efficiency, use of the internet and automated processes, reduced cost, flexibility, disintermediation, artificial intelligence (AI), innovative solutions/products, and a high level of personalization (Siddiqui & Rivera, 2022). Fintech has changed the priorities in the search for job seekers. As per Google Trends, the keyword "fintech" is now searched more than "accounting" or "finance" by jobseekers (Sung et al., 2019). In parallel, it has been

seen that the number of fintech has also been increasing exponentially. Therefore, the authors think that the workforce must be up to the standards of what the industry requires and expects. This is where academia plays a vital role.

One of the authors attended the Fintech Forum 2023 held in October, where different stakeholders stated several times that the number of fintechs has declined in Eastern Europe in the past 18 months. Therefore, authors became more interested and curious to know which areas should be emphasized from the academia's perspective to attain fintech sustainability (Fintech Latvia, 2023).

Given that fintech implies the convergence between finance, IT, and other disciplines (Siddiqui & Rivera, 2022), higher education needs to be interdisciplinary rather than monodisciplinary, as stated in several studies in this area. Therefore, to ensure the readiness of the workforce to face the challenges, approach the existing issues from a new perspective, and enhance their abilities to come up with innovative and creative solutions, there is a need to offer fintech-specific content. Also, this type of content will develop sophisticated epistemological beliefs, boost critical thinking and metacognitive skills, and help understand the relationship resulting from various disciplines in the professionals working in this industry (Ivanitskaya et al., 2002).

In this research, authors intend to understand how to develop fintech-related interdisciplinary specific content for the undergraduate, graduate, and professional levels. To achieve this purpose, the authors have conducted a systematic literature review with qualitative content analysis (QCA) to understand the accepted consensus on interdisciplinarity and why it is essential in fintech-specific qualifications. It is followed by web scraping or web data mining to find out what type of fintech-specific courses are offered by the top 20 universities in the world. For this purpose, the authors will analyze which courses are offered and what courses or courses can be added to prepare professionals for the fintech industry. Finally, the authors will conclude with a written initial proposal on the courses or courses that can be endorsed by higher education institutes and universities that intend to start offering fintech-related content.

The following is the main research question:

RQ: Which interdisciplinary courses should be offered in fintech-specific programs?

To answer this central question, the authors will reply to the following sub-questions:

RQa: What is interdisciplinary learning?

RQb: What are the features of interdisciplinary learning?

RQc: What is the impact of interdisciplinary programs on different types of skills?

RQd: What types of fintech-specific courses are offered by the top universities in the world?

The remaining structure of this paper is as follows. Section 2 reviews the relevant literature. Section 3 analyses the methodology used to conduct empirical research on embedding fintech-specific content in higher education. Section 4 will look at the findings, followed by the analyses. Section 5 is the discussion of the findings and some recommendations. Lastly, Section 6 summarizes the findings and has the concluding remarks.

2. LITERATURE REVIEW

2.1. What is interdisciplinary education in academia?

As per the QCA conducted by the authors, it was found that interdisciplinary education was described with three main phases: integration of multidisciplinary, understanding of other disciplines, and making the connection in unrelated domains.

Integration of multidisciplinary: Interdisciplinary education is regarded as integrating diversified knowledge from different disciplines in a single program (Ivanitskaya et al., 2002) as it helps the learners understand the relationship between disciplines (Moran, 2010). Also, there is a deeper incorporation of cross-disciplinary notions, giving learners a holistic view as they seek to focus on high-order thinking and to make meaningful connections in different disciplines (Lake, 1995). This means that a single method or approach cannot solve problems and answer questions satisfactorily (Klein, 1990).

Therefore, it can be said safely that the main difference between the multidisciplinary approach and the interdisciplinary approach is that the multidisciplinary refers to the involvement of different areas of studies in any specific profession where integration is not essential (Shafritz et al., 1988), however, the interdisciplinary approach refers to the integrations of different disciplines where each of them has some impact on one another (Rowntree, 1981).

Once the learners are merged into the interdisciplinary programs, they enhance their abilities to connect factual information in a more profound way, which eventually helps them to improve their ability to use information in the future (Acton et al., 1994), which is one of the abilities that the learners require in the multifaced and increasingly complex setting (Jacobs, 1989). Therefore, the interdisciplinary curriculum assists them with the necessary skills in complex and modern society (Davis, 1995). For instance, it helps them solve innovative problems that may need to be addressed using a single approach (Klein, 1990). In other words, the interdisciplinary curriculums motivate the learners to see, share, and appreciate all the perspectives of the story (Newell, 1990).

As per the Irish Research Council, nowadays, there is a focus on the challenge-based approach, which means that the emphasis is placed on the outcomes when solving complex issues that do not align with any specific discipline but the integration of several (Tobi & Kampen, 2018). Therefore, it is about breaking the boundaries of several disciplines and coming to a consensus to refer to complex and multifaceted issues (White & Deevy, 2020). Salomon (1991) also agrees that providing the necessary tools for integrating knowledge is needed instead of instructing compartmentalized disciplines.

Understanding of another discipline: To solve the multifaceted and complex issues in the world today, professionals must have acquired the knowledge that is deeply assimilated (Lake, 1995). As a result, highly skilled labourers are expected to recall the big chunks of integrated knowledge instead of the small ones (Wyman & Randel, 1998). Interdisciplinary programs also help leaders by facilitating them with the domain knowledge of at least two fields (Madden et al., 2013).

Interdisciplinary education is thus a collaborative process where integration is done in the input from different disciplines that requires the collaboration and coordination of team members who have different backgrounds, especially when technical and scientific knowledge is needed (Repko, 2008). When coordinating team members have a mutual understanding to solve a problem, they develop, execute, and agree upon solutions (Bruhn, 2000). This means proficient researchers with specialized knowledge in different disciplines collaborate to exchange ideas, concepts, tools, data, methods, and results associated with the shared project (Rhoten & Pfirman, 2007). This collaboration results in wholesomeness, which is more valuable than combining their disciplinary components (Boix Mansilla & Duraisingh, 2007). Moreover, interdisciplinary ties enhance educational space, creating a virtual academic laboratory. These laboratories help students to apply knowledge from various disciplines in a new scenario, thus resulting in the application of learned knowledge in their professional activities (Ying et al., 2020).

However, so-called "T-shaped" researchers must be involved in interdisciplinary programs. T-shaped researchers or collaborators are the ones with the capability to work extensively across diverse disciplines while simultaneously possessing in-depth expertise in their areas (Moore, 2006). That eventually increases the success rate as these researchers build an ability to accept new ideas openly and explore beyond their areas of expertise (Hansen & von Oetinger, 2001) and leads to meaningful dialogue among the collaborators (Sandoval, 2014). Suppose the disciplinary curriculum and technology are used for graduates, undergraduates, or professionals. In that case, it promotes productive interaction and breaks all the traditional boundaries that are usually there in the hierarchical arrangement (Collins et al., 2004). Kali (2014) agreed with this when supporting an interdisciplinary approach in higher education.

Making the connection in unrelated domains: Interdisciplinary studies should enable researchers to identify the relationships among contexts that seem connected (Ivanitskaya et al., 2002) using analogies and metaphors (Ackerman & Perkins, 1989). These days, interdisciplinary studies are evolving and emerging, where they should adapt disciplines from different fields/disciplines (White & Deevy, 2020). The interdisciplinary approach in higher education and a topical or issue-oriented approach are attractive to the learners (Newell, 1990). Therefore, interdisciplinary connections are vital in integrating subject areas into the training system. The reason is that it leads to the assimilation of the various unrelated knowledge of different academic disciplines (Balykbayev et al., 2022).

Despite many different disciplines, which sometimes are unrelated, it has led to the evolution of interdisciplinary education. It has led to the adaptation of other methods, outstanding creativity, and human-centric qualities of innovative solutions (Gaynor et al., 2018). Chairman of Bain & Co. mentioned that when it comes to a T-shaped model for the learners, it means that they can put the diverse knowledge that seems unconnected in every way, they identify the patterns and find the connections in multiple disciplines. This is achieved through deep thinking, intense focus, and perfect thinking (Nae, 2017).

2.2. Features of interdisciplinary education

Holistic rather than discipline-specific studies: Interdisciplinary studies focus on a holistic view of knowledge rather than specific studies. This means it focuses on higher-order thinking and lets the learners find the relationship between them (Ivanitskaya et al., 2002). The workforce must come from diverse backgrounds and expertise, which will help the problem convergently and divergently (Madden et al., 2013).

Effect or effect of others' perspective: The new pedagogical approach differs from the traditional approach, emphasizing adopting a community approach. This means the participants/stakeholders are motivated to synthesize diverse views and solve issues. Also, together, team up for advanced knowledge with the diverse ideas of each contributor (Bielaczyc et al., 2013). The nature of interdisciplinary programs is such that all sides of the story are seen, meaning learners appreciate the perspective of all stakeholders' perspectives (Newell, 1990). Therefore, it means there is a need for the contribution of the stakeholders who are at the periphery of the specific domain or, in other words, completely outsiders (Gendron & Rodrigue, 2021).

Enable the creation of complex connections between declarative facts: Therefore, when students are studying in interdisciplinary programs, they can assimilate their prior knowledge and experience, which helps them to make the complex connections between the declarative facts at an increasing rate (Acton et al., 1994). Also, the faculty now expects students to have enough knowledge in different disciplines to make adequate and meaningful connections (Boix Mansilla & Duraisingh, 2007). The use of technology in the teaching environment can play a vital role in conveying, transmitting, or providing knowledge due to its speed, flexibility, and customization when it comes to teaching the declarative component of a specific language (Asif et al., 2022).

Collaborative learning: "Interdisciplinary" is defined as the collaborative process. This means that an expert disciplinarian can integrate other members' input, which involves engaging in technical and scientific studies, leading to teamwork (Repko, 2008). In other words, team collaboration is when multiple researchers who are masters in their fields work together to trade. This is regarding tools exchange, data, and methods, which results in a joint project (Rhoten & Pfirmen, 2007). Fostering inter-organizational and interdisciplinary collaboration helps improve teamwork, coordination, teamwork, communication and conceptual underpinning. These eventually result in improved collaborations and increased knowledge (Simon et al., 2022).

Involvement of other professionals: In the interdisciplinary approach, the traditional boundary and hierarchy are broken between the undergraduate and graduate so that they can work together and build cognitive apprenticeship, which results in productive interactions (Collins, 2006). As it is said, one plus one is not two when two brains are working together; therefore, when

two researchers work toward a mutual problem with totally different backgrounds, it results in a systematic investigation of the problem, and the results are fruitful (Bruhn, 2000). Nevertheless, some problems tend to be wicked and thus require multiple disciplines to work together and develop a solution (World Health Organization [WHO], 2022).

2.3. Impact of interdisciplinary programs

The authors identified several skills during QCA that interdisciplinary education impacts. The authors have identified and distributed them into three main categories. These categories were 1) teleological skills, 2) cognitive skills, and 3) social skills.

2.3.1. Teleological skills

Teleological skills refer to the skills that are result-oriented or driven by some purpose. This means the learners are motivated to learn to achieve specific objectives by acquiring skills, knowledge, and behaviours. Thus, the key is ends, goals, purpose, or objectives (Rosenberg & McShea, 2007), and understanding that everything exists has a reason (Mayr, 1988). This is why the learners have a purpose and tend to be motivated.

Develop epistemological beliefs: Interdisciplinary learning enhances the epistemological beliefs that result in understanding the relationship among different perspectives of different disciplines (Ivanitskaya et al., 2002). Also, once the precised outcome objectives are set, it improves skills in professional skills and aligns training with the goals (Van Hartesveldt & Giordan, 2009). Interdisciplinary collaboration plays a crucial role in the implementation challenges of business education. To make noticeable and valuable changes, it is essential to look at how the business education curriculum is made and used. For instance, one can understand how knowledge is created and applied by looking at creative jobs like music and art. Therefore, contemplating workers' role and the way knowledge work, i.e., epistemology is crucial in terms of an interdisciplinary approach to be successful in terms of creating business education matter (Nayak, 2022).

Declarative knowledge: Interdisciplinary education helps an individual to develop declarative knowledge, which states and declares the concepts, facts, and propositions (Anderson, 1982). Eventually, it assists them in making connections in the domains that seem unrelated at the beginning (Ivanitskaya et al., 2002). It forecasts the ability to access information (Acton et al., 1994).

Procedural knowledge: Procedural knowledge is enhanced by offering interdisciplinary educational content. This refers to the knowledge regarding how a particular task is performed by actions, which means it is process-based information (Anderson, 1982). Similarly, Bruhn (2000) stated that interdisciplinary research results from systematically investigating a specific problem. Research earlier confirms that if students are exposed to a combination of exploratory and structured tasks, they tend to gain equal procedural knowledge and more conceptual knowledge if compared with the students exposed to structured tasks only (Mavrikis et al., 2022).

Structural knowledge: Therefore, declarative and procedural knowledge are the structural knowledge components that develop learners' abilities to comprehend advanced interconnection and overarching principles (Goldsmith & Peder, 1990) by creating personal understanding (Entwistle & Tait, 1990). Therefore, these interdisciplinary approaches enhance the vertical and horizontal skills essential for success as an expert generalist (Nae, 2017).

2.3.2. Cognitive skills

Cognitive skills require learners to acquire, process, retain, and use information. This includes different abilities, such as thinking, reasoning, problem-solving, and decision-making. Many studies showed that interdisciplinary studies have improved high-level cognitive skills (Lattuca et al., 2004).

Enhance critical thinking: When exposed to interdisciplinary approaches regularly, learners enhance their critical thinking abilities from knowledge from different disciplines (Ivanitskaya et al., 2002). This critical thinking is crucial to technological and socio-technological challenges surrounding us, such as climate change, energy, public health, and sustainability (National Science Foundation, 2006). Furthermore, developing intuitions and critical thinking in educational and professional activities helps maintain human resilience (Mygal & Mygal, 2020).

Enhance metacognitive thinking: Cognitive strategies facilitate the acquisition of skills and knowledge, whereas metacognitive thinking enables one to assess and enhance this progress, understanding, and application of the learned knowledge to novel situations (Gourgey, 1998). The interdisciplinary programs offer these metacognitive skills, the high-order cognitive process, and critical thinking (Ivanitskaya et al., 2002). Hence, this metacognitive thinking via interdisciplinary programs (STEM) aims to result in exceptional and creative leaders having these six key traits: excellent communication skills, effective organisation, management skills, in-depth knowledge in multiple fields, innovative problem-solving abilities, personal development including qualities like self-motivation, flexibility, collaboration, and responsibility (Madden et al., 2013).

Enhance creative thinking: It has been observed that interdisciplinary programs improve students' ability to handle complex issues, be more creative, and motivate them to take more risks (Van Hartesveldt & Giordan, 2009). Creative thinking has other benefits, too, such as advanced thinking (Hangrove, 2012), enhanced self-awareness (Autury & Walker, 2011), community engagement, stress management, and higher motivation to think creatively (Ma, 2006). Moreover, it boosts faculty satisfaction and retention via diverse pedagogical practices and enhances collaborative learning (Burnard, 2007).

Use analogies and metaphors: Interdisciplinary programs lead to the development of exclusive leadership skills, including the ability to think and communicate in analogies and metaphors (Madden et al., 2013). Analogical reasoning is essential to interdisciplinary education as it involves adapting and transforming different ideas from several

disciplines (Ouaki, 2022). Moreover, interdisciplinary programs help learners devise the connection between unconnected content and generate analogies and metaphors (Ackerman & Perkins, 1989).

2.3.3. Social skills

Social skills refer to the ability to work in teams where collaborators share and negotiate their ideas, resulting in problem-solving. Moreover, it is the ability by which collaborators can continue conversations and explore new aspects (Heitzmann et al., 2021).

Enhance life skills: The creativity aspect in interdisciplinary education results in enhanced self-awareness, more advanced thinking, life skills, and social skills, which include teamwork, autonomy, confidence, and motivation, improved interaction with colleagues, collaborative learning, and above all, lead to employee retention dues to enhanced job satisfaction (Madden et al., 2013). Academicians agree that interdisciplinary studies have the distinctive property that lets students have enough knowledge (not in-depth) of each discipline so that they can make connections (Boix Mansilla & Duraisingh, 2007; Repko, 2008).

Employees' teamwork, satisfaction, and retention: When an interdisciplinary approach is implemented, peers and experts meet to support profound ideas from several domains and tend to make connections between ideas from diverse domains. This leads to positive disruption in higher education and results in teamwork among people from different backgrounds (Kidron & Kali, 2015). Interdisciplinary education has a collaboration model under which there is team collaboration among the students and the mentors in the industry. This results in a team-focused curriculum, shared cross-discipline courses, inner-discipline mentorship programs, and innovation centres (Nae, 2017). Also, successful communication across disciplines results in managing interdisciplinary teamwork and collaboration, identifying and using hidden potentials, and creating innovations (Telleus et al., 2023). These innovations and collaboration enhance collaborative learning and, therefore, retention of the academician in the industry (Madden et al., 2013).

Improve problem-solving skills: During the research conducted by Madden et al. (2013), industry leaders were asked about the characteristics they would like students to cultivate in them before starting their corporate lives. As per them, they should have diverse expertise to deal with the problems both divergently and convergently. Moreover, once they can solve the problems, they may be ready to take more risks (Borrego & Newswander, 2010) which, as in business, may lead to higher profitability.

Survive in the complex and multifaceted work environment: An interdisciplinary approach such as the STEAM approach, which integrates Science, Technology, Engineering, Arts, and Mathematics, helps to create multi-skilled and adaptable professionals who are needed and suitable in volatile work environments. These skills are necessary to encounter challenges, including sustainability (National Science Foundation, 2006). Moreover, the learners in interdisciplinary develop the ability to think outside the box and take higher risks (Van Hartesveldt & Giordan, 2009). Lastly, the learners tend to build an ability to do cross-validation in the wide variety of information available and interpret through the holistic view (Davoudi, 2013).

3. RESEARCH METHODOLOGY

To develop a thriving interdisciplinary program for fintech-specific, an understanding of the terminology "interdisciplinary" is essential. Once the terminology is understood, looking at its interdisciplinary aspects will be easy. QCA is done followed by frequency analysis to achieve this goal.

Some of the features of QCA are: Firstly, it is research question-oriented, which means that these questions originated from the main objective of the research project. Secondly, category formulation is based on the text evaluation (Mayring, 2019). The text chosen for this purpose from the shortlisted paper must answer the questions created by the authors. Thirdly, there are two ways to interpret QCA, i.e., inductive or deductive. The inductive method was applied for this research when enough data in the literature was unavailable (Elo & Kyngäs, 2008). Following this, frequency analysis was done for the identified categories to see which components are critical from the researchers' perspectives.

QCA will be repeated to understand the areas critical to fintech-specific content in interdisciplinary studies. This will lead to an all-encompassing approach to stakeholders and the knowledge essential to this field of study. Therefore, it will help propose a sophisticated interdisciplinary program that may span multiple disciplines.

Subsequently, web data mining techniques were used to find the fintech-specific courses offered by the top 20 universities of the world as per the Center for World University Rankings (CWUR, 2023). The notion of retrieving informative data from various web pages across the internet is called "web data mining" (Kumar & Singh, 2016). This method summarises and clusters courses per the field/areas offered by top universities worldwide. This helped the authors identify the areas that were considered and which areas or courses were missing out, as per the authors.

Based on the findings, the authors recommended that the course development offer fintech-specific content with a holistic view. This idea is designed to cater to all fintech industry stakeholders.

However, a different approach can be taken to answer the research questions. For instance, the survey could be conducted via interviews where fintech leaders can be asked what type of knowledge helped them and what other areas could be helpful to or are crucial. In order to improve further, they can be asked about the reasons behind the high failure rate of fintech and their opinions, which will help the academia to find a way to find the solution.

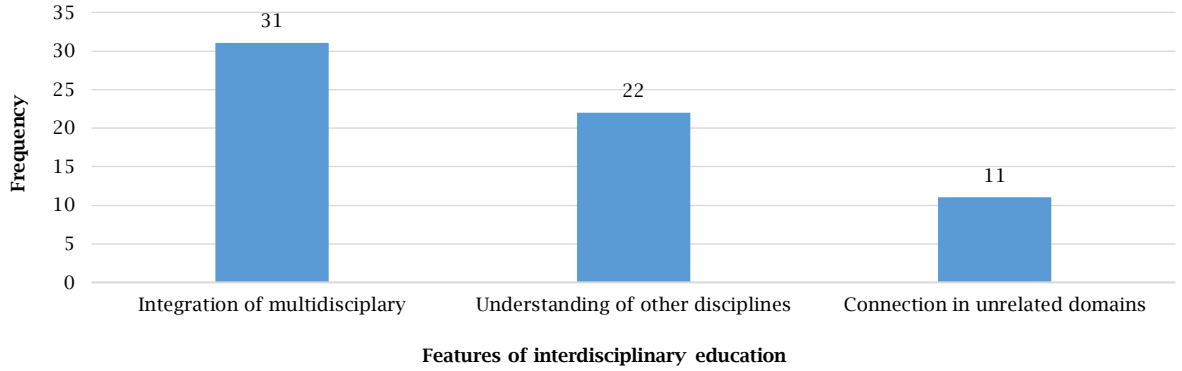
4. RESULTS

To answer the research question, the authors would like to propose fintech-associated courses in higher education based on the findings of this research and their prior research, experiences, and suggestions they have gotten from the discussions with the corporate personnel.

4.1. What is interdisciplinary education?

The authors took fifty-two extracts from different research papers defining interdisciplinary education and generated codes to determine the definition of interdisciplinary education. The results are shown in Figure 1. This shows that "integration of multidisciplinary" was often used to describe interdisciplinarity, followed by understanding other disciplines and connections in unrelated domains.

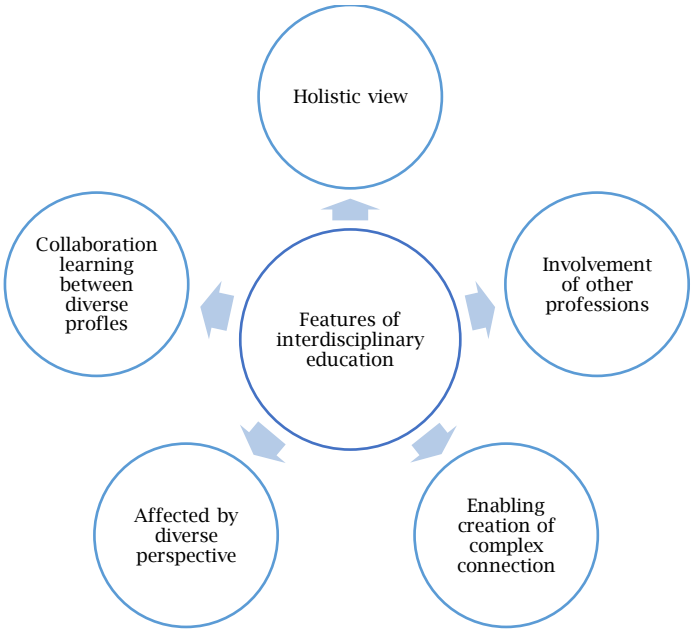
Figure 1. What is interdisciplinary education?



Source: Authors' elaboration.

As per the QCA conducted by the authors, the features mentioned above were identified. Figure 2 shows the identified characteristics of interdisciplinary education. Therefore, based on the findings from academic literature, authors have come up with their definition of interdisciplinary education. Interdisciplinary education refers to educational programs that tend to integrate multidisciplinary fields by understanding and connecting dots to find connections among several disciplines that may be unrelated — resulting in innovative solutions in terms of products and services that are more output-centric and holistic that may not be possible to achieve with the multidisciplinary approach. To achieve the desired outcome, teammates must collaborate to share data, exchange ideas, and have a holistic view open-heartedly. Lastly, it helps the learners to make predictions based on their knowledge of different disciplines.

Figure 2. Features of interdisciplinary education



Source: Authors' elaboration.

4.2. Impact of interdisciplinary programs on different types of skills

The fintech industry encounters crucial challenges in terms of innovation and technology. Therefore, higher education could contribute in improving the ecosystem by giving enough skills to the learners to tackle them.

The summary of the primary skills affected by the interdisciplinary studies identified by QCA is shown in Table 1. The frequency of the appearance in the chosen literature shows that the learners'

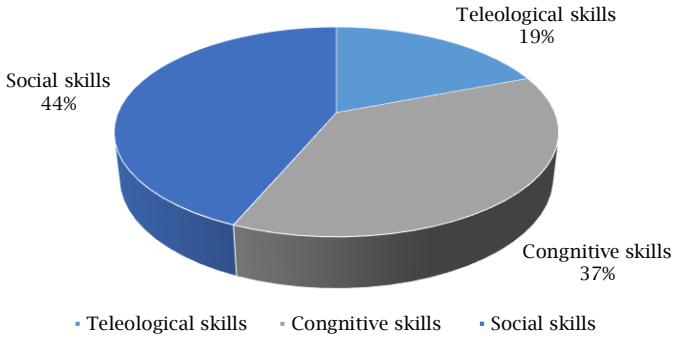
social skills are most impacted by the interdisciplinary studies, followed by the cognitive and teleological skills. However, it can be seen that the researchers highlighted the teleological and cognitive skills almost frequently, and the difference from social skills is relatively small. The bar chart shows the comparison in their frequencies.

Table 1. Frequency analysis of skills enhanced interdisciplinary education in existing research

Teleological skills	*F*	*Cognitive skills*	*F*	*Social skills*	*F*
Develop epistemological beliefs	4	Enhance critical thinking	7	Enhance life skills	12
Declarative knowledge	11	Enhance metacognitive thinking	12	Employee satisfaction and retention	10
Procedural knowledge	3	Enhance creative thinking	7	Improve problem-solving skills	8
Structural knowledge	6	Use analogies and metaphors	3	Survive in complex and multifaceted work environment	11
Total frequency	24	Total frequency	29	Total frequency	41

Source: Authors' elaboration.

Figure 3. Impact of interdisciplinary education as per QCA



Source: Authors' elaboration.

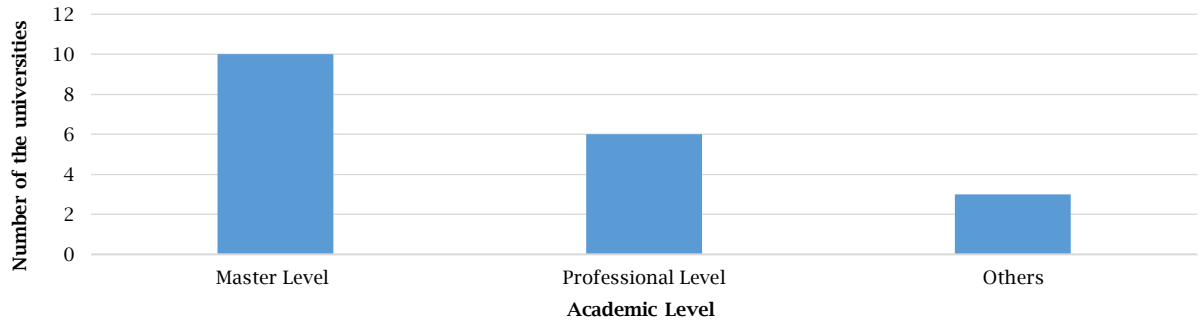
4.3. Existing fintech-specific courses in academia

Fintech is a disruptive innovation not only for the conventional financial industry/institutions but also for academia. After the authors collaborated with personnel from the fintech industry and academicians from different international institutes, it was concluded that the fintech industry needs help to get suitable talent. One of the reasons is the lack of an interdisciplinary approach in new professionals in the fast-changing trend. Therefore, in this sub-section, the authors have summarised the list of the fintech-specific programs offered by the world's top universities, categorising them into four distinctive disciplines. The world's leading universities list was extracted from the Global 2000 List by the Center for World Universities Rankings (CWUR, 2023).

The authors sorted 20 top universities offering fintech-specific courses, which was reduced to 16 later due to the non-availability of the detailed curriculum during the web content mining process. With web content mining, two types of information were summarized: firstly, what fintech-specific content was offered to which level, and secondly, what courses were offered. Based on the findings, the authors will conclude the main areas that should be offered to fintech-specific studies based on the interdisciplinary approach.

The top 20 universities offering fintech-specific courses include Massachusetts Institute of Technology (MIT), University of Oxford, Imperial College London, University of California (Berkeley), Columbia University, New York University (NYU), National University of Singapore (NUS), University of Toronto, The Hong Kong University of Science and Technology, University of Chicago, London School of Economics (LSE), University of Hong Kong, Carnegie Mellon University, University of Waterloo, University of Warwick, Swiss Federal Institute of Technology Zurich (ETH Zurich), Singapore Management University, and the University of Pennsylvania.

Figure 4. Academic levels offering fintech-specific courses



Source: Authors' elaboration.

As per the result of web content mining, it was found that the fintech-specific courses were offered at three levels: professional level, master's level, and others (including some undergraduate level). The authors have summarised the outcomes in Figure 5. As per the findings, top universities offer fintech-specific courses primarily to the master's program and to the professionals as either boot camps or short courses for the personnel already working in the industry. Moreover, it was rare to find Fintech-specific courses at the bachelor's level.

The authors then looked into the details of the courses offered in each program to find the main areas of study. The data obtained were classified into four broad disciplines under which all the courses fell. These four disciplines were Finance, IT, Regulations and Compliance, and Leadership. Around 58% of the studies were related to Finance, 32% to IT, 8% to Regulations and Compliance, and about 2% to Leadership.

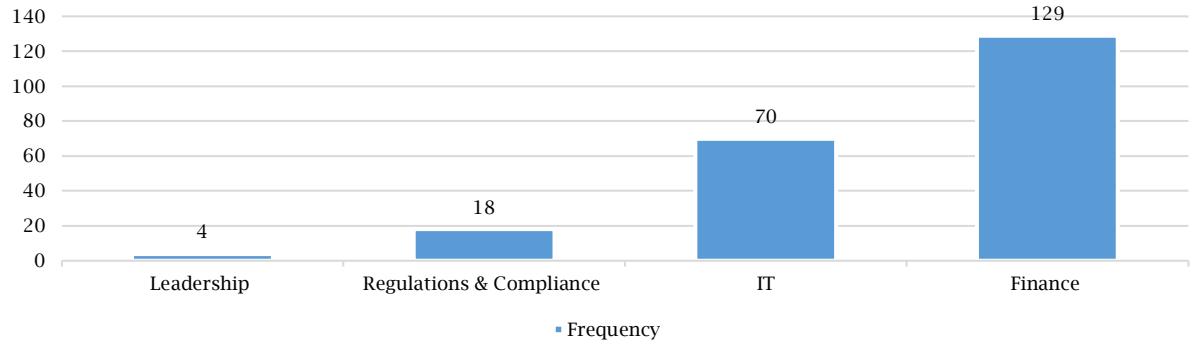
The most offered finance courses were Trading and Capital Market (financial market), Accounting and Corporate Finance (Financial Reporting and Analysis), Investments and Portfolio Management, Derivatives, and Financial Risk Management. Other courses included Trends in Financial Services, Marketing Channels, Payments, Credit and Lending, Challenger Banks, Insurance, Coronavirus Crises and Finance, Business Valuation, Financial Econometrics, Financial Mathematics, Asset Allocation and Investment Strategies, Text Mining for Economics and Finance, Advance Financial Statistics, Advance Corporate Finance, Asset Pricing Application, Fixed Income Markets, Financial Data Science, Financial Institutions, Saving & Wealth Management, Fintech Ecosystem, Robo-advising, Application in Entrepreneurial Finance, Fintech Personal Financial Planning, Behavioural Finance in Fintech, Digital Money, Digital Platform, Mobile Financial Services, Currencies (CBDC), Fintech Existence and Digital Banking.

In IT-based courses, the most common courses in almost every program were Artificial Intelligence, Machine Learning, Blockchain, Digital Platforms, Big Data in Finance and Financial Data, and Financial Data Mining. Other courses included Deep Learning AI, Open APIs, Mobile Financial Services, Open Data and Data Networks, Application of R and Databases for Finance, Securities, Data Structures and Algorithms in Python, C++, Computational Finance with C++, Text Mining for Economics and Finance and Programming in Fintech.

Regulations and Compliance courses included Digital Money, Central Bank Digital Currencies (CBDC), Open Banking and Data Networks, Ethics and Professional Standards in Finance, Cyber Security, and Regulations and Compliance in Fintech.

From the leadership perspective, the courses offered were Application in Entrepreneurial Finance, Leadership, Corporate Governance, and Entrepreneurship.

Figure 5. Disciplines of fintech-specific courses offered by different universities



Source: Authors' elaboration.

Based on the findings related to the courses offered by different top universities in the world, it can be concluded that to provide fintech-specific programs, it must have Finance, IT, Regulations and Compliance, and Leadership. Also, Finance and IT-related courses are a must. Regarding the duration of the courses, master's programs were mostly M.Sc. and MBAs, which were 2–3 years long, whereas the professional courses were about 4–6 months long. The others included bachelor's, boot camps, and short courses, which varied in length and content. However, it was interesting that the fintech-specific was offered rarely at the undergraduate level.

As per the authors' previous research about fintech and fintech ecosystem, different fintech business models were identified, such as peer-to-peer (P2P) lending, crowdfunding, cryptocurrency, blockchain, cyber-currency, disrupted ledger, payments, billings, e-wallets, mobile payments, insurtech, risk management, big data analytics, exchange services, forex and money market, asset management, wealth management, application programming interface (API) streams and robo-advising (Siddiqui & Rivera, 2022). Therefore, the results regarding what type of fintech-specific courses were offered by the top universities aligned to these areas from the perspective of Finance courses and a part of IT and Regulations. However, the courses related to leadership were new information, but only a few universities offered Leadership as a part of fintech studies.

4.4. Recommendations on fintech-specific content

The authors have accumulated a list of the courses that can be offered in different fintech courses at higher education in Table 2. The authors have ensured that the offered courses in the proposed courses are interdisciplinary, as it is vital.

Table 2. Proposal on fintech courses in fintech-specific courses at higher education

Finance	*IT*	*Regulations and compliance*	*Leadership*
Introduction to Fintech	Blockchain Technology	Regulatory Framework in Fintech	Leadership in Fintech
Financial Markets and Trading Technologies	Artificial Intelligence & Machine Learning	Compliance in Fintech	Fintech Entrepreneurship
Blockchain and Cryptocurrencies	Cloud Computing	Legal Issues in Fintech	Ethics and Governance in Fintech
Digital Banking and Payments	Cybersecurity	Regtech and Compliance	Collaborative Leadership in the Fintech Ecosystem
Risk Management and Internal Control	Big Data Analytics		
Central Bank Digital Currencies (CBDC)	Mobile and Web Development		
Business Valuation	Open APIs		
Advanced Financial Statistics	Computational Finance with C++		
Saving and Wealth Management	Data Structures and Algorithms with Python		
Financial Data Analysis			
Digital Platform/Trading			

Source: Authors' elaboration.

The authors have made this list after analyzing what type of courses are required in the job ads posted by fintech on the internet and how to integrate them to offer a package of interdisciplinary studies. This comprehensive list includes the courses and topics from four major areas: Finance, IT, Regulations and Compliance, and Leadership. This means that this list has a holistic view of what the students and professionals need regarding the tools to succeed in the fintech industry.

However, to ensure that students on different levels are offered efficient and practical courses per their needs. This means that the universities may offer different courses at different levels. For instance, there can be a focus on an overview of fintech and its impact on the finance industry or the economy in general at the undergraduate level. On the other hand, there can be more emphasis on advanced topics such as trading technologies, blockchain, and risk management. Lastly, the professional-level courses can use more practical courses like implementing machine learning to improve risk management or using digital payments in different businesses.

All the findings by the authors on how interdisciplinary education in fintech-specific courses can impact skills along with the academic levels have been summarized in Table 3. Interdisciplinary education of fintech-specific courses integrates four multidisciplinary teaching: Finance, IT, Regulations and Compliance, and Leadership. For each multidisciplinary, the authors have suggested different courses based on data mining of the top universities offering fintech-specific courses and their personal experience from teaching, research, and informal talks with the professionals in the fintech industry. Lastly, the courses are designed to enhance teleological, cognitive, and social skills among learners.

Table 3. Summary of findings

Interdisciplinary fields	*Titles of the courses*	*Academic level*	*Skills*
Finance	Introduction to Fintech; Financial Markets and Trading Technologies; Blockchain and Cryptocurrencies; Digital Banking and Payments; Risk Management and Internal Control; Central Bank Digital Currencies (CBDC); Business Valuation; Advanced Financial Statistics; Saving and Wealth Management; Financial Data Analysis; Digital Platform/Trading	Master's level	*Teleological skills*: Develop epistemological beliefs, declarative knowledge, procedural knowledge, and structural knowledge
IT	Blockchain Technology; Artificial Intelligence and Machine Learning; Cloud Computing; Cybersecurity; Big Data Analytics; Mobile and Web Development; Open APIs; Computational Finance with C++; Data Structures and Algorithms with Python	Professional level	*Cognitive skills:* Enhance critical thinking, enhance metacognitive thinking, enhance creative thinking, use analogies and metaphors
Regulations and Compliance	Regulatory Framework in Fintech; Compliance in Fintech; Legal Issues in Fintech; Regtech and Compliance	Others (Bootcamps and bachelor's level)	*Social skills:* Enhance life skills, employee satisfaction and retention, improve problem-solving skills, survive in complex and multifaceted work environments
Leadership	Leadership in Fintech; Fintech Entrepreneurship; Ethics and Governance in Fintech		

Source: Authors' elaboration.

5. DISCUSSION

Interdisciplinary studies are those where multidisciplinary studies, such as STEAM, are integrated. Its main aim is a collaboration between diverse disciplines to solve existing issues, fill the gaps, and predict the future. Also, interdisciplinary studies tend to address complex problems and challenges that cannot adequately be tackled via the single disciplinary lens. Thus, interdisciplinary

studies have a holistic approach, considering available perspectives and aspects to handle issues.

Moreover, interdisciplinary studies help the learners make the connections, synergies, and commonalities among multidisciplinary to understand the environment, such as the fintech ecosystem completely. Integrating various theories, methods, concepts, and findings from diverse backgrounds helps the learners to spawn new insights and perspectives. Also, this study demands effective communication and collaboration. Then, only there can be shared and prosperous outcomes.

On the contrary, interdisciplinary studies demand flexibility from the perspective of the framework, methodologies, and research approaches. Therefore, it requires patience and collaboration by all stakeholders. This is where industry professionals and practitioners collaborate to adapt and customize according to the needs of the learners.

Furthermore, interdisciplinary studies improve three different types of skills in learners: teleological skills, social skills, and cognitive skills.

The authors' area of research is fintech, and they intended to explore the interdisciplinary studies courses that higher education institutions can offer to adhere to the needs of the fintech industry. After the QCA and web mining, the authors concluded that four disciplines could be integrated into the program to help graduates and professionals succeed in the complex, challenging, multifaceted fintech industry. These disciplines are Finance, IT, Regulations and Compliance, and Leadership.

Moreover, considering the needs of different audiences, the course can be divided into three different types of packages. Like fundamental information on fintech and its ecosystem in the undergraduate programs, in the graduate program, there can be more complex courses like Blockchain, Cryptocurrencies, APIs, Pythons, Ethics, and Governance in Fintech and Fintech Entrepreneurship. For professionals looking to update their skills and improve their leadership, universities can offer courses that show the impact of different areas of study on the profitability, rapport, and sustainability of the fintech with which they are associated.

6. CONCLUSION

Based on the findings, it can be concluded safely that interdisciplinary education, which integrates multidisciplinary, is more beneficial in today's complex world. It is because it gives a holistic view to the learners, and learners can make connections and come up with innovative and more comprehensive solutions that may not be possible if they are held separately. Also, the multidisciplinary approach motivates learners to be more flexible, share the methodology and methods, and work together.

Fintech is new and has been discussed more in the last decade, like other technology-based industries. However, the rate of increase in fintech has been less than expected. One of the reasons is the gap between the professionals with the right skills and the demand for skilled labourers. Therefore, academicians can be crucial in narrowing the gap between the demand and supply regarding skills and knowledge.

To explore the fintech-specific courses that higher education could offer to help this struggling industry, the authors carried out QCR to identify the fintech-specific courses provided by the top 20 universities in the world. In addition to this list, authors have offered a list of the courses from different multidisciplinary. This, in turn, will help the learners improve their teleological, cognitive, and social skills.

The suggested fintech-specific courses can be offered to learners at different academic levels. For instance, master's, professional, and others (including boot camp and bachelor's levels). Hence, the higher educationist can utilize the information in Table 3 to form programs offering fintech-specific courses.

There were some limitations in this research. Firstly, the authors only focused on the top universities by the Center for World Universities Rankings 2023. The criteria differ for each ranking platform, meaning that the top 20 universities offering fintech-specific content from different platforms can be used for the analysis. Secondly, the authors used secondary data to do the analysis, but as mentioned earlier, primary data can be used by interviewing the leaders of fintechs. Moreover, further research can be done to reflect on the courses or programs offered by universities by both the professionals who took these courses and by the trainers to find loopholes and make them more efficient. Lastly, stakeholders like the Ministry of Economics (and Finance) or the Securities Exchange get an idea of the strategic plan in terms of the FinTech industry.

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