Investigating the Influence of an Educational Intervention for Bridging Distinct Student Communities in an iCons Class: A First Step Towards Success

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Abstract

UMass Amherst's iCons Program is an interdisciplinary program created to equip college students with practical research experience. To address complicated global concerns like energy, public health, and environmental challenges, the program encourages collaboration amongst students from STEM, business and policy majors. Students participate in group projects, case studies, and research throughout a 20-credit program over 4 years, where they choose a specialty track - biomedicine or renewable energy. Research on attitudes of STEM and Business students suggests the possibility of a cultural divide between these populations, which can limit the full potential of interdisciplinary collaboration. Here, we investigated the efficacy of an educational intervention that may foster an environment for STEM, Business and policy students to work together effectively, overcoming these biases. We used a case study, previously co-written by the author, that focuses on the cross-section of STEM and business. In particular, the case study deals with implications of AI in the health insurance industry. We employed a case study methodology, integrating a collaborative learning experience where STEM and business students work together on real-world scenarios involving AI and the health insurance industry. We utilised existing survey instruments as pre/post measures to determine how the educational intervention may influence STEM students' attitudes about business and vice versa. Using pre- and post-surveys, we measured students' self-perception as STEM or Business thinkers and their attitudes toward interdisciplinary collaboration. The findings, although not statistically significant, suggest positive directional shifts and offer preliminary evidence of impact. In particular, we find that study samples in the range of 150 to 400 participants are needed to yield statistically significant results using our study design.

1. Introduction

The need for interdisciplinary collaboration in education and industry has never been more critical. However, there remains a significant curricular gap between STEM education and the sustainability needs of modern businesses (Sayers *et al*., 2020). Many academic programs continue to treat STEM and business as separate silos. Many academic programs continue to treat STEM and business as separate silos. This divide is not only structural but also cultural, with differences in communication styles and problem-solving approaches(Schlee, *et al.,* 2007). These differences can lead to friction in cross-functional teams and limit innovation when collaboration is not intentionally cultivated. Bridging this divide requires educational models that actively integrate technical, ethical, and managerial perspectives to prepare students for collaborative problem-solving in diverse professional environments.

Prior research has shown that interdisciplinary education can enhance students' ability to synthesize knowledge, develop cognitive flexibility, and engage with complex societal issues (Spelt *et al.*, 2009). However, achieving these outcomes is not automatic; it requires carefully designed interventions that go beyond presenting multiple perspectives and instead foster true integration of disciplinary knowledge and appreciation for the value of other fields.

The **Integrated Concentration in STEM** (iCons) at the University of Massachusetts Amherst is a 20-credit undergraduate certificate program, designed to enhance students with interdisciplinary, real-world problem-solving experiences. Launched in 2010, iCons brings together students from diverse disciplines—including science, engineering, public health, policy, and business—to collaborate on complex societal challenges. Through specific tracks such as Biomedicine/Biosystems, Renewable Energy, and Food-Water-Climate, students engage in team-based projects, case studies, and research that emphasize integrative thinking and innovation. The program's curriculum fosters skills in collaborative learning, leadership, and multidisciplinary analysis, preparing graduates to become effective problem solvers and leaders in their respective fields (UMass iCons Program, 2022).

This study evaluates a case-based intervention designed to foster interdisciplinary awareness and collaboration among undergraduate students from STEM and Business/Policy backgrounds.

Implemented in an **iCons 189H** class, the intervention centered on a real-world case study examining the role of artificial intelligence (AI) in health insurance—an issue that sits at the intersection of data science, ethics, economics, and public policy (Gadage, *et al.*, 2024) . The case study invited students to consider both the technical, ethical and managerial dimensions of AI-driven decision-making in healthcare insurance, challenging them to articulate their disciplinary perspectives while learning from others. A validated survey approach was adapted to assess student attitudes in ingroup and out of group work, before and after the case study. The findings suggest positive directional shifts and while not statistically significant, are a first step towards success (Krosnick *et. al,* 2010).

2. Methods

Summary of the Case Design

As part of the intervention, students engaged with a case study based on real-world reporting about Cigna Health Insurance's use of automated systems to deny medical claims (Gadage *et al,*. 2024) This case raised pressing questions about ethical decision-making, algorithmic accountability, patient rights, and corporate responsibility. The case was written with the intention of utilizing the content for an academic intervention. This case formed the foundation for team discussion, reflection, and survey-based assessment of students' interdisciplinary understanding and identity.

Study Design

The intervention was intended to target students early in their academic journeys. Interventions delivered during formative stages of identity development can shape long-term attitudes toward collaboration and self-concept across disciplines (Spelt et al., (2009)).

The intervention spanned one week over 2 days during class time - 1 hour and 15 minutes scheduled on Monday (April 7, 2025) and Wednesday (April 9, 2025). The intervention can be broken down into 3 major categories -

1. Pre-Survey and Reading Assignment

2. Case Study Engagement in Interdisciplinary Teams

3. Post-Survey

The pre survey and post survey were structurally identical and distributed as Google forms. This allowed for direct comparison of student responses before and after the intervention. Questions 1 and 2 focused on disciplinary identity and used a validated visual instrument shown below.

Students were asked to select one of five images representing increasing degrees of overlap between "Me" and either a "STEM Thinker" or a "Business Thinker," with responses coded from 1 (no overlap) to 5 (complete overlap). These visual scales serve as effective representations of self-perceived identity alignment, a key construct in measuring interdisciplinary development.

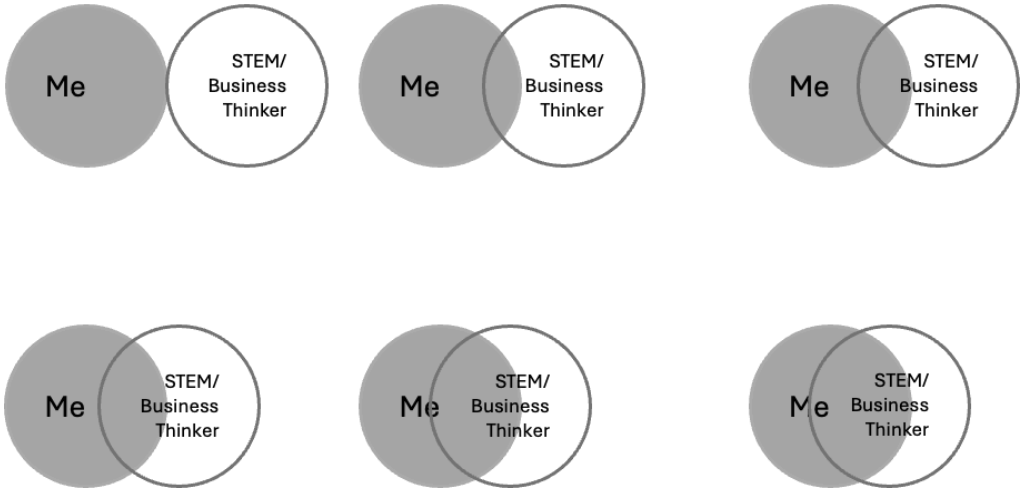

Figure 1- *Survey Question 1 & 2 - "Select the picture that best describes the current overlap of the image you have of yourself and your image of what a STEM thinker is."*

Question 7 was a Likert-scale item, asking students to rate the extent to which they agreed with the statement: *"Students from STEM majors and from Business/Policy majors can bring equal value to collaborative projects."* Responses were captured on a 5-point scale from "Strongly Agree" to "Strongly Disagree." This question was used to test student attitudes toward interdisciplinary value equivalence which is a central outcome measure of the intervention.

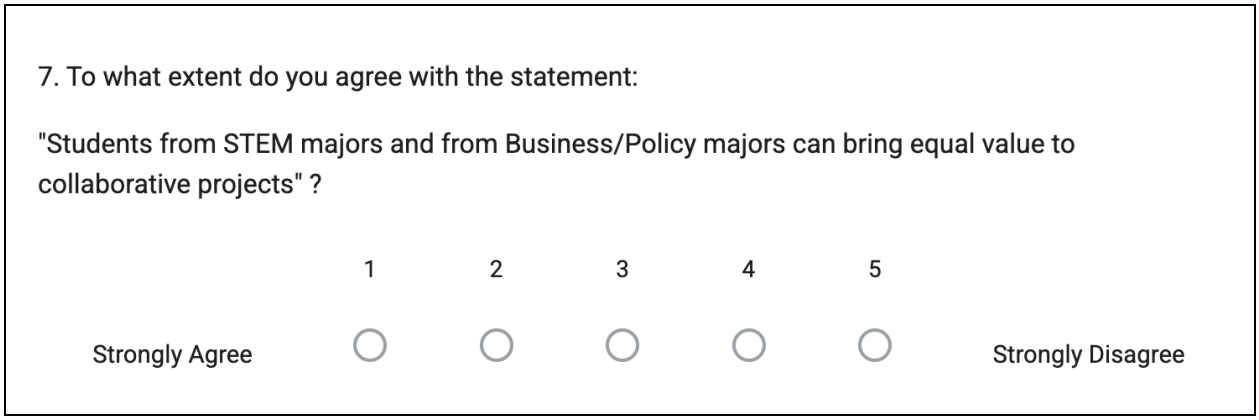

Figure 2 - *Survey Question 7 from Pre Survey (Google Forms)*

Institutional Review Board (IRB) Approvals and Ethical Considerations

Prior to data collection and case study implementation, this study received formal approval from University of Massachusetts Amherst Institutional Review Board (IRB). The research was reviewed under IRB protocol ID # 6040, and was classified under Category 7 for educational social behavioral research involving normal classroom practices. All participants were informed of the voluntary nature of the study, and consent forms were collected before the surveys were sent out. Assent forms along with parental/ guardian consent forms were distributed to students below the age of 18. No identifiable personal information was collected, and all data were aggregated for analysis to protect student confidentiality.

Implementation

The study was implemented with the iCons Program at UMass Amherst. The intervention was implemented in a first-year 4 credit iCons course (iCons 189H), which serves as the program's introductory experience for 1st or 2nd year college students. This cohort-level course was selected due to its mix of students from diverse majors and its design flexibility, which allows for experimental pedagogy. The case study and intervention plan received approval from iCons 189H instructors Professor Sasha Adkins and Professor Martin Medina Elizalde.

At the start of class on Monday April 7, students were given 10 minutes to complete a pre-survey (see Appendix A) designed to capture baseline disciplinary identity, openness to interdisciplinary collaboration, and attitudes toward the relative value of STEM and Business/Policy contributions. Students were assigned a case study (See Appendix B) based on a real-world ethics controversy involving Cigna Health Insurance's alleged use of an automated AI-based claim review system "PxDx". The case study highlighted the delicate balance between technological efficiency, legalities surrounding AI in healthcare, business ramifications and ethical responsibilities.

The class consisted of ~ 40 students who were randomly assigned to 12 teams of about 3-4 members each, to ensure each team was equipped with diverse skill sets. Each team was tasked with analyzing the case from multiple disciplinary standpoints and answering a series of structured case study questions (see Appendix C). Questions were structured to ensure adequate comprehension of the case study. The questions prompted students to articulate both technical and ethical evaluations of the situation, assess and calculate potential business and reputational risks. The teams were asked to work on the questions together and report out their findings on Wednesday, April 9. The teams were then tasked to focus on a particular aspect of the case study which involved identifying a key problem, formulating a research question and suggesting potential solutions in the form of a paper that asks the question - *"You are the CEO of Cigna Healthcare, would you still continue to use only AI in claims processing?"* (~ 2 pages, 750 words). They were encouraged to consider all aspects of the case while formulating their responses. At the end of the intervention, students completed a post-survey identical in structure to the pre-survey. The goal was to measure any short-term changes in disciplinary identity alignment, willingness to collaborate across fields, and appreciation of interdisciplinary value.

Data treatment

The data were analysed using aggregated response distributions for each question, provided as percentages of total responses across Likert-scale. These distributions were treated as weighted frequencies, and responses were numerically coded from 1 to 5. For each survey item, we computed weighted average scores by multiplying each response value by its corresponding

percentage and summing the products. We calculated the variances were estimated from the weighted response distributions under the assumption of normality and independent sampling

Two-tailed p-values were then computed using the standard normal distribution. While results for Q1, Q2, and Q7 did not reach statistical significance (all $p > 0.05$), they provided insight into directional trends.

Results

Figures 3 and 4 show comparisons of the participants' perceptions of their identities as STEM and Business thinkers, respectively, before and after the case study-based intervention. For Fig. 1, five images were presented to the participants, each showing different levels of overlap between "Me" and "STEM Thinker," with 1 denoting “no overlap” and 5 denoting “total overlap;” Fig. 2 is likewise with “Business Thinker.”

Responses shown in Fig. 3 from the pre-survey were more evenly split between lower and middle overlaps, suggesting a modest level of STEM identification. The post-survey data indicate a change in trend toward alternatives 4 and 5 following the intervention, indicating that more participants felt more strongly aligned with the identity of a STEM thinker.

Figure 4 shows the parallel data for participants’ self-perceived identity as Business thinkers, using the same 5 point visual overlap scale. Initially, responses were concentrated around medium overlap, with fewer participants fully identifying with the business persona - complete overlap. In the post-survey, there is a mild shift toward option 4, though not as pronounced as in the STEM identity chart.

The weighted averages for survey responses show a positive change from pre- to post-survey in both the STEM and Business groups, suggesting that the tested intervention succeeded in bridging STEM and Business populations. In terms of the STEM identity survey question, the average increased from 3.475 to 3.573, yielding a difference of 0.098. A z-test on weighted averages (using the visual identity scores 1–5) showed that the increase is not statistically significant ($p = 0.312 > 0.05$).

For the Business group, the increase was slightly greater, with averages rising from 2.8 to 2.944, for a total change of 0.144. We used a z-test on weighted averages, the change was not statistically significant ($p = 0.318 > 0.05$), but it may reflect a slight enhancement in business identity following the interdisciplinary case study. .

The greater increase observed among Business students may indicate that the interdisciplinary case study was particularly impactful in helping non-STEM participants feel more integrated into STEM-adjacent conversations. These shifts, while modest, are encouraging and signal potential areas for deeper exploration with a larger, more statistically powered sample in future studies.

The anecdotal improvement implies that the case study and course discussions may have influenced participants' sense of belonging or identification within STEM fields. This result cannot be confirmed with statistical certainty due to the limited sample size of fewer than 40 participants. However, it offers evidence of a positive perceptual shift. A larger and more diverse sample would be necessary to validate these findings and establish statistical significance. Below we speculate further on whether these directional changes are meaningful.

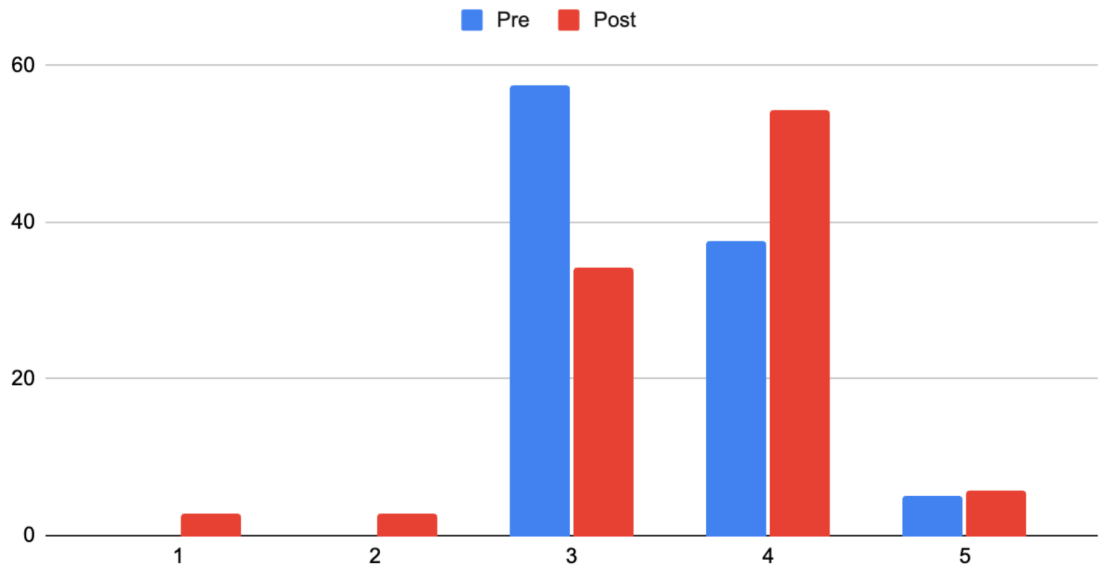

Figure 3: Responses to Survey Question 1 - *"Select the picture that best describes the current overlap of the image you have of yourself and your image of what a STEM thinker is."*

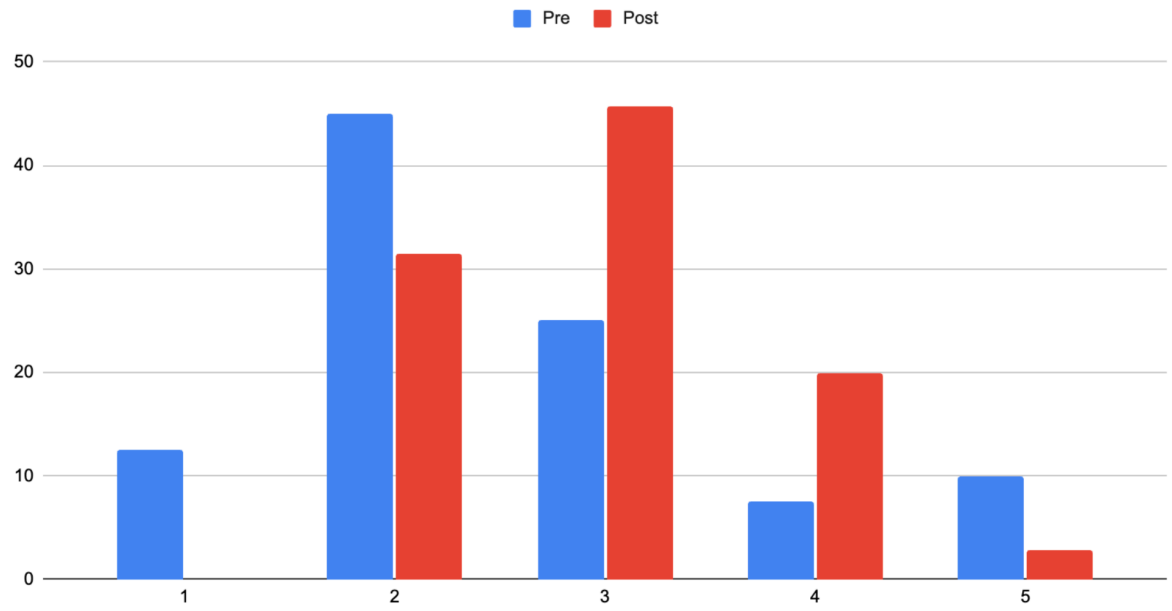

Figure 4: Responses to Survey Question 2 - *"Select the picture that best describes the current overlap of the image you have of yourself and your image of what a Business thinker is"*

Figure 5 shows the distribution of STEM students' responses to Survey Question 3 before and after the intervention. The post-survey responses suggest a slight upward shift in perception or self-assessment. This change aligns with the trend seen in earlier figures—indicating potential growth in areas such as interdisciplinary awareness or perceived relevance of STEM learning. The visual trend suggests the intervention may have encouraged students to broaden their self-conception or role within STEM contexts.

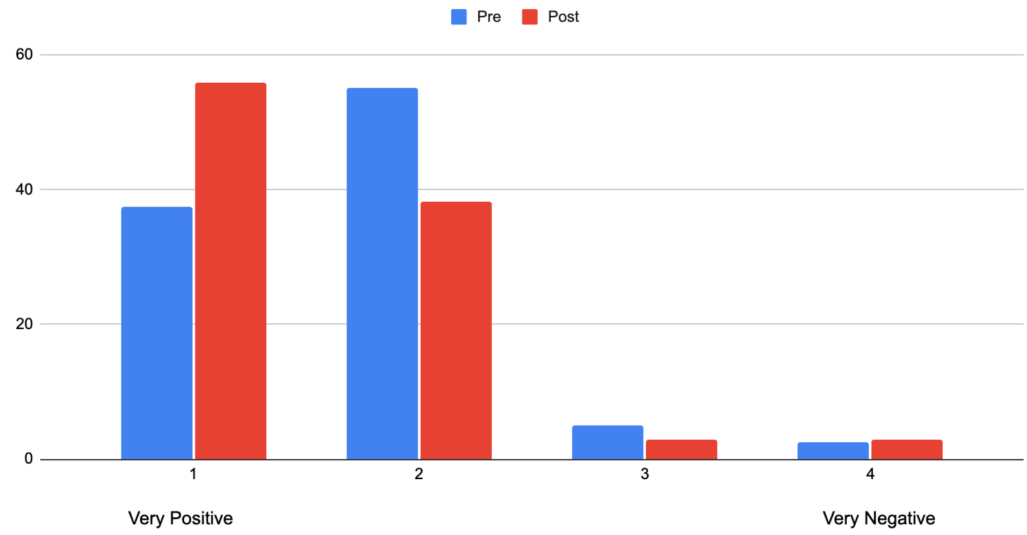

Figure 5 - Responses to Survey Question 3: *"Rate your overall experiences interacting with STEM students in academic settings."*

Figure 6 displays how Business students' responses changed from pre to post for Survey Question 2. This supports the idea that Business students, too, experienced a perceptual shift—perhaps recognizing their contributions to or integration within STEM-related discussions. This pattern strengthens the case for using interdisciplinary case studies as a bridge between STEM and business mindsets.

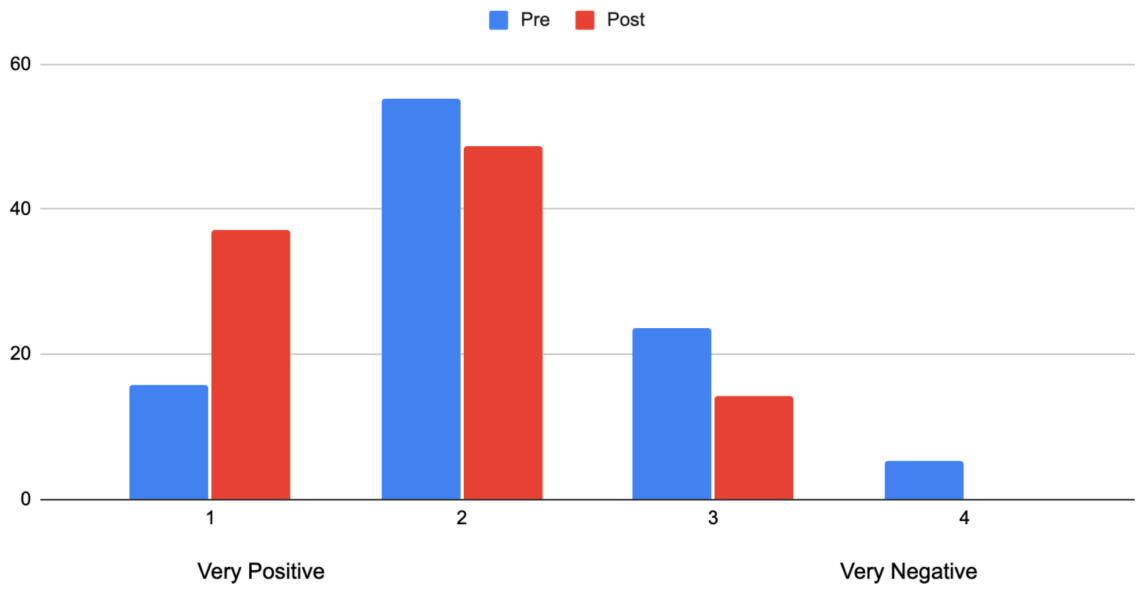

Figure 6. Responses to Survey Question 4: *"Rate your overall experiences interacting with Business students in academic settings."*

Figure 7 illustrates the shift in students' self-reported willingness to seek perspectives from disciplines outside their major when solving complex problems. The Likert-scale responses (1 = Highly Likely, 4 = Highly Unlikely) are compared pre- and post-intervention, with blue representing pre-survey responses and red representing post-survey.

The proportion of students selecting "Highly Likely" (1) rose notably from just under 50% in the pre-survey to around 60% in the post-survey. Concurrently, there was a decline in the proportion of responses at categories 2 and 3, suggesting a shift away from neutral or uncertain positions. Responses in the "Highly Unlikely" (4) category remained negligible in both surveys, reinforcing the cohort's general receptivity to cross-disciplinary thinking.

This outcome is particularly meaningful in the context of real-world problem-solving, where complexity often demands collaboration across technical, social, and managerial domains. This suggests increased intentionality toward interdisciplinary engagement.

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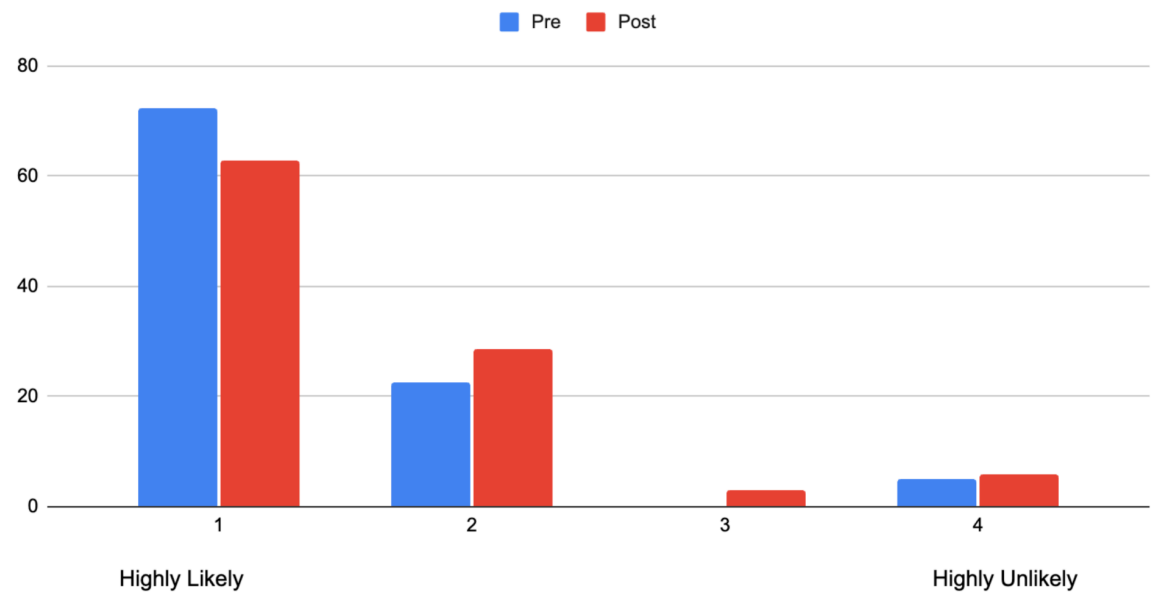

Figure 7. Responses to Survey Question 5: *"How likely are you to seek perspectives from disciplines outside your major when solving complex problems?"*

Figure 8 displays students' perceptions of the benefit to the world from interdisciplinary collaboration on real-world problems, comparing responses from the pre- and post-surveys. The responses are rated on a Likert scale from 1 (Highly Likely) to 4 (Highly Unlikely), with the goal of assessing the perceived societal value of cross-disciplinary teamwork.

In both the pre- and post-surveys, the majority of respondents selected "1 – Highly Likely", with over 70% of participants doing so initially and 65% post-intervention. There is a slight increase in category 2 post-survey, suggesting that a small number of students shifted from very high to moderately high belief in the benefit of interdisciplinary work. Responses in categories 3 and 4 remained extremely low, reflecting a consistent consensus around the importance and value of interdisciplinary approaches.

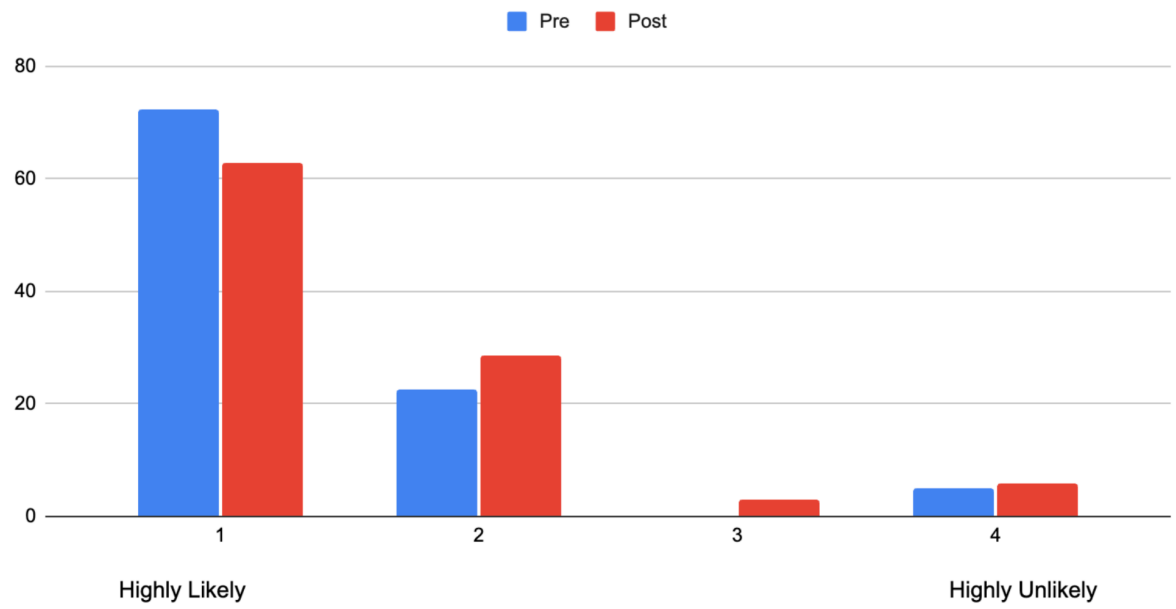

Figure 8. Responses to Survey Question 6: *"What is your perception of the benefit to the world from interdisciplinary collaboration on real-world problems?"*

Figure 9 shows the percentage of students who “strongly agreed” increased significantly in the post-survey, jumping from 47% to nearly 70%. While ratings of 4 (Disagree) and 5 (Strongly Disagree) remained low, there was a slight uptick in "5" in the post-survey. This may reflect a small number of students developing more critical views, possibly informed by their team dynamics or personal experiences during the project.

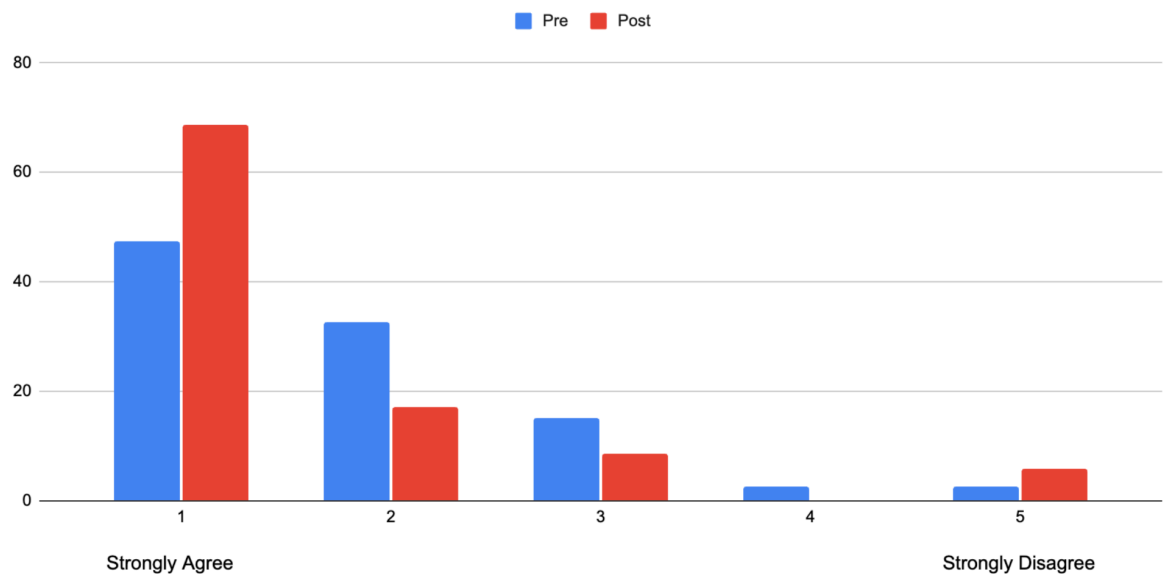

Figure 9. Responses to Survey Question 7: *" To what extent do you agree with the statement: "Students from STEM majors and from Business/Policy majors can bring equal value to collaborative projects?"*

Discussion

This study aimed to evaluate the impact of a case-based interdisciplinary intervention on student perceptions of identity, collaboration, and cross-disciplinary value. The results reflect positive directional change across all key survey items—suggesting a promising effect of the intervention. However, statistical testing did not confirm significance at the standard 0.05 level, primarily due to the limited sample size (~ 40 participants). This constraint limited the statistical power of the analysis and prevented the observed changes from reaching conventional thresholds for inference.

Z-tests on weighted averages showed non-significant p-values for both identity questions - for Question1 (STEM identity) the p value was 0.312 while for Question 2 (Business identity), the p value was 0.318.

In both cases, although there was an increase in post-survey weighted averages, the results were not statistically significant. The shifts suggest that participants began to see themselves more

closely aligned with either a STEM or Business identity post-intervention, but the evidence remains *anecdotal*. Importantly, this trend was consistent across both groups, reinforcing the potential of interdisciplinary interventions to influence self-concept across different academic domains.

Question 7 asked whether students believed that individuals from STEM and Business/Policy backgrounds can bring equal value to collaborative projects. The results show that the change was more pronounced. The post-survey results showed a substantial increase in the percentage of students who strongly agreed with the statement, reflecting a possible shift in how students understand the importance of diverse perspectives in team-based problem-solving. However, the z-test for this question also returned a non-significant p-value of 0.106, suggesting that—while the visual trend is strong—it remains statistically inconclusive in the current study.

To assess the potential for significance under improved conditions, we simulated sample sizes to observe their effects. For both Question 1 and Question 2, a sample size of approximately 400 participants would be required to achieve statistical significance. Simulated p-values for these questions under larger samples dropped to 0.043 and 0.046, respectively. For Question 7, a sample size of 150 was enough to detect significance with the simulated p-value reaching 0.048.

These projections suggest that the intervention may indeed be effective, but that its measurable impact is likely masked by a small sample size. In small samples,it is possible to overlook even moderate effects due to high variability and wide confidence intervals. Given the consistency of the upward trends, these early results should be treated as preliminary but encouraging evidence of success.

To build on these findings, we strongly recommend a larger-scale follow-up study with an expanded and demographically diverse cohort. A future survey study with at least 400 participants will provide the statistical power needed to rigorously test the intervention's effectiveness. It would also allow for subgroup analysis by major, class year, or gender, which could offer further insight into how different learners respond to interdisciplinary teaching strategies.

Summary and Concluding remarks

This study set out to examine whether an educational intervention could shift student perception of their own disciplinary identity and their attitudes toward collaboration across academic domains. Drawing on research advocating for integrated STEM and business curricula (Sayers et al., 2020; Craig et al., 2022) and the cognitive benefits of interdisciplinary learning (Spelt et al., 2009), the study was implemented within the UMass iCons Program, an academic program uniquely designed to support collaborative, real-world problem-solving. Participants completed pre- and post-surveys measuring their identification with STEM and Business/Policy disciplines, as well as their beliefs about the value of interdisciplinary collaboration. They engaged in a team-based case study based on Cigna Health Insurance's alleged use of automated AI tools to deny claims.

Survey results revealed positive directional shifts across all key measures: students reported stronger identification with their disciplines and greater appreciation for the value of interdisciplinary collaboration following the intervention. However, z-tests conducted did not yield statistically significant results at the $p < 0.05$ level, and were largely due to the limited sample size. Simulation analyses in R suggested that with larger sample sizes (N = 150–400), these effects would likely reach significance.

Despite the lack of statistical significance, these findings are meaningful. The positive directional trends in disciplinary self-concept and collaborative value perception suggest that even a brief, interdisciplinary experience can make students reconsider how they see themselves and others in problem-solving contexts. This aligns with broader educational goals of promoting ethical literacy and interdisciplinary collaboration. These competencies are critical to addressing complex societal challenges in industry, policy, and science.

This pilot study serves as a proof of concept for the use of such case studies in fostering interdisciplinary learning, especially early in students' academic development. Future research should involve a larger, multi-cohort sample to better understand how such interventions affect students over a larger period of time. Ultimately, this work highlights the importance of curricular models that actively bridge STEM and business domains, and provides early evidence that such interventions have the potential to change student perceptions

Acknowledgments

We thank the coauthors of the AI Ethics Case study Gabriella Pagnini & Ruchi Patel, and faculty Dr. Scott Auerbach, Dr. Jennifer Merton & Dr. Mila Sherman for their support and guidance throughout this process.

We also thank Professor Sasha Adkins and Professor Martin Medina Elizalde for allowing us to conduct the intervention in their iCons 189H class.

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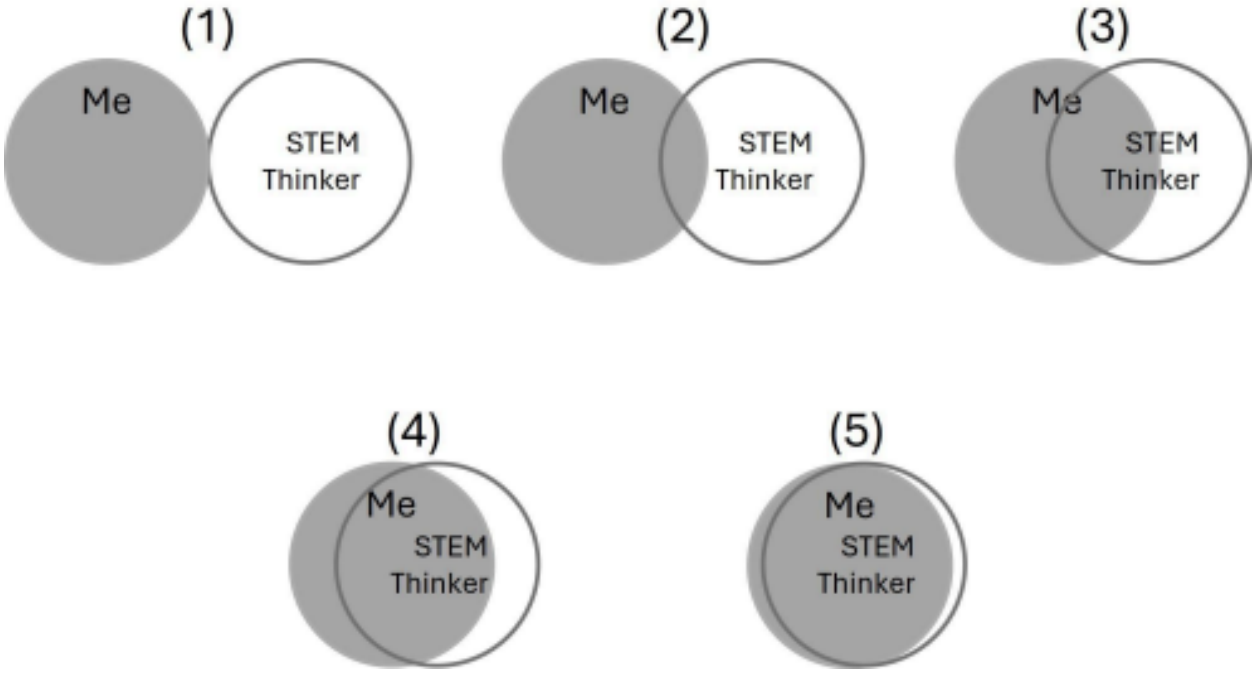
Appendix A - Pre/Post Survey

The following is a list of questions in the Pre/ Post Survey given to the students in iCons 189H who participated in the case study intervention. The surveys were distributed as Google forms to the students.

Perception and Identity (Self and Professional)

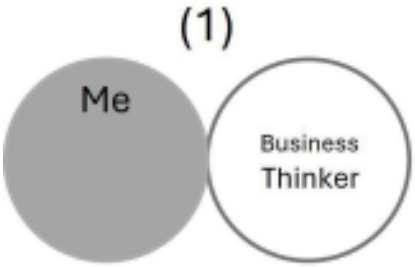
1. Select the picture that best describes the current overlap of the image you have of yourself and your image of what a STEM professional is.

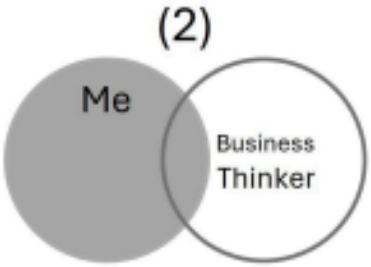


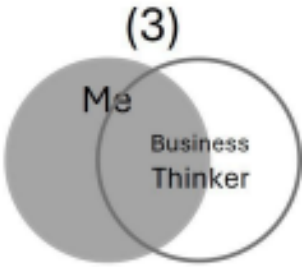
1	
2	
3	
4	

5	

2. Select the picture that best describes the current overlap of the image you have of yourself and your image of what a Business professional is.







1	
2	
3	
4	
5	

Skills and Perceived Benefits of Collaboration

3. Rate your experience interacting with STEM students.

- Scale: 1 (Very Positive) to 2 (Positive) to 3 (Negative) to 45 (Very Negative)

Very Positive	Positive	Negative	Very Negative

4. Rate your experience interacting with business students.

- Scale: 1 (Very Positive) to 2 (Positive) to 3 (Negative) to 45 (Very Negative)

Very Positive	Positive	Negative	Very Negative

5. How likely are you to seek perspectives from disciplines outside your major when solving complex problems?

- Scale: 1 (Very Likely) to 2 (Likely) to 3 (Unlikely) to 4 (Very Unlikely)

Very Positive	Positive	Negative	Very Negative

6. What is your perception of the benefit to the world from interdisciplinary collaboration on real-world problems?

- Scale: 1 (Highly Beneficial) to 2 (Beneficial) to 3 (Somewhat beneficial) to 4 (Not at all beneficial)

Very Positive	Positive	Negative	Very Negative

Bias and Stereotype Reduction

7. To what extent do you agree with the statement:

"Students from STEM majors and from Business/Policy majors can bring equal value to collaborative projects" ?

- Scale: 1 (Strongly Agree) to 2 (Agree) to 3 (Disagree) to 4 (Strongly Disagree)

Very Positive	Positive	Negative	Very Negative

Appendix B

The following is the case study that was used in the intervention.

AI Ethics Case Study

Gabriella Pagnini, Arya Gadage, Ruchi Gupta

University of Massachusetts Amherst, Isenberg School of Management & iCons Program

**Intended for iCons 189H*

Introduction

Imagine you are David Cordani, CEO and Chairman of The Cigna Group, at an executive leadership meeting. You are seated in a round-table conference room in Bloomfield, Connecticut listening to your leadership group provide their operational updates.

Nicole Jones, Executive Vice President and General Counsel, stands up and announces that The Cigna Group faces a current dilemma: two class action lawsuits alleging that Cigna is using an artificial intelligence algorithm, known as "Procedure to Diagnosis" (PxDx), to systematically deny patient claims without a physician review. Ms. Jones discusses the complaints in the lawsuits and recommends that Cigna stop using the PxDx technology in the medical claims review process because of the litigation and regulatory risks.

Noelle Eder, Executive Vice President and Chief Information Officer, jumps in to defend PxDx, arguing that the innovative technology is improving patient experience and company efficiencies. Brian Evanko, who is both the President for Cigna Healthcare (a division of The Cigna Group that provides health insurance) and the Chief Financial Officer of The Cigna Group, chimes in about how the PxDx technology is reducing costs and thus increasing profits for The Cigna Group. Both sides argue back and forth, discussing the risks and rewards of continuing with the PxDx technology in the medical claims review process. Suddenly the conversation stops, and Mr. Evanko asks for your input. *What do you, as the CEO of The Cigna Group, suggest?*

Lawsuits

Two class-action lawsuits were filed against The Cigna Group and Cigna Healthcare in 2023 and 2024. Kisting-Leung et al. v. Cigna Corporation et al. and Sachs v. Cigna Corporation et al. allege that Cigna systematically, wrongfully, and automatically deny their insureds the thorough,

individualized physician review of claims guaranteed to them by law and, ultimately, the payments for necessary medical procedures owed to them under Cigna's health insurance policies[1].

Both complaints allege that Cigna developed the PxDx algorithm for their medical claims review process, enabling their doctors to automatically reject claims on medical grounds in batches of hundreds or thousands at a time for treatments that do not match certain preset criteria, without ever opening individual patient files. The complaints allege that Cigna failed to use reasonable standards in evaluating the individual claims of the Plaintiffs and Class members and by engaging in this misconduct, Cigna breached its fiduciary duties, including its duty of good faith and fair dealing, because their conduct serves Cigna's own economic self-interest and elevates Cigna's interest above the interests of their insureds[2].

Kisting-Leung et al. v. Cigna Corporation et al.

The case of Kisting-Leung et al. v. Cigna Corporation et al. was filed in the U.S. District Court for the Eastern District of California on July 24, 2023. The plaintiffs, Suzanne Kisting-Leung and Ayesha Smiley, claim that Cigna's use of the PxDx algorithm violates the implied covenant of good faith and fair dealing, California's Unfair Competition Law, and deprives them of their right to a fair evaluation of their health insurance claims[3].

On August 19, 2022, Ms. Kisting-Leung underwent a transvaginal ultrasound after being referred by her doctor due to a suspected risk of ovarian cancer. The ultrasound results revealed that Ms. Kisting-Leung had a dermoid cyst on her left ovary[4]. Around October 2022, Ms. Kisting-Leung received a letter from her medical provider informing her that Cigna denied her claim for the ultrasound procedure, stating that the procedure was not medically necessary. As a result, Ms. Kisting-Leung was left responsible for the $198 bill and appealed Cigna's decision[5]. On November 30, 2022, Ms. Kisting-Leung was referred to and underwent another transvaginal ultrasound. Ms.

[1] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[2] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[3]Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[4] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[5] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.

Kisting-Leung's doctor confirmed the necessity of the procedure upon referral. Around December 2022, Ms. Kisting-Leung was informed by her medical provider that Cigna again denied coverage for her claim, stating that the procedure was not medically necessary. On May 18, 2023, Ms. Kisting-Leung received a $525 bill from her medical provider for the second ultrasound. Ms. Kisting-Leung immediately appealed Cigna's decision to deny her claim. To the filing date, Cigna had not paid either of Ms. Kisting Leung's claims[6]. According to Cigna's Medical Coverage Policy, a transvaginal ultrasound is considered "medically necessary for the evaluation of suspected pelvic pathology or for screening or surveillance of a woman at increased risk for ovarian or endometrial cancer[7].

Around January 2023, Ms. Smiley's doctor determined that it was medically necessary to check her Vitamin D levels to confirm she had no Vitamin D deficiency. Accordingly, Ms. Smiley's doctor ordered such a test, which was administered the same month. Around January 2023, Cigna verbally informed Ms. Smiley that Cigna denied her claim and she was required to pay for the testing out-of-pocket. Ms. Smiley did not receive any written correspondence from Cigna explaining the reasons for the denial, as required by Cal. Code Regs. tit. 10, § 2695.7 (b)(1)[8].

To determine whether a submitted claim is medically necessary, Cigna is required to conduct and diligently pursue a "thorough, fair, and objective" investigation into each bill for medical expenses submitted, per California Insurance Regulations, Cal. Code Regs. tit.10, § 2695.7 (d)[9]. This means Cigna's medical directors must examine patient records, review coverage policies, and use their expertise to decide whether to approve or deny claims to avoid unfair denials.

The two plaintiffs allege that Cigna neither provided a "thorough, fair, and objective" investigation of their claims nor any written correspondence explaining the reasons for the denial. They also allege that Cigna's denials were illegal because they violated California law requiring that a licensed physician examine claims[10].

[6] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[7]Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[8] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[9] Kisting-Leung, S., & Smiley, A. v. Cigna Corporation, et al. (2023, July 24). Case No. 2:23-cv-01477. U.S. District Court for the Eastern District of California.
[10] Reisdorf, P. (2023, October 16). Healthcare Giant Cigna Sued For Using Algorithm to DenyClaims. https://www.corpwatch.org/article/healthcare-giant-cigna-sued-using-algorithm-deny-claims

Sachs v. Cigna Corporation et al.

The case Sachs v. Cigna Corporation et al. is a consumer class action lawsuit filed in the U.S. District Court for the District of Connecticut on March 11th, 2024. The Plaintiff, Andrew Sachs, alleges that Cigna's algorithm, PxDx, automatically denied over 300,000 medical claims without review and Cigna's doctors confirmed these denials in batches without checking patients' individual files, a requirement under Connecticut law[11].

Mr. Sachs, a Nevada resident, requires a specific injection medication as the only effective treatment for his neurological condition[12]. His neurologist submitted a prior authorization for the injection, but Cigna requested more information, which was promptly provided. Despite this, Cigna denied coverage for the injection five times. Cigna then requested additional tests and referred Mr. Sachs to facilities hundreds of miles away, despite his residence in a major metropolitan area. These delays and denials by Cigna are alleged to have caused Mr. Sachs further neurological damage[13]. Additionally, the complaint details Cigna's denial of a PET scan initially recommended for Mr. Sachs' neurological condition. Despite Mr. Sachs providing medical records and his doctor's order and justification for the scan, Cigna denied the request twice, citing the need for a peer-to-peer review with the doctor, who had limited availability[14]. Finally, after several phone calls where Cigna did not acknowledge reviewing the updated reports, Cigna approved the request for the PET scan in February 2023[15]. The PET scan revealed early-stage Alzheimer's disease, for which treatment is crucial to slow down the progression. Mr. Sachs argues that Cigna's initial denials and delays regarding the injection request and the PET scan may have caused him irreversible damage[16].

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[11] Cousins, E. (2024, March 13). Cigna uses algorithm that auto-denied 300,000 claims, alleged in lawsuit. Benefits Pro. https://www.benefitspro.com/2024/03/13/cigna-class-action-algorithm-allegedly-auto-denies-300000-claims-412-163851/?slreturn=20240417173904

[12] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.

[13] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.

[14] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.

[15] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.

[16] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.

Cigna's failure to "pay claims without conducting a reasonable investigation based upon all available information" is a violation of Conn. Gen. Stat. § 38a-816(6)(D)[17]. Cigna's medical directors are required under Connecticut law to examine patient records, review coverage policies, and use their expertise to decide whether to approve or deny claims to avoid unfair denials.

Mr. Sachs alleges that Cigna's failure to conduct a reasonable investigation based on all available information is a violation of Connecticut law and Cigna fraudulently misled their insureds into believing their health plan would individually assess their claims and pay for medically necessary procedures[18].

The Cigna Group

The Cigna Group is a for profit multinational healthcare and insurance company. The company offers life, accident, disability, health, supplemental, Medicare, and dental insurance products and services. Cigna heavily invests in technology and data analytics to improve healthcare outcomes, enhance patient care, and manage healthcare costs effectively. Cigna, like many other major healthcare insurance providers, has increasingly incorporated artificial intelligence (AI) into its operations, particularly for processing and reviewing insurance claims, which is crucial for both the insurer and the insured. Cigna has implemented a "Procedure to Diagnosis" (PxDx) process aimed at accelerating payments to physicians for common, low-cost tests and treatments.

Major key players in the industry include UnitedHealth Group Inc, Humana Inc, Aetna (CVS Health Corp), Elevance Health Inc, and Centene Corp. Refer to Figure 1 for a Comparable Company analysis, which is a valuation method that compares similar public companies based on their profitability and growth ratios.

Figure 1

[17] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.
[18] Sachs, A. v. Cigna Corporation et al. (2024, March 11). Case No. 3:24-cv-00329. U.S. District Court for the District of Connecticut.

The Cigna Group Comparable Company Analysis ($ in millions, except per share data) Data from Bloomberg (FY 2023)											
Company	Ticker	Market Cap (M)	P/E	EV/EBITDA	ROIC	FCF	Net Debt/ EBITDA	Gross Margin	EBITDA Margin	Operating Margin	Earnings Per Share
The Cigna Group	CI	87625.1	13.8x	9.5x	10.1%	10,240.00	1.94x	12.9%	6.0%	4.4%	17.57
UnitedHealth Group Inc	UNH	486945.4	22.1x	14.2x	15.9%	25682.0	1.00x	24.5%	10.2%	8.7%	24.12
CVS Health Corp	CVS	101613.4	10.4x	8.3x	6.6%	10,395.00	3.30x	15.2%	5.8%	3.8%	6.49
Humana Inc	HUM	56361.3	17.7x	9.4x	10.7%	2,977.00	-2.04x	16.9%	4.6%	3.8%	20.09
Elevance Health Inc	ELV	110797.3	13.2x	9.5x	10.4%	6,765.00	-0.98x	17.3%	6.2%	5.1%	25.38
Centene Corp	CNC	39643.1	12.7x	8.5x	4.8%	7,254.00	-0.17x	20.5%	3.0%	1.9%	4.97
Mean		159072.1	15.2x	10.0x	9.7%	10614.6	0.22x	18.9%	5.9%	4.7%	16.2
Median		101613.4	13.2x	9.4x	10.4%	7254	-0.17x	17.3%	5.8%	3.8%	20.1

Cigna's market capitalization is below its competitors' average suggesting that they may have a smaller presence in the market compared to their competitors. The price-earnings ratio measures a company's current share price relative to its per-share earnings. Cigna's P/E ratio is slightly below the industry mean, suggesting their stock is less expensive relative to its earnings compared to their competitors. EV/EBITDA is a common valuation ratio that compares a company's Enterprise Value (EV) to its Earnings Before Interest, Taxes, Depreciation & Amortization (EBITDA)[19]. The Cigna Group's Net Debt/ EBITDA is on the higher end of its peers and their gross margin is below the industry averages, suggesting that they are retaining less in revenue from their peers due to higher costs. The Cigna Group's operating margin is slightly below their peers, suggesting they are generating fewer operating profits. Earnings Per Share (EPS) indicates how much money a company makes for each share of its stock and is a widely used metric for estimating corporate value[20]. The Cigna Group's EPS is slightly higher than its industry mean, suggesting that investors are willing to pay a higher price for its shares.

Cigna's stock has demonstrated notable stability in the face of these recent legal challenges, suggesting that investors might not see these lawsuits as detrimental to the company's long-term value or that the impacts of these legal matters are effectively managed by the company, minimizing financial disruptions.

It is interesting to note that the stock shows resilience despite these legal difficulties for the company.[21]

[19] Vipond, T. (2024). EV/EBITDA. Corporate Finance Institute. https://corporatefinanceinstitute.com/resources/valuation/ev-ebitda/
[20] Fernando, J. (2024, May 2). Earnings Per Share (EPS): What It Means and How to Calculate It. Investopedia. https://www.investopedia.com/terms/e/eps.asp
[21] Yahoo Finance. (2024). Cigna Corporation (CI) Stock Price, News, Quote & History. Retrieved from https://finance.yahoo.com/quote/CI

Cigna's Claims Review Process

Cigna has a standard claims review process. The process involves a "prior authorization" where specific medical procedures require approval from Cigna before the treatment is rendered. These codes must align with what is termed necessary according to Cigna's clinical coverage policies. This procedure cross verifies the coverage until the patient's health care plan. Following the pre-approval, the claims are submitted by providers or patients. For low cost, uncomplicated procedures, Cigna employs the PxDx - Procedure to Diagnosis system. The PxDx screening process involves a post service review where the software is utilized to match the procedure codes submitted by physicians with the corresponding diagnosis codes. After the claim is approved, payments are processed directly to providers or patients. An Explanation of Benefits (EOB) is issued, describing how each claim was handled and outlining patient financial responsibilities.[22]

When your insurance company refuses to pay for the treatment/ surgery/ drug post the service being performed, it is called a "claim denial". A claim can be denied for a variety of reasons including lack of prior authorization or referral, out-of-network provider, exclusion of a service, based on medical necessity.

PXDX Company Information, Mission and Values

PXDX was founded with a vision to "harness the power of AI for positive societal impact". Its inception stemmed from the recognition of the potential of predictive AI to address complex challenges and drive innovation across industries. PXDX's mission is to develop AI technologies that allow organizations to make informed decisions[23]. The company claims to value integrity, innovation, and social responsibility, striving to create AI solutions that benefit society while minimizing potential risks and harms. Research and Development

Technology

[22] The Cigna Group. (n.d.) . Claims and Explanation of Benefits (EOB). https://www.cigna.com/individuals-families/member-guide/claims-and-eobs](https://www.cigna.com/individuals-families/member-guide/claims-and-eobs

[23] PXDX. (n.d.). https://pxdx.co/

Artificial Intelligence (AI) has revolutionized various industries, enabling predictive and generative models to make accurate forecasts and generate novel content. Predictive AI models, which are also referred to as forecasting models, utilize sophisticated algorithms to examine historical data and uncover patterns indicative of future events or trends. These models encompass various techniques, including regression analysis, time series forecasting, and machine learning algorithms like decision trees, random forests, and neural networks.

Such models are being used to assist health professionals in clerical, administrative and financial aspects of practicing medicine. Medicine exposes physicians and other healthcare professionals in many settings to large amounts of paperwork for recording patient information and data in electronic health records, billing in private, insurance or public health-care systems and other administrative tasks. Documentation constitutes a large amount of physician's time and is a leading cause of physician burnout[24]. Utilizing technology for such administrative tasks returns to health-care professionals their most valuable commodity –time– both to reduce burn-out and to allocate more time to providing care for patients.

How does Predictive AI make predictions?

A predictive AI model is designed to streamline and automate the process of medical claims review. By leveraging an extensive database of past claims, the system analyzes historical data to make informed decisions on new claims based on patterns and outcomes.

[24] World Health Organization (2024). Ethics and governance of artificial intelligence for health. Guidance on large multi-modal models. Geneva. License: CC BY-NC-SA 3.0 IGO. https://iris.who.int/bitstream/handle/10665/375579/9789240084759-eng.pdf?sequence=1

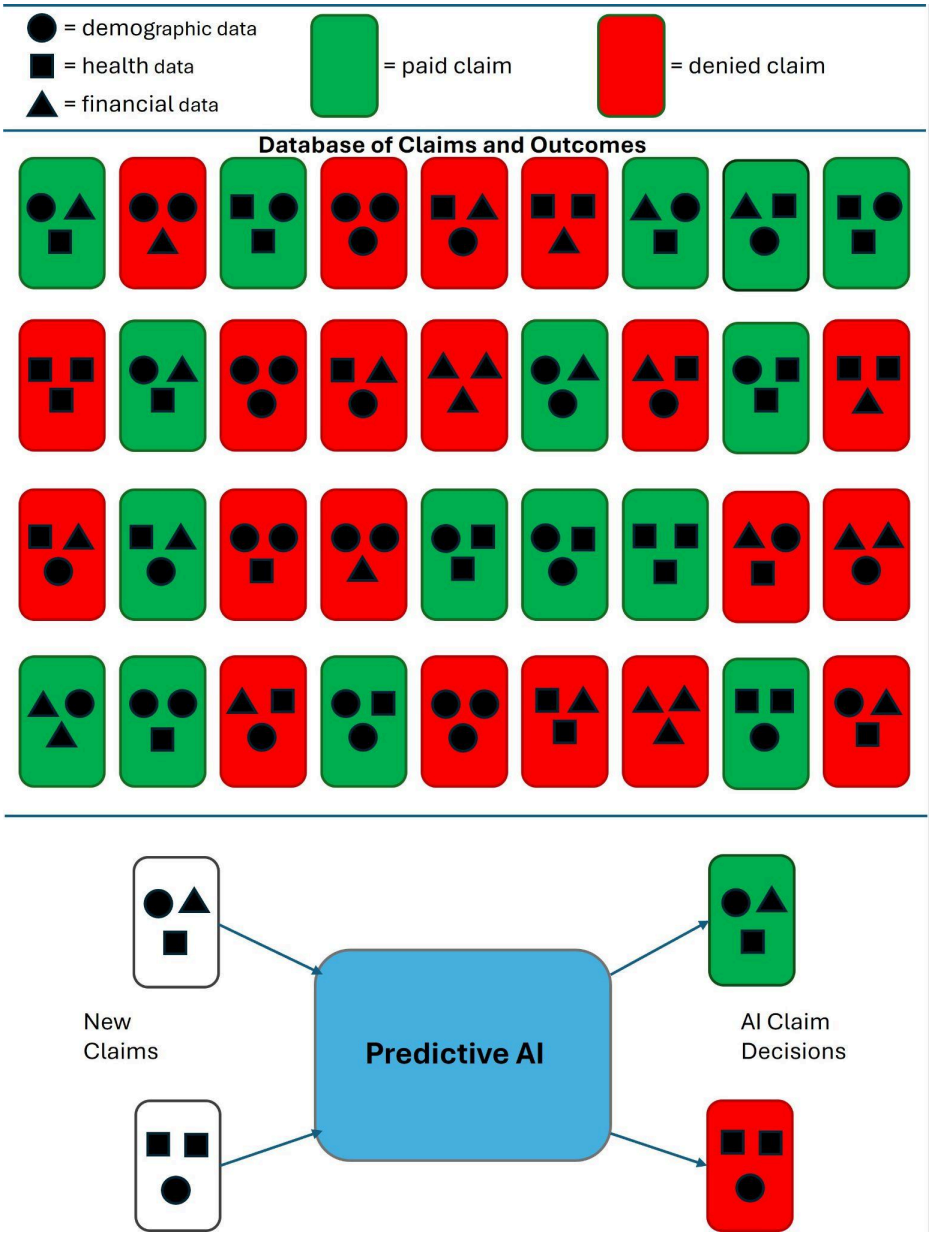

Figure 2 - PXDX AI Mechanism

The model's primary function is predictive analysis based on historical data. The system evaluates each new claim by comparing its attributes with historical claims that have similar characteristics. This comparison enables the model to make decisions by matching patterns and analyzing trends.

The top section of the figure is an **old database of claims**, with each block representing a claim request with colored borders—**green** for approved claims and **red** for rejected claims. Each box corresponds to a claim, composed of specific attributes represented by shapes. In this case, triangles could signify *demographic information* (such as age or location), circles could represent *medical history* (prior conditions or treatments), and squares might denote *financial status or credit score*. These attributes show various factors that may influence the decision to approve or reject. Some of the claims might miss some attributes which makes it less likely for the claim to be approved in the first cycle.

The historical data in this database reflects past decisions as well, with claims classified by their outcomes. By categorizing these claims based on outcomes, the predictive model can learn from the patterns embedded within these attributes and outcomes, developing a model to predict the outcome of future claims.

Two new claims are shown as "inputs" into the system. They process these new claims by analyzing the similarity between their attributes and those in the historical database.

Using historical data, the model identifies patterns among claims with similar demographic profiles, medical histories, and financial situations. For instance, if claims with certain demographics (triangles) and medical histories (circles) were consistently approved in the past, the model is likely to recommend approval for new claims with similar attributes. Conversely, if claims with certain financial indicators (squares) were frequently rejected, a new claim with similar financial attributes might receive a rejection recommendation.

Ethics

Ethics is the discipline concerned with what is morally good and bad and morally right and wrong[25]. How should we live? Is it right to be dishonest for a good cause? What are our obligations to those who will come after us? Ethics deals with these questions, and many more, by addressing the fundamental issues of practical decision making and the standards by which human actions can be

[25] Singer, P. (2024, April 15). Ethics | Definition, History, Examples, Types, Philosophy, & Facts. In Encyclopædia Britannica. https://www.britannica.com/question/What-is-ethics

judged right or wrong[26]. Ethical, legal, and financially responsible behavior is interconnected. Today's ethics are tomorrow's laws. In business, ethics influences a company's culture, employees' motivation and productivity, and business processes' effectiveness. It also impacts an organization's reputation—in terms of how customers, partners, investors, and prospective employees perceive it—and long-term success[27]. Ethics is crucial in STEM fields because it ensures scientific advancements and technological developments consider potential risks, fairness, and the well-being of society alongside their benefits. This helps us avoid unintended consequences and steer innovation towards a positive impact.

PXDX - Ethical Implications and Bias Mitigation

While PXDX boasts of its efforts to mitigate bias and ensure fairness in its AI technology, there are glaring gaps in its approach that raise concerns. Despite claims of algorithmic transparency, the company's disclosure practices remain insufficient, leaving stakeholders in the dark about the inner workings of its models. Furthermore, while PXDX emphasizes fairness-aware training, it falls short in integrating these techniques effectively, risking the perpetuation of biases. The company's commitment to continuous monitoring and evaluation lacks depth, as it fails to conduct rigorous audits for bias and fairness on a regular basis. Additionally, PXDX's adherence to ethical guidelines appears superficial, lacking genuine engagement with affected communities to address their concerns. These shortcomings highlight a need for PXDX to reassess its strategies and prioritize genuine transparency, robust training protocols, and meaningful community involvement to truly mitigate bias and ensure fair AI deployment.

AI and Ethics

The United Nations Educational, Scientific and Cultural Organization (UNESCO) produced the first-ever global standard on AI ethics – the 'Recommendation on the Ethics of Artificial Intelligence' in November 2021. According to the recommendation, there are ten core principles that compose a human right's centered approach to the ethics of AI: Proportionality and Do No Harm, Safety and

[26] Singer, P. (2024, April 15). Ethics | Definition, History, Examples, Types, Philosophy, & Facts. In Encyclopædia Britannica. https://www.britannica.com/question/What-is-ethics
[27] Han, E. (2023, August 3). 7 Ways to Improve Your Ethical Decision-Making. Harvard Business School Online. https://online.hbs.edu/blog/post/ethical-decision-making-process

Security, Right to Privacy and Data Protection, Multi-stakeholder and Adaptive Governance & Collaboration, Responsibility and Accountability, Transparency and Explainability, Human Oversight and Determination, Sustainability, Awareness & Literacy, Fairness and Non-Discrimination[28]. The World Health Organization (WHO) also released the "Ethics and governance of artificial intelligence for health: Guidance on large multi-modal models" in January 2024. According to the WHO, a responsible AI policy addresses the above principles and is adaptive to reflect the changing technology.

Legal Considerations

Compliance with the law is the minimum standard for ethics and it is important to understand the legal and regulatory landscape when making business and technology decisions. This section will introduce the relevant laws and regulations with respect to insurance companies, artificial intelligence, data privacy, and data security & cyber-attacks.

Artificial Intelligence Law

The AI legal landscape is a complex and evolving one, with new issues emerging as AI technology continues to develop. The European Union (EU) has robust regulation governing the use of AI. The European Parliament adopted the EU Artificial Intelligence Act (AI Act) on March 13, 2024. The AI Act is the world's first standalone law governing AI and is intended to establish a global legal framework that promotes trustworthy AI[29]. The AI Act establishes rules for data quality, transparency, human oversight, and accountability across the EU. It also requires AI systems to meet certain transparency standards, such as: informing humans when they are interacting with a machine, providing that AI-generated content is identifiable, labeling AI-generated text, audio, and video content that informs the public on matters of public interest[30].

While the EU has very specific legislation that governs the use of AI, the regulatory landscape in the United States is much more uncertain. The main federal guidance is the White House's "AI Bill of Rights", which was published in October of 2022. The Blueprint for an AI Bill of Rights is a guide

[28] UNESCO. (2024). Ethics of Artificial Intelligence. https://www.unesco.org/en/artificial-intelligence/recommendation-ethics
[29] Jain, R. (2024, March 15). The European Union's AI Act: What You Need to Know. Holland & Knight IP/Decode Blog. https://www.hklaw.com/en/insights/publications/2024/03/the-european-unions-ai-act-what-you-need-to-know
[30] Jain, R. (2024, March 15). The European Union's AI Act: What You Need to Know. Holland & Knight IP/Decode Blog. https://www.hklaw.com/en/insights/publications/2024/03/the-european-unions-ai-act-what-you-need-to-know

for a society that protects all people from the threats associated with using AI and encourages responsible use of the technology[31]. The White House Office of Science and Technology Policy (OSTP) has identified five principles that should guide the design, use, and deployment of automated systems to protect the American public in the age of artificial intelligence. The principles include "Safe and Effective Systems", "Algorithmic Discrimination Protections", "Data Privacy", "Notice and Explanation", and "Human Alternatives, Consideration, and Fallback"[32].

.The "Algorithmic Accountability Act of 2022" was introduced to Congress in the House of Representatives in February of 2022. The main features of the bill include directing the Federal Trade Commission to require impact assessments of automated decision systems and augmented critical decision processes, requiring companies to assess the impacts of the automated systems they use and sell, creating new transparency about when and how automated systems are used[33]. The House referred the bill to the Subcommittee on Consumer Protection and Commerce, but there has been no action since April of 2022. In absence of federal legislation, states are publishing their own recommendations for responsible AI use, and some have begun to restrict certain uses of AI, specifically with profiling and employment.

Data Privacy & Security

In the United States, there is regulatory uncertainty with respect to data privacy overall but some governed areas such as healthcare. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is a federal law that requires the creation of national standards to protect sensitive patient health information from being disclosed without the patient's consent or knowledge. The goal of HIPAA is to make sure that individuals' health information is properly protected while allowing the flow of health information needed to provide and promote high-quality healthcare, and to protect the public's health and well-being. Insurance companies must comply with HIPAA regulations to properly handle private health information[34] On the state level, the California Consumer Privacy Act

[31] The White House. (2022, October). Blueprint for the AI Bill of Rights. https://www.whitehouse.gov/wp-content/uploads/2022/10/Blueprint-for-an-AI-Bill-of-Rights.pdf
[32] The White House. (2022, October). Blueprint for the AI Bill of Rights. https://www.whitehouse.gov/wp-content/uploads/2022/10/Blueprint-for-an-AI-Bill-of-Rights.pdf
[33] H.R.6580 - 117th Congress (2021-2022): Algorithmic Accountability Act of 2022. (2022, February 4). https://www.congress.gov/bill/117th-congress/house-bill/6580/text
[34] Center for Disease Control and Prevention. (n.d.). Health Insurance Portability and Accountability Act of 1996 (HIPAA). *Public Health Law*.

(CCPA) has the most robust protections for its citizens. The CCPA provides California consumers with a number of privacy protections, including right to access, delete, and opt-out of the "sale" of their personal information[35].

Both the GDPR and HIPAA have data security protections that make companies responsible if there is a security breach. The GDPR requires that personal data must be processed securely using appropriate technical and organizational measures. The Regulation does not mandate a specific set of cyber security measures but rather expects companies to take 'appropriate' action with data protection. In addition, The HIPAA Security Rule requires physicians to protect patients electronically stored, protected health information (known as "ePHI") by using appropriate administrative, physical and technical safeguards to ensure the confidentiality, integrity and security of this information[36].

As companies use AI, they open themselves up to exposure in the legal areas mentioned in this section. Responsible AI policies should focus on complying with relevant regulations. Companies with effective AI policies limit the financial risks of noncompliance and establish themselves as ethical adopters of AI in their industries.

https://www.cdc.gov/phlp/php/resources/health-insurance-portability-and-accountability-act-of-1996-hipaa.html?CDC_AAref_Val=https://www.cdc.gov/phlp/publications/topic/hipaa.html

[35] State of California Department of Justice (2024, March 13). California Consumer Privacy Act (CCPA). https://oag.ca.gov/privacy/ccpa

[36] American Medical Association (n.d.). HIPAA security rule & risk analysis. https://www.ama-assn.org/practice-management/hipaa/hipaa-security-rule-risk-analysis

Appendix C

The following is a list of questions that the case study intervention participants were tasked to answer in teams after having read the case study (see Appendix B).

Questions

1. What industry does Cigna operate in? What is Cigna's market share? What is Cigna's current stock price?

1. What is Cigna's claim's review process?

2. How would you explain how predictive technology works in the context of this case?

3. What is PxDx's role in Cigna's claims review process?

4. How is AI used in other industries? Compare other industries' use of AI to the medical claims review process.

5. What was the Cigna stock price when the lawsuits were filed? How was the stock price affected by the lawsuits? How has it been since?

6. What is Cigna's Assets Under Management (AUM) in 2023?

7. What percentage of Cigna Group's revenue comes from health insurance in 2023? Explain the significance of this number with respect to Cigna's use of PxDx.

8. Compare Cigna's financial metrics to its competitors. Where are they succeeding? Where are they falling short?

9. Which ethical frameworks are most applicable in this case?

10. Discuss the legal and regulatory landscape. Which regulations do you think are most important for The Cigna Group to consider?

11. How would you construct an AI policy for an insurance company?

12. Final Question: As the CEO (the decision maker), what do you suggest with respect to Cigna using the PxDx algorithm in the claims review process? Do you suggest that Cigna uses the PxDx

algorithm as is? Do you suggest that Cigna stops using the PxDx algorithm altogether? Do you use the technology with some stipulations and policy? What is that policy? Why is that policy the best?

Appendix D - Day by day curricula

Monday

(Prep from Previous Wednesday):

- Assign case study and distribute associated newspaper clippings for reading and review.
- In-Class Activities:
    - Introduce the case study
    - Have students work in their teams to collaboratively answer a set of guided questions based on the case study.
    - Teams should discuss and write responses together.
    - Submit answers by the end of the work period.

In-Class Activities:

- Return students to their same teams.
- Discuss the written responses
- Team Discussion on Engagement Question: *What do you, as the CEO of The Cigna Group, suggest?*
    - Teams discuss the responses and analyze the rationale behind their decisions as CEOs.

      Encourage them to debate or defend their positions based on the case study.

- Output:
    - Each team generates a set of "further questions" — follow-up issues or unresolved tensions that emerged from the discussion. These should be thoughtful and build on the engagement question.

- Team Focus Time:

    - Continue working in teams with a focused approach.

- Each team can explore a different aspect of the case (e.g., public image, internal HR policy, shareholder interests, ethical responsibilities)

- Note: Encourage depth of analysis, but don't allow teams to deviate from their assigned focus area.