Indiana University School of Informatics and Computing, IUPUI
Program Review and Assessment Report: 2015–2016

The following degree programs are reviewed in the 2015–2016 academic year:

- Bachelor of Science in Media Arts and Science
- Bachelor of Science in Health Information Management
- Master of Science in Bioinformatics

Schedule

	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
Health Information Management BS	✓		✓		
Informatics BS	✓	✓			✓
Media Arts and Science BS	✓		✓		
Bioinformatics MS	✓		✓		
Health Informatics MS	✓			✓	
Human-Computer Interaction MS	✓			✓	
Informatics MS (starting fall 2016)					✓
Library and Information Science MS	✓			✓	
Media Arts and Science MS	✓			✓	

Media Arts and Science Program Review Report
Fall 2017

Prepared by Media Arts and Science Program

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General Information, Institutional Data

This review focuses on the Media Arts and Science (MAS) Program under the IUPUI School of Informatics and Computing.

MAS Program is currently housed under the Department of Human-Centered Computing (HACC), which was founded on July 1, 2013. When it was established in 1999, it was a stand-alone program in IUPUI. In 2000, when the School of Informatics was established, MAS was integrated into the latter. Since then, MAS has been the largest program in the IUPUI portion of the School. It has brought together strong research and education expertise in instructional technology, healthcare digital media, emerging media, and advanced interdisciplinary research at the forefront of media arts and science.

Purposes, Reputation, and Aspirations of the Media Arts and Science Undergraduate Program

1. Reputation
    a. *Estimate of the program's national ranking based upon number of graduates, subsequent placement of graduates, level of support, or other criteria appropriate to the discipline.*

    The breadth of the MAS program is reflected in the diversity of organizations that hire graduates. Organizations ranging from animation, cloud services, education, entertainment, search, and telecommunications are a small representation of the types of organizations that hire MAS graduates with specialized skillsets and talents. Some current employers of MAS students are Evanced Solutions, Google, McGraw-Hill Higher Education, Pearson Education, Pixar, Salesforce, Telamon, and Warner Music Group.

Program Processes

1. Program Content
    a. *Distinctive characteristics*. The focus of MAS is on creativity and digital storytelling while enhancing contemporary career-building skills. Our program offers education and experience on various integrated media venues in today's convergent society. Students produce dynamic websites, smartphone apps, interactive education, serious and entertaining games and simulations, 3D motion graphics, digital illustrations and animations, and audio and video. The program is designed to be flexible, with the opportunity to concentrate on one specialty track or broaden studies in multiple tracks. Specializations include 3D graphics and animation, digital storytelling; game design and development; video production and sound design; and web design and development. When a student completes a specialization, it will be listed on the diploma as such.

    b. *Structure, breadth, and depth of program*
    The Bachelor of Science in Media Arts and Science focuses on applied research and application, is oriented toward professional practice, and relies on a theory base drawn from disciplines that study communication as sight, sound, and motion. Skills and knowledge embedded in this degree program include web, mobile, and multimedia design, web and mobile computer programming, multimedia authoring language skills, multimedia implementation of audio and video materials, digital graphics (photography, scanning), and the writing and editing of materials for multimedia storyboarding and content. Students learn to develop a website from scratch with knowledge of all elements required for development, operational support and security, develop programs in languages on multiple computer platforms, prepare and present a major project with industry-standard documentation, plan projects, allocate and budget resources, and practice with an understanding of ethical, legal and regulatory considerations.

    Once students take the foundational courses in both technical and creative venues, they choose a specialization to become fluent in the use of contemporary media tools and project management principles. A specialization gives the opportunity to customize a student's education in those aspects of media and production best suited for their career goals. MAS students take two career-specific courses; one course focuses on resume-building, cover letters and job shadowing while the other focuses on portfolio development. In preparation for their capstone, the final wrap-up of a student's educational experience, students take multimedia project development to learn about product planning and design, timelines, and project management tools to enable students to develop a project plan for the capstone.

    c. *Interdisciplinary program offerings.*
    The undergraduate degree has a 4+1 option with the M.S. in Human–Computer Interaction, in which students apply the latest research and principles of design, psychology, business, engineering, and/or computing to create innovative and human-centered interactive technology. MAS also has an 18-credit Studio Art and Technology minor offered jointly with the IU Herron School of Art and Design that combines courses from Media Arts and Science, Fine Arts, and Visual Communication Design. SoIC students are introduced to and become proficient with a wide variety of skills related to drawing techniques, design thinking, artistic and visual forms, and visual communication design

that complement the cutting-edge technology and digital media design and production courses in the MAS program.

d. *Desired learning outcomes for students.*
The MAS program has 10 major learning outcomes for undergraduate students.

e. *How has the department curriculum responded to new directions in the discipline?*
In 2013, the Associate Dean for Academic Affairs observed that the BS in Media Arts and Science lacked clear progressions through courses that built on each other to competencies required for specific job positions. The alumni careers data, which Career Services had begun to gather, showed that some students were unable to find jobs in their major after graduation. Typically, these students simply went through the program taking whatever course interested them, because there were no specific requirements beyond taking a minimum number of upper-level courses in the MAS major. Although the major had informal areas of specialization, course progressions leading to employability in the major were not clearly specified. While course progressions existed, they were obscured by inconsistent course titles.

The HCC Chair initiated faculty committees to the five areas of specialization, and this effort enabled faculty teaching within each of these areas to carefully examine the curriculum and the relation between courses. The faculty began to redesign the curriculum accordingly. Specifically, the faculty identified job positions associated with each of the five areas, and competency areas and student learning outcomes required for those job positions. This effort led the faculty to redesign existing courses and propose new courses. The Associate Dean worked with the MAS faculty to renumber and rename many of the undergraduate courses to make course progressions clear. For example, the sequence Multimedia Authoring Tools, Multimedia Content Management, and Online Document Development was given consistent names, Introduction to Multi-Device Web Development, Intermediate Multi-Device Web Development, Advanced Multi- Device Web Development and consistent numbers, N115, N215, and N315.

The faculty also identified among students a lack of artistic design skills required of practitioners in their intended fields (e.g., web design, game design, 3D animation). To avoid course duplication, the faculty and HCC Chair collaborated with the Herron School of Art and Design in creating a Studio Art and Technology minor to enable MAS students to receive recognition for taking drawing, sculpture, and other art-related courses as well as enabling Herron students to receive recognition for taking technology-related courses from the MAS program. The minor was approved in spring 2015.

Although the five majors have not yet been formally proposed, with faculty approval, the Associate Dean renamed specializations within the BS in MAS that had become obsolete and fallen into disuse more than a decade prior to correspond to the titles of the five majors. The renamed specializations were made transcriptable upon graduation, so potential employers could verify them from the final transcript and the specializations first appeared on the transcripts of the graduating class of May 2015. The faculty continues to consider the merits of separate majors, which show expertise in a narrower area but may make it more difficult for a student to transition into a new area and also might smack of a trade school rather than the program's broader curriculum, which includes a general education core and in media arts and science core. Nevertheless, the specializations provide a useful springboard for designing minors and certificates in these five areas. The HCC Department proposed one minor and certificate in the 2015-

2016 academic year.

f. Curricular philosophy

The philosophy has shifted from encouraging students to indulge their interests supporting employment in major. The design of majors that support career aspirations has been a major emphasis of the Indiana State government and the Indiana Commission for Higher Education. Given that media arts and science encompasses fields that are firmly rooted in technology and the unfilled demand for employees in many technology sectors, it is generally expected that students will be employed in major upon graduation. The response to the change in philosophy extends beyond the redesign of the curriculum and the establishment of five specializations. Engagement with industrial partners with respect to student internships, capstones, and project and portfolio critiques has increased as has interaction with the HCC department's Advisory Board.

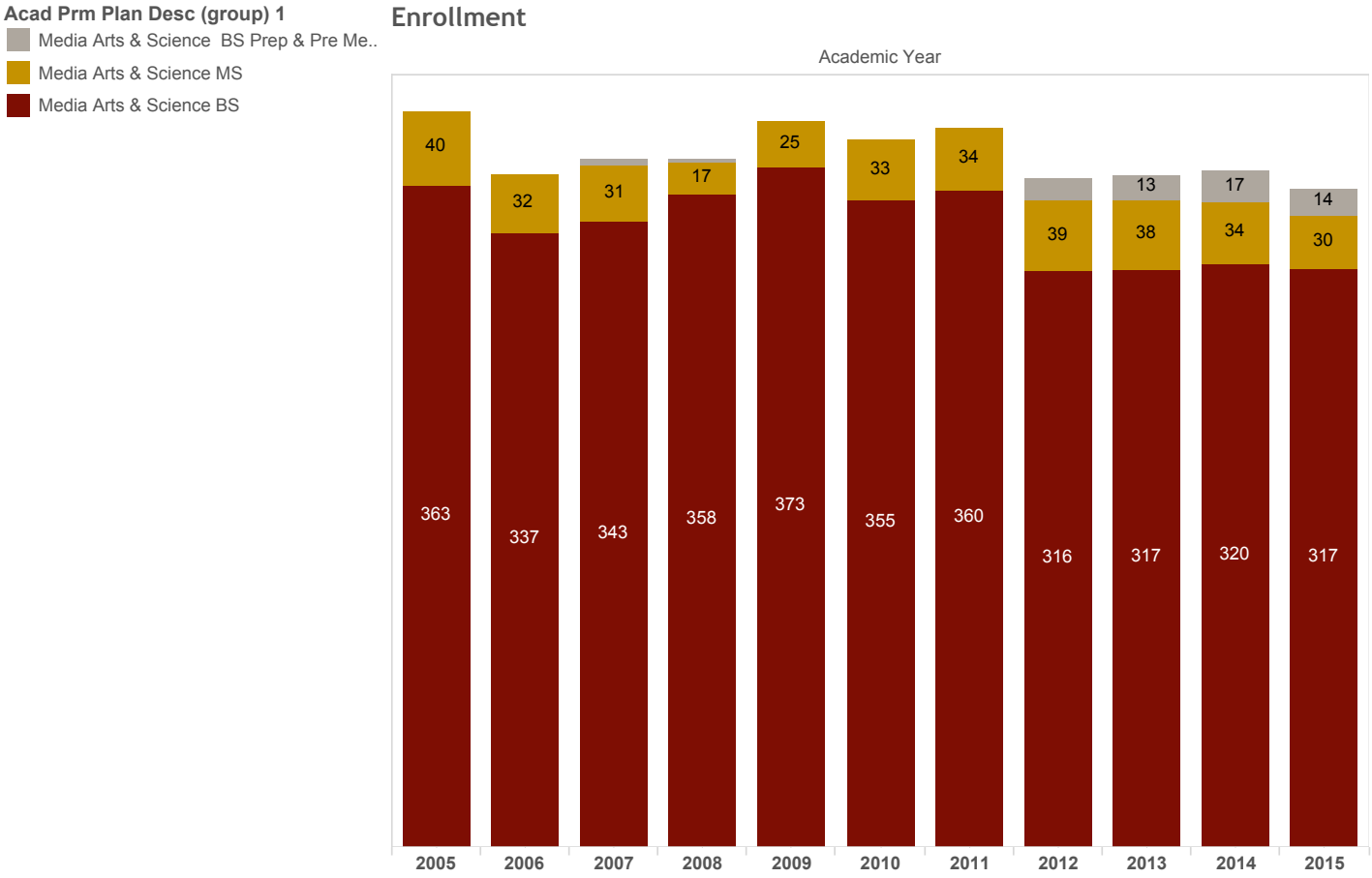
The program has set the goal of 100% employment rate in major for its graduates. A major impediment to achieving this goal for students in the Game Design and Development specialization is that jobs are typically out of state, and students are often reluctant to leave Indiana. A number of solutions have been proposed, including out-of-state internships and the incorporation of more skills in web and mobile software development, user experience design, and entrepreneurship in the game specialization. There is also concern that as the number of graduates in the 3D Graphics and Animation specialization grows, Central Indiana may reach market saturation. To address this concern, advanced niche courses have been added, targeting the application of 3D technologies to new areas, such as the use of 3D prototyping and printing in medicine and dentistry.

Learning Outcomes

Graduates of the Media Arts and Science undergraduate program will demonstrate expertise in the following core competencies essential to success as an informatics, computing and information technology professional specializing in new and interactive media:

1. Understand digital media and its effective use as a form of communication
2. Communicate ideas effectively in written and oral form to a range of audiences
3. Work effectively as a member of a team to achieve a common goal
4. Analyze a problem, identify and evaluate alternatives and plan an appropriate solution
5. Appreciate the history, theory and traditions of digital media. Evaluate media from multiple perspectives using the theories, concepts and language of digital media
6. Demonstrate mastery of the concepts, techniques and tools in one or more digital media specialties
7. Apply knowledge and skills to develop professional quality digital media productions in a timely manner and utilizing best practices and standards
8. Explain the impact of digital media on individuals, organizations and society
9. Acknowledge diverse opinions regarding professional, ethical, legal and social issues with a global perspective
10. Appreciate the need for lifelong learning and have a plan for continuing professional development

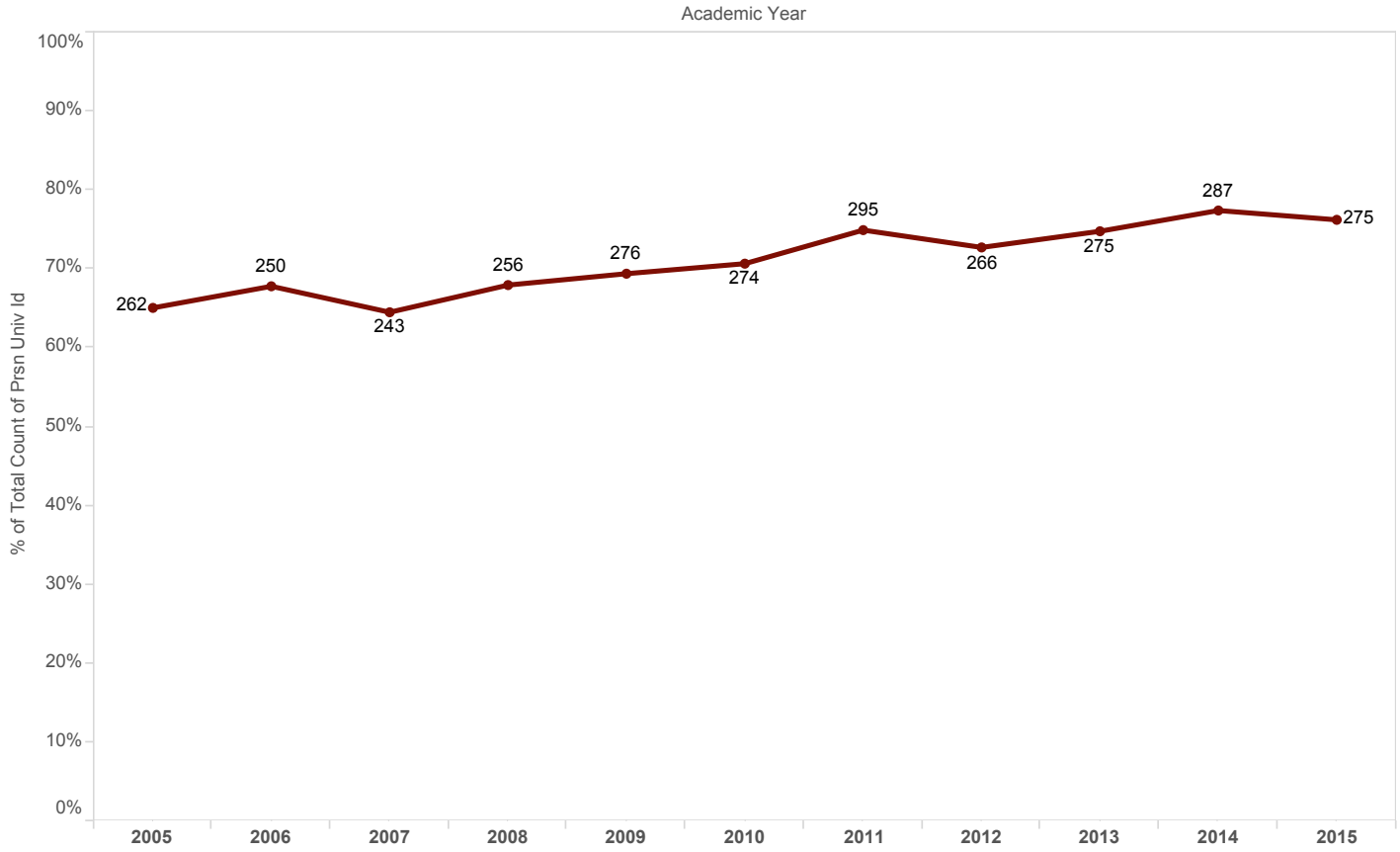
Enrollment



Enrollment by Plan

		Academic Year										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Media Arts & Science BS	n.	363	337	343	358	373	355	360	316	317	320	317
	%.	90%	91%	91%	95%	94%	91%	91%	86%	86%	86%	88%
Media Arts & Science BS Prep & Pre Media Arts & Science BS	n.			3	2				11	13	17	14
	%.			1%	1%				3%	4%	5%	4%
Media Arts & Science MS	n.	40	32	31	17	25	33	34	39	38	34	30
	%.	10%	9%	8%	5%	6%	9%	9%	11%	10%	9%	8%

Full-time Enrollment

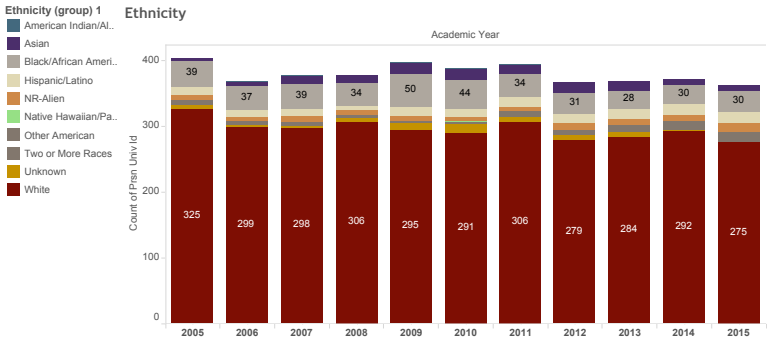


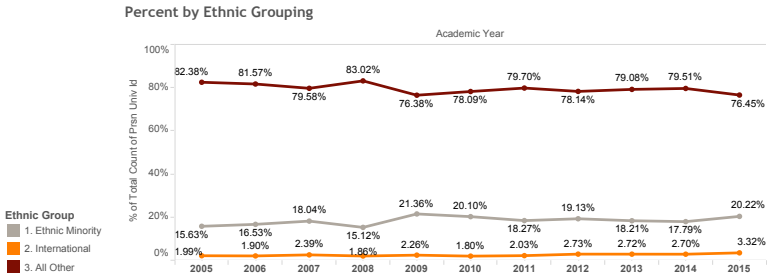
Academic Load

	Academic Year										
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Part-Time	35%	32%	36%	32%	31%	29%	25%	27%	25%	23%	24%
Full-Time	65%	68%	64%	68%	69%	71%	75%	73%	75%	77%	76%
Grand Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Academic Load

		Academic Year										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Media Arts & Science BS	Part-Time	31%	28%	31%	30%	28%	26%	22%	25%	24%	22%	20%
	Full-Time	69%	72%	69%	70%	72%	74%	78%	75%	76%	78%	80%
Media Arts & Science BS Prep & Pre Media Arts & Science BS	Part-Time			67%	50%				36%	23%	12%	21%
	Full-Time			33%	50%				64%	77%	88%	79%
Media Arts & Science MS	Part-Time	73%	75%	77%	82%	76%	64%	59%	46%	39%	35%	63%
	Full-Time	28%	25%	23%	18%	24%	36%	41%	54%	61%	65%	37%
Grand Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%





Ethnicity Detail

Academic Year

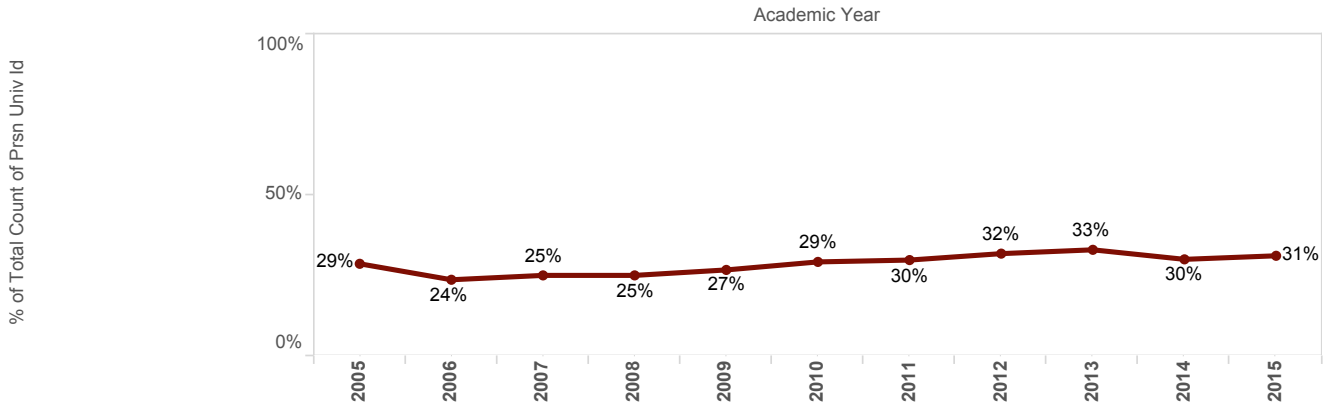
Ethnic Group	Ethnicity (group)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1. Ethnic Minority	American Indian/Alaska Na..		0% 1	0% 1		0% 1	0% 1	0% 1				
	Asian	1% 4	2% 7	3% 12	3% 12	4% 17	4% 16	4% 14	4% 16	4% 14	2% 8	2% 8
	Black/African American	10% 39	10% 37	10% 39	9% 34	13% 50	11% 44	9% 34	8% 31	8% 28	8% 30	8% 30
	Hispanic/Latino	3% 13	3% 10	3% 10	2% 7	4% 14	3% 13	4% 15	4% 14	4% 14	4% 16	5% 19
	Two or More Races						1% 3	2% 8	2% 9	3% 11	3% 12	4% 16
	Native Hawaiian/Pacific ..						0% 1					
	Other American	2% 7	2% 6	2% 6	1% 4	1% 3						
	Total	16% 63	17% 61	18% 68	15% 57	21% 85	20% 78	18% 72	19% 70	18% 67	18% 66	20% 73
2. International	NR-Alien	2% 8	2% 7	2% 9	2% 7	2% 9	2% 7	2% 8	3% 10	3% 10	3% 10	3% 12
	Total	2% 8	2% 7	2% 9	2% 7	2% 9	2% 7	2% 8	3% 10	3% 10	3% 10	3% 12
3. All Other	White	81% 325	81% 299	79% 298	81% 306	74% 295	75% 291	78% 306	76% 279	77% 284	79% 292	76% 275
	Unknown	2% 7	1% 2	1% 2	2% 7	2% 9	3% 12	2% 8	2% 7	2% 7	1% 3	0% 1
	Total	82% 332	82% 301	80% 300	83% 313	76% 304	78% 303	80% 314	78% 286	79% 291	80% 295	76% 276

Ethnicity Detail

Academic Year

Acad Prm Plan ..	Ethnic Group		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Media Arts & Science BS	1. Ethnic Minority	n.	58	55	62	56	81	73	66	58	56	58	60
		%..	16%	16%	18%	16%	22%	21%	18%	18%	18%	18%	19%
	2. International	n.	6	5	5	5	6	4	7	6	6	4	7
		%..	2%	1%	1%	1%	2%	1%	2%	2%	2%	1%	2%
	3. All Other	n.	299	277	276	297	286	278	287	252	255	258	250
		%..	82%	82%	80%	83%	77%	78%	80%	80%	80%	81%	79%
Media Arts & Science BS Prep & Pre Media Arts & Science BS	1. Ethnic Minority	n.			1					4	3		5
		%..			33%					36%	23%		36%
	2. International	n.										1	
		%..										6%	
	3. All Other	n.			2	2				7	10	16	9
		%..			67%	100%				64%	77%	94%	64%
Media Arts & Science MS	1. Ethnic Minority	n.	5	6	5	1	4	5	6	8	8	8	8
		%..	13%	19%	16%	6%	16%	15%	18%	21%	21%	24%	27%
	2. International	n.	2	2	4	2	3	3	1	4	4	5	5
		%..	5%	6%	13%	12%	12%	9%	3%	10%	11%	15%	17%
	3. All Other	n.	33	24	22	14	18	25	27	27	26	21	17
		%..	83%	75%	71%	82%	72%	76%	79%	69%	68%	62%	57%

Percent Female



Gender

Academic Year

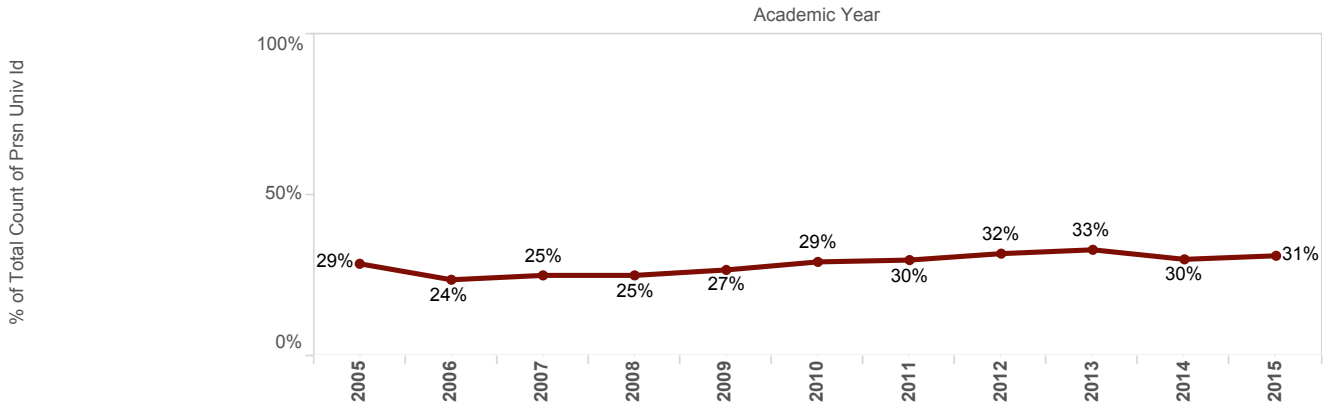
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Female	%.	29%	24%	25%	25%	27%	29%	30%	32%	33%	30%	31%
	n.	115	87	94	94	106	113	117	116	121	111	112
Male	%.	71%	76%	75%	75%	73%	71%	70%	68%	67%	70%	69%
	n.	288	282	283	283	292	275	277	250	247	260	249

Gender by Plan

Academic Year

			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Media Arts & Science BS	Female	%.	26.17%	21.66%	23.03%	24.30%	26.54%	28.45%	28.61%	29.43%	31.86%	30.00%	30.28%
		n.	95.0	73.0	79.0	87.0	99.0	101.0	103.0	93.0	101.0	96.0	96.0
	Male	%.	73.83%	78.34%	76.97%	75.70%	73.46%	71.55%	71.39%	70.57%	68.14%	70.00%	69.72%
		n.	268.0	264.0	264.0	271.0	274.0	254.0	257.0	223.0	216.0	224.0	221.0
Media Arts & Science BS Prep & Pre Media Arts & Science BS	Female	%.			66.67%	50.00%				27.27%	23.08%	17.65%	21.43%
		n.			2.0	1.0				3.0	3.0	3.0	3.0
	Male	%.			33.33%	50.00%				72.73%	76.92%	82.35%	78.57%
		n.			1.0	1.0				8.0	10.0	14.0	11.0
Media Arts & Science MS	Female	%.	50.00%	43.75%	41.94%	35.29%	28.00%	36.36%	41.18%	51.28%	44.74%	35.29%	43.33%
		n.	20.0	14.0	13.0	6.0	7.0	12.0	14.0	20.0	17.0	12.0	13.0
	Male	%.	50.00%	56.25%	58.06%	64.71%	72.00%	63.64%	58.82%	48.72%	55.26%	64.71%	56.67%
		n.	20.0	18.0	18.0	11.0	18.0	21.0	20.0	19.0	21.0	22.0	17.0

Percent Female



Gender

Academic Year

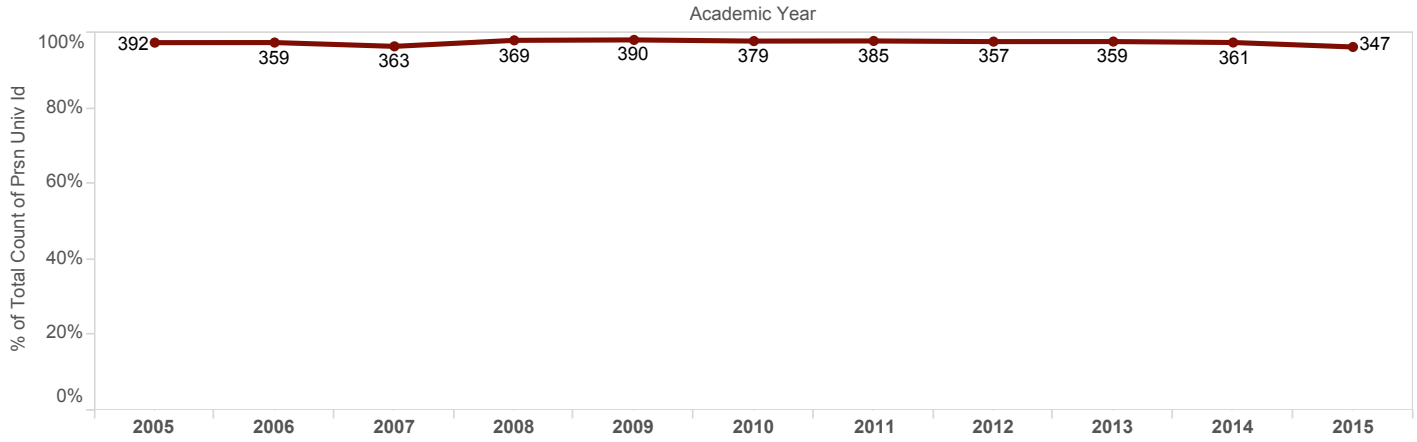
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Female	%.	29%	24%	25%	25%	27%	29%	30%	32%	33%	30%	31%
	n.	115	87	94	94	106	113	117	116	121	111	112
Male	%.	71%	76%	75%	75%	73%	71%	70%	68%	67%	70%	69%
	n.	288	282	283	283	292	275	277	250	247	260	249

Gender by Plan

Academic Year

			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Media Arts & Science BS	Female	%.	26.17%	21.66%	23.03%	24.30%	26.54%	28.45%	28.61%	29.43%	31.86%	30.00%	30.28%
		n.	95.0	73.0	79.0	87.0	99.0	101.0	103.0	93.0	101.0	96.0	96.0
	Male	%.	73.83%	78.34%	76.97%	75.70%	73.46%	71.55%	71.39%	70.57%	68.14%	70.00%	69.72%
		n.	268.0	264.0	264.0	271.0	274.0	254.0	257.0	223.0	216.0	224.0	221.0
Media Arts & Science BS Prep & Pre Media Arts & Science BS	Female	%.			66.67%	50.00%				27.27%	23.08%	17.65%	21.43%
		n.			2.0	1.0				3.0	3.0	3.0	3.0
	Male	%.			33.33%	50.00%				72.73%	76.92%	82.35%	78.57%
		n.			1.0	1.0				8.0	10.0	14.0	11.0
Media Arts & Science MS	Female	%.	50.00%	43.75%	41.94%	35.29%	28.00%	36.36%	41.18%	51.28%	44.74%	35.29%	43.33%
		n.	20.0	14.0	13.0	6.0	7.0	12.0	14.0	20.0	17.0	12.0	13.0
	Male	%.	50.00%	56.25%	58.06%	64.71%	72.00%	63.64%	58.82%	48.72%	55.26%	64.71%	56.67%
		n.	20.0	18.0	18.0	11.0	18.0	21.0	20.0	19.0	21.0	22.0	17.0

Percent Indiana Resident



Residency

		Academic Year										
		2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Indiana Resident	%	97%	97%	96%	98%	98%	98%	98%	98%	98%	97%	96%
	n	392	359	363	369	390	379	385	357	359	361	347
Non-Resident	%	3%	3%	4%	2%	2%	2%	2%	2%	2%	3%	4%
	n	11	10	14	8	8	9	9	9	9	10	14
Grand Total	%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	n	403	369	377	377	398	388	394	366	368	371	361

Residency

			Academic Year										
			2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Media Arts & Science BS	Indiana Resident	%	98%	98%	97%	98%	99%	98%	98%	98%	98%	99%	97%
		n	354	330	334	352	368	349	352	311	312	316	308
	Non-Resident	%	2%	2%	3%	2%	1%	2%	2%	2%	2%	1%	3%
		n	9	7	9	6	5	6	8	5	5	4	9
Media Arts & Science BS Prep	Indiana Resident	%			100%	100%							
		n			3	2							
Media Arts & Science MS	Indiana Resident	%	95%	91%	84%	88%	88%	91%	97%	90%	89%	85%	83%
		n	38	29	26	15	22	30	33	35	34	29	25
	Non-Resident	%	5%	9%	16%	12%	12%	9%	3%	10%	11%	15%	17%
		n	2	3	5	2	3	3	1	4	4	5	5
Pre Media Arts & Science BS	Indiana Resident	%								100%	100%	94%	100%
		n								11	13	16	14
	Non-Resident	%										6%	
		n										1	
Grand Total		%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
		n	403	369	377	377	398	388	394	366	368	371	361

IUPUI Faculty Ratings of Student Performance on Principles of Undergraduate Learning

Department of Media Arts and Sciences

Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014 and Fall 2014

Office of Institutional Research and Decision Support

May 2016

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Major Emphasis (100 Level & Lower)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	39 3.46	5 12.8	1 2.6	4 10.3	29 74.4	39 100.0
2. Critical Thinking	293 3.23	38 13.0	35 12.0	41 14.0	179 61.1	293 100.0
4. Intellectual Depth, Breadth, and Adaptiveness	118 3.00	16 13.6	21 17.8	28 23.7	53 44.9	118 100.0
Total [1]	450 3.19	59 13.1	57 12.7	73 16.2	261 58.0	450 100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 200 level course.

[2] Scale: 1 = "Not Effective", 2 = "Somewhat Effective", 3 = "Effective", 4 = "Very Effective"

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Moderate Emphasis (100 Level & Lower)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	159 3.18	19 12.0	27 17.0	20 12.6	93 58.5	159 100.0
1C. Information Resource Skills	39 3.46	5 12.8	1 2.6	4 10.3	29 74.4	39 100.0
2. Critical Thinking	118 2.89	17 14.4	28 23.7	24 20.3	49 41.5	118 100.0
3. Integration and Application of Knowledge	134 3.12	31 23.1	9 6.7	7 5.2	87 64.9	134 100.0
Total [1]	450 3.11	72 16.0	65 14.4	55 12.2	258 57.3	450 100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 200 level course.

[2] Scale: 1 = "Not Effective", 2 = "Somewhat Effective", 3 = "Effective", 4 = "Very Effective"

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Major Emphasis (200 Level)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	324 3.19	32 9.9	31 9.6	103 31.8	158 48.8	324 100.0
2. Critical Thinking	336 3.28	42 12.5	35 10.4	46 13.7	213 63.4	336 100.0
3. Integration and Application of Knowledge	25 3.40	0 0.0	5 20.0	5 20.0	15 60.0	25 100.0
4. Intellectual Depth, Breadth, and Adaptiveness	283 3.60	19 6.7	11 3.9	35 12.4	218 77.0	283 100.0
5. Understanding Society and Culture	7 3.43	0 0.0	1 14.3	2 28.6	4 57.1	7 100.0
Total [1]	975 3.35	93 9.5	83 8.5	191 19.6	608 62.4	975 100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 200 level course.

[2] Scale: 1 = “Not Effective”, 2 = “Somewhat Effective”, 3 = “Effective”, 4 = “Very Effective”

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Moderate Emphasis (200 Level)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	355 3.30	45 12.7	32 9.0	51 14.4	227 63.9	355 100.0
1B. Quantitative Skills	130 3.28	13 10.0	18 13.9	18 13.9	81 62.3	130 100.0
1C. Information Resource Skills	219 3.18	30 13.7	23 10.5	44 20.1	122 55.7	219 100.0
2. Critical Thinking	117 3.32	2 1.7	11 9.4	51 43.6	53 45.3	117 100.0
3. Integration and Application of Knowledge	31 3.19	1 3.2	6 19.4	10 32.3	14 45.2	31 100.0
6. Values and Ethics	30 3.87	0 0.0	0 0.0	4 13.3	26 86.7	30 100.0
Total [1]	882 3.28	91 10.3	90 10.2	178 20.2	523 59.3	882 100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 200 level course.

[2] Scale: 1 = “Not Effective”, 2 = “Somewhat Effective”, 3 = “Effective”, 4 = “Very Effective”

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Major Emphasis (300 Level)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
2. Critical Thinking	54 3.30	3 5.6	5 9.3	19 35.2	27 50.0	54 100.00
3. Integration and Application of Knowledge	66 3.44	3 4.6	1 1.5	26 39.4	36 54.6	66 100.00
4. Intellectual Depth, Breadth, and Adaptiveness	71 3.61	3 4.2	4 5.6	11 15.5	53 74.7	71 100.00
5. Understanding Society and Culture	13 4.00	0 0.0	0 0.0	0 0.0	13 100.0	13 100.00
Total [1]	204 3.50	9 4.4	10 5.0	56 27.5	129 63.2	204 100.00

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 300 level course.

[2] Scale: 1 = “Not Effective”, 2 = “Somewhat Effective”, 3 = “Effective”, 4 = “Very Effective”

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Moderate Emphasis (300 Level)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	34	2	0	14	18	34
	3.41	5.9	0.0	41.2	52.9	100.0
1B. Quantitative Skills	45	3	7	5	30	45
	3.38	6.7	15.6	11.1	66.7	100.0
2. Critical Thinking	32	0	4	16	12	32
	3.25	0.0	12.5	50.0	37.5	100.0
3. Integration and Application of Knowledge	52	1	2	23	26	52
	3.42	1.9	3.9	44.2	50.0	100.0
4. Intellectual Depth, Breadth, and Adaptiveness	16	1	4	3	8	16
	3.13	6.3	25.0	18.8	50.0	100.0
6. Values and Ethics	25	1	3	6	15	25
	3.40	4.00	12.0	24.0	60.0	100.0
Total [1]	204	8	20	67	109	204
	3.36	3.9	9.8	32.8	53.4	100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 300 level course.

[2] Scale: 1 = “Not Effective”, 2 = “Somewhat Effective”, 3 = “Effective”, 4 = “Very Effective”

Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Major Emphasis (400 Level)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	13 3.77	0 0.0	0 0.0	3 23.1	10 76.9	13 100.0
1C. Information Resource Skills	5 3.20	0 0.0	1 20.0	2 40.0	2 40.0	5 100.0
2. Critical Thinking	138 3.31	6 4.4	19 13.8	39 28.3	74 53.6	138 100.0
3. Integration and Application of Knowledge	173 3.71	1 0.6	6 3.5	35 20.2	131 75.7	173 100.0
4. Intellectual Depth, Breadth, and Adaptiveness	70 3.36	2 2.9	4 5.7	31 44.3	33 47.1	70 100.0
5. Understanding Society and Culture	51 3.80	0 0.0	0 0.0	10 19.6	41 80.4	51 100.0
6. Values and Ethics	5 3.40	0 0.0	1 20.0	1 20.0	3 60.0	5 100.0
Total [1]	455 3.54	9 2.0	31 6.8	121 26.6	294 64.6	455 100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 300 level course.

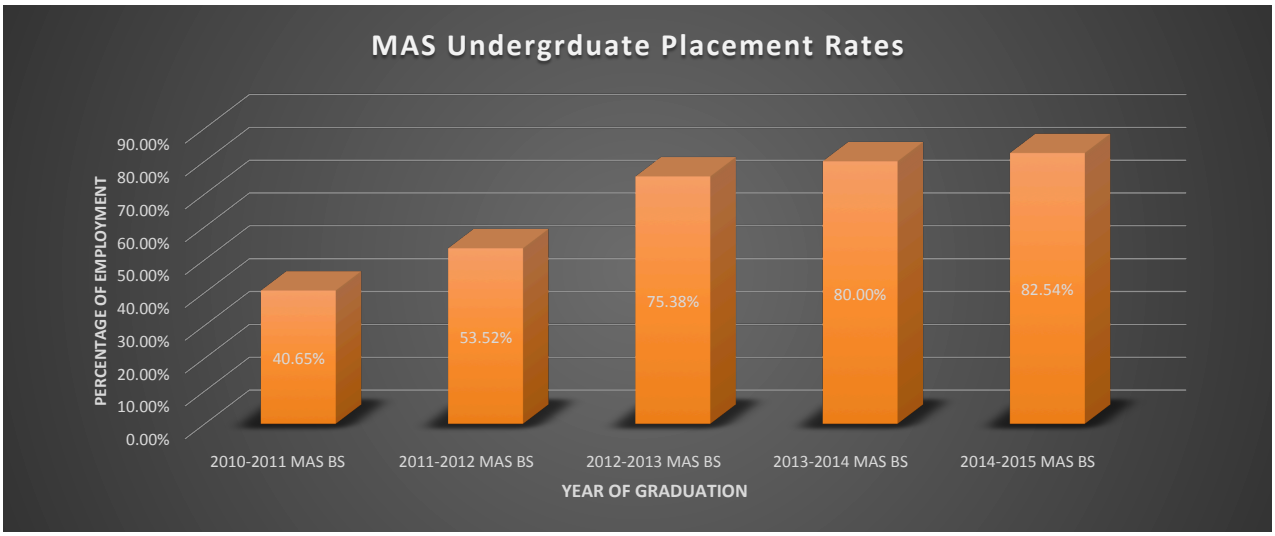
[2] Scale: 1 = “Not Effective”, 2 = “Somewhat Effective”, 3 = “Effective”, 4 = “Very Effective”

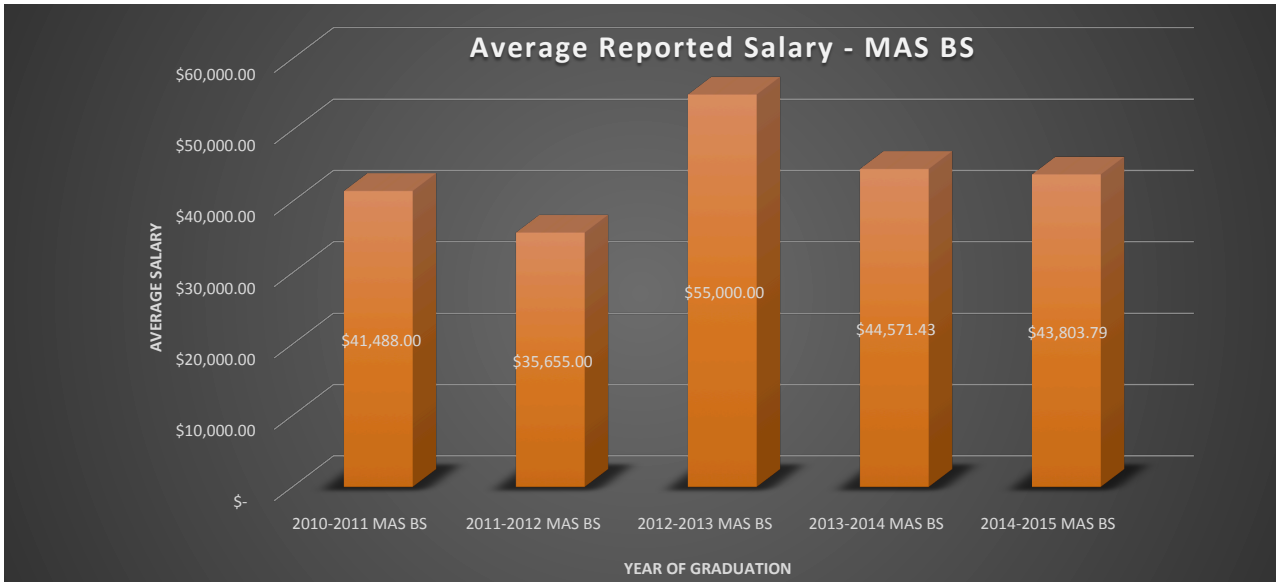
Faculty Ratings of Department of Media Arts and Sciences Student Performance on PULs with Moderate Emphasis (400 Level)

PUL – Major Emphasis	Mean [2]	Not Effective	Somewhat Effective	Effective	Very Effective	Total
1A. Written, Oral, & Visual Communication Skills	91 3.64	1 1.10	6 6.59	18 19.78	66 72.53	91 100.0
1C. Information Resource Skills	9 3.00	2 22.22	0 0.00	3 33.33	4 44.44	9 100.0
2. Critical Thinking	100 3.33	4 4.00	4 4.00	47 47.00	45 45.00	100 100.0
3. Integration and Application of Knowledge	119 3.50	3 2.52	12 10.08	27 22.69	77 64.71	119 100.0
4. Intellectual Depth, Breadth, and Adaptiveness	16 3.00	3 18.75	2 12.50	3 18.75	8 50.00	16 100.0
5. Understanding Society and Culture	60 3.85	0 0.00	0 0.00	9 15.00	51 85.00	60 100.0
6. Values and Ethics	51 3.67	0 0.00	0 0.00	17 33.33	34 66.67	51 100.0
Total [1]	446 3.53	13 2.9	24 5.4	124 27.8	285 63.9	446 100.0

[1] Combined number of student ratings in all 100-level courses sampled in Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014, and Fall 2014. A student may be evaluated more than once if he or she is taking more than one 300 level course.

[2] Scale: 1 = “Not Effective”, 2 = “Somewhat Effective”, 3 = “Effective”, 4 = “Very Effective”


MAS Undergrduate Placement Rates
PERCENTAGE OF EMPLOYMENT
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
40.65%
53.52%
75.38%
80.00%
82.54%
2010-2011 MAS BS
2011-2012 MAS BS
2012-2013 MAS BS
2013-2014 MAS BS
2014-2015 MAS BS
YEAR OF GRADUATION


Average Reported Salary - MAS BS
AVERAGE SALARY
$60,000.00
$50,000.00
$40,000.00
$30,000.00
$20,000.00
$10,000.00
$-
$41,488.00
$35,655.00
$55,000.00
$44,571.43
$43,803.79
2010-2011 MAS BS
2011-2012 MAS BS
2012-2013 MAS BS
2013-2014 MAS BS
2014-2015 MAS BS
YEAR OF GRADUATION

Video for Social Change

NEWM-N465

Final Reflection

After three years of college, I would have to say that my experience in this service-learning course will definitely stay with me for the rest of my life. Out of all of the classes that I have taken up to this point, this is the only class where I felt that the work I was doing amounted to more than just a grade or credit hours.

I learned that I am not averse to volunteer service. Admittedly, I probably would've never given the idea of volunteer service a chance if it hadn't been for this class. It certainly wasn't due to a lack of volunteer opportunities, as I have read hundreds if not thousands of fliers and emails for volunteer service from my time on the IU Bloomington campus and the IUPUI campus. I suppose that I just felt like I didn't want to volunteer for something only to find that I lacked the skills or teamwork necessary to be of any help. After taking this class I now have a better understanding of what I am capable of and how I can apply myself in a volunteer service setting.

The most important thing I learned about the community I served is that there are good people in this world that are doing great things. A person can read all of the work that they do and have done on their website, but I feel lucky to have had the privilege to work with them and have this experience. Listening to these women's stories has given me a deeper insight into how the Volunteers of America are helping them. The help that the VoA provides these people with goes beyond rehab programs or counseling. These women have told me stories of how they were able to reconnect with family that they haven't been in contact with for years with the help of the VoA. They told me stories of how people like Rachel Halleck have helped them cope with loss or addiction in their lives. They told me how wonderful it was that people like Sara Pugh would put in so much hard for the events that they would have, like Halloween and Christmas parties. From listening to these women's stories, I understood that the help that the VoA provides goes beyond the programs in the building. They have programs that provide school supplies and clothes for children with incarcerated parents. The VoA and every person in there goes above and beyond in the work that they do, and I feel lucky to have been given the chance to record the personal stories of a few of the women that have worked closely with the VoA.

The best thing that happened to me in this semester would have been getting to meet Sara Pugh. From the initial impression that Skip had given me on how the VoA might conduct itself similar to that of a prison setting, I will admit that I had gone in expecting a stern and authoritative environment. I was taken by surprise on how Sara truly was, and how the women had described everybody else that worked at the VoA. Now there are rules and regulations that are in place due to the nature of their work, but everyone that I had met there acted as if they were just talking to their friends. The VoA is a supportive environment, and it's people like Sara that make such an environment possible. Not to mention all of the work that Sara puts in at the VoA herself. Not only was she helping me with the project, she was also in the process of planning out parties for the residents and rebuilding the VoA of Indiana website. I admire how hard she works and how much work she puts into her job. And despite all of the work that she had,

she was still able to allocate some time for me and this project. I can't thank her enough for how helpful and kind she's been, and for allowing me to help her and the VoA this semester.

The worst part of this experience would have to be the rental cameras that I used. Having no equipment of my own, I decided to utilize the equipment rental service provided by the School of Informatics to ascertain the equipment I would need. I hate to admit it, but the first camera that I had received had been a little faulty. Despite all of my efforts, I couldn't get the camera to record without adding a bright yellow hue to the footage. And to only add to the misfortune, the second camera that I used for the second batch of interviews had not saved the footage properly. The video files were corrupted and completely unusable, and I had not known this until I had returned the camera and the footage was wiped from the SD card. I felt ashamed about this and wasn't sure how to tell Sara. Fortunately for me she wasn't upset at me from this turn of events. She told me not to worry about it as this has happened to her before, and that they could interview those women again at a later date with their own little camera. So in conclusion, I am grateful that the School of Informatics provides this equipment to be used by the students, but I also feel like I may have put too much faith into rental equipment.

First-time Full Time Beginners and One-Year Retention Rates.

Planname: Media Arts and Sciences B.S. Fall First-Time, Full-Time Beginners IUPUI Indianapolis

Retained 1 Year Any IU Campus		
Cohort Year	Retention Rate	N
2007	91%	23
2008	83%	24
2009	81%	21
2010	86%	22
2011	82%	28
2012	92%	26
2013	70%	33
2014	83%	36
Total	83%	213

MAS (BS) Position Title
(Median Salary= $27,000)

3D Modeler
3D Print Consultant
Call Center Manager
Client Experience Designer
CO-Founder
E-Commerce Web Designer
Erosion Control Inspector
Event Technician
Freelance Producer, Videographer, Photographer
Front-end Developer & Designer
GA New Media and web specialist
Graphic Designer
Interactive Multimedia Developer
Interactive Programmer
Junior Graphic Designer
Marketing Associate
Mobilization Operations Project Manager
Motion Capture Animator
Network Administrator
Owner
Simulation Technician
Solutions Specialist
Sr. Business analyst
UX Project Specialist
Web/Graphic Designer

MAS (BS) Company List

C2C Studio Inc.
Caldwell VanRiper
Circle City Virtual Assistance
City of Westfield
Diverse Talent Strategies
Engaging Solutions, LLC
Freelance
Indiana University Bloomington
Indianapolis Spring
Indy Gaming LLC
IU Health
Koeus Solutions
Lenovo
Markey's Rental and Staging
Memory Ventures
Nemasons Inc.
Neverending Games
Omni Source Marketing
Self employed
Sysco
Tiki Hut
UCOL Division of undergraduate education
IUPUI
Veolia North America
Verizon
Vineyard Community church
Virtual Reality to Assess and Treat Childhood Aggression
Virtual Xperience and Tethys Interactive

MAS Competitive Scholarships 2015-2016

Scholarship/ Fellowship	Amoun	GP	Other
Major-Specific			
Media Arts and Science			
Tyler R. Stull Memorial Scholarship	$1,500, not renewa	3.0	Awarded to an undergraduate student of senior standing majoring in Media Arts and Science. Student must demonstrate significant talent and future career potential
The OfficeWorks/Tom O'Neill Scholarship	$1,000, not renewa ble	3.5	This is awarded to an undergraduate student of senior standing majoring in Media Arts and Science. Special consideration will be given to underrepresented students, including but not limited to financially challenged students and students of a Hispanic background.
Health Information Administration			
Gertrude L. Gunn Memorial Fund Scholarship	$1,000, not renewab	3.0	Available to students with junior or senior standing who have been admitted into the HIM professional program. The student must demonstrate academic excellence, a

- Students ***must*** apply by the deadline**.** Late applications will not be considered by the Scholarship Committee.
- Students must enroll full-time to receive award.
- HIM students must be Fully Qualified and Unconditionally Admitted to receive the Gertrude L. Gunn Memorial Scholarship. If awarded a scholarship the student must continue to meet the requirements of the program (including but not limited to grade requirements for prerequisites, and admission and enrollment in the Fall semester to the HIM program) in order to receive the scholarship.
- For scholarships to be awarded to a junior, students should apply in the spring semester *prior* to junior year.
- For scholarships to be awarded to a senior, students should apply in the spring semester *prior* to senior year.
- For these awards, the application must be received by the deadline listed above.

School of Informatics at IUPUI Scholarship Committee – awrd@soic.edu

MAS Financial Assistance for full-time* graduate students *Effective Fall 2015*

Requirements	GPA	Time period	Resident	Criteria for renewal
MS student in MAS	3.	4 semester maximum	$500/ sem (resident) $3,000/sem (non-	continued full-time enrollment, regular attendance at School colloquia series, satisfactory performance and general satisfactory progress toward completion of master's or doctoral degree studies

* Masters students must be enrolled in a minimum of 8 credit hours or more each semester to be considered full-time and receive the scholarship.

MAS Student Groups

ACM SIGGRAPH
SIGGRAPH IUPUI Student Chapter is dedicated to furthering the knowledge, excitement, and creativity of its members. Typically members are interested in graphics, interactive techniques, or computer animation.
Contact: facebook.com/SIGGRAPH

Anime
A group dedicated to spreading and sharing the benefits of anime to other people on Campus. They showcase both subbed and dubbed anime based on preference.
Contact: facebook.com/groups/IUPUIsAnimeClub

Concept Art Society
A place where concept artists can come together and learn art in a inspiring environment.
Contact: facebook.com/ConceptArtSociety

Cosplay Club at IUPUI
The IUPUI Cosplay Club is dedicated to the creation and discussion of costumes and prop making. Members can come to work on their projects, meet others with a passion for cosplay, pick up a few tips, or just hang out.
Contact: facebook.com/groups/iupuicosplay/

F.U.N. (Fandom United Network)
A group of people who like different TV shows, movies, or other forms of media discussing topics centered around the symbolism in media and how they reflect upon the modern cultural mindset.
Contact: facebook.com/fandomunitednetworkIUPUI

Game Developer's Group
This group is for dedicated students who want to advance their skills in game development with hands on exposure to the medium.
Meetings are focused on learning, creating, and critiquing.
Contact: facebook.com/GameDevIUPUI

Gamers' Guild at IUPUI
The Gamers Guild at IUPUI is a place where you can kick back, relax, and enjoy some gaming to take a break from your stressful academic life. No fees, no requirements to attend, just fun.
Contact: facebook.com/GGIUPUI

Informatics Student Government (ISG)
Informatics Student Government (ISG) is the governing organization for student clubs and activities within the School of Informatics and Computing. It is comprised entirely of students. Contact: www.iupui.edu/~isg/

MacGuffin Media (MacMedia)
MacGuffin Media (MacMedia) is an IUPUI student organization dedicated to providing any and all students with the opportunity to become involved in the various aspects of media, including (but not limited to): Film Production, Audio, 3D, Scriptwriting, etc.
Contact: facebook.com/MacMediaIUPUI

Mobile App Developers at IUPUI (MAD)
The Mobile App Developers organization at IUPUI's primary purpose is to facilitate and promote a community of mobile application developers at IUPUI. Members will gain hands on experience working in the app development pipeline. Facets of development include programming, design, asset creation, and quality assurance testing. No experience is required to join.
Contact: Michael Auer-miauer@iupui.edu

Ohmniscient Audio Collective
The Ohmniscient Audio Collective is an audio based organization that focuses on enhancing and expanding their technical prowess in regards to anything audio related.
Contact: facebook.com/ohmniscientaudiocollective

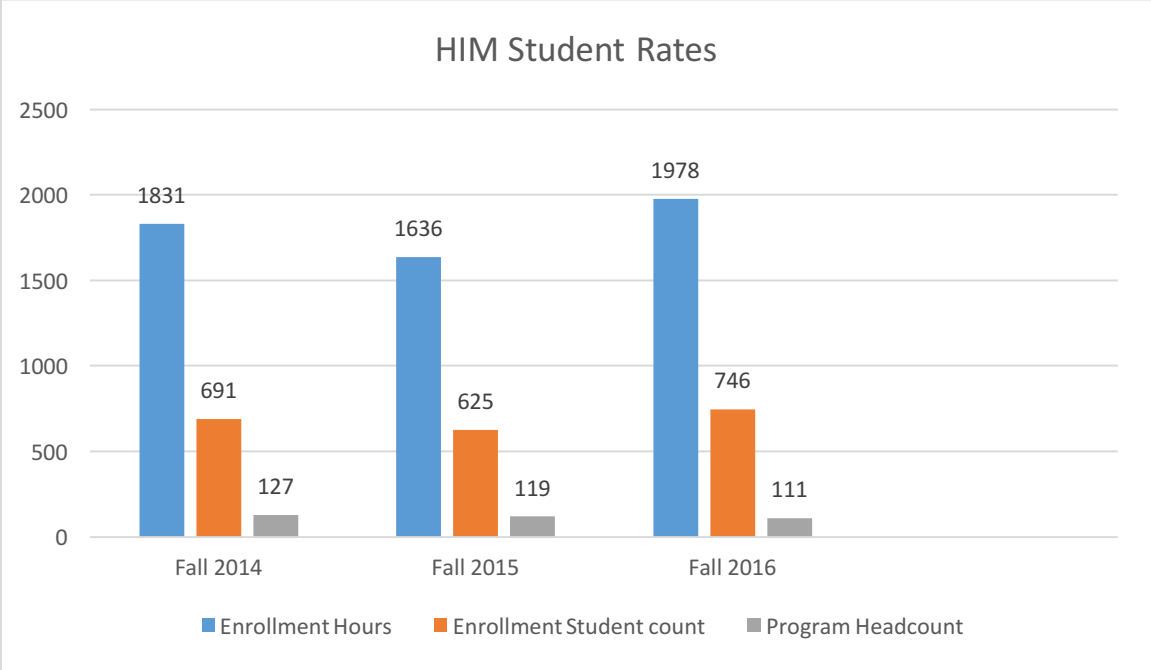
STARS (Students & Technology in Academia, Research, and Services) The mission of the STARS Alliance is to increase the participation of women, under-represented minorities and people with disabilities in computing disciplines through multi-faceted interventions Contact: facebook.com/groups/IUPUIStars/
Vicki Daugherty- vdaugher@iupui.edu

Women in Technology (WiT)
Women in Technology (WiT) is dedicated to improving community by empowering women from all disciplines to utilize technology to make a difference.
Contact: www.iupui.edu/~getwitit

I. Purposes, Reputation, Aspirations

1. Reputation

The Bachelor of Science in Health Information Management (HIM) in the Indiana University School of Informatics and Computing, Indianapolis, is one of the strong and stable HIM programs in the country. There is not a National Ranking for such programs due to the specialty secondary accrediting body. Commission on Accreditation of Health Informatics and Information Management (CAHIIM) holds Indiana University as one of the original schools. With the 90.9% pass rate that IU currently has, the strengths of the curriculum, school, and program are not in doubt. Currently IU has graduated well over 600 students including 29 students in 2016. Currently the 2014–2015 and 2015–2016 students are all employed in the field. Indiana University no longer counts pre-HIM students, which shows as a drop in the 2015 enrollments. There has been an increase in credit hour and class headcount but the students do not count as HIM until they meet the requirements and have declared their major in Health Information Management.



The diverse backgrounds of the Health Information Management faculty prepares students for both traditional and nontraditional careers. This program is offered online and in traditional classroom settings. With the Health Information Management profession evolving rapidly, the faculty have the support to travel to conferences and symposia to gather new and innovative ways to deliver education and to update their knowledge for the students.

The pass rates on the Registered Health Information Administrative (RHIA) exam for students in the Health Information Management program has been increasing over the past few years. The set goal was 90%. However, there was an expected decrease in 2015 due to changes to the curriculum and the new requirement that 100% of the graduates

take the exam in their final semester. In the coming year it is our goal to have an exam pass rate of 90% even though the standard nationally is only 75.8%.

It is the aspiration of the program director and faculty to keep building a strong and diverse program. This program would like to enroll students from smaller schools and community colleges to further their education and either do their final two years to finish a bachelor's degree or to enroll in the acelerated BS/MS program to complete their bachelor and master degree in only three years. It is also the aspiration of the program director to increase the enrollment of international students, both traditional and nontraditional.

II. Program Processes

1. Program Content

The faculty has been working to meet the Health Information Management content set forth by the Commission on Accreditation Health Informatics and Information Management (CAHIIM). With the adjusted content, there is an increased emphasis on databases, technology and informatics skills. The emphasis on policy, procedure, law, and management continues.

a. Distinctive characteristics of the program

The Indiana University Health Information Management program has secured Professional Professional Experience sites that are completed weekly in order to get a full year's worth of professional experience before they enter the healthcare industry. They also have been given classes in both the ICD-9-CM coding and also given extensive education in ICD-10- CM and PCS. This will give them another area of specialty. To distinguish this program from its competitors, the HIM program has experienced instructors that have different areas of specialty. This will give the students a more diverse classroom experience so they have more real-life situational exprience to learn from. The school also offers tutoring and other resources for assistance.

b. Structure, breadth (distance measured from and too), and depth of curriculum

This program is very structured and must be taken in a specific order. It is set up so that the program is built as blocks to help ensure the student is given its foundation to move onto the next section. The introductory class gives the basic overview but as the students progress, it becomes much more specialized to ensure that the student can find what they are interested in pursuing when they are finished. The HIM program is very diverse so each class has a specific measure to meet to make sure the student has the foundation experienc to build from

Previously the HIM Program had its own grading scale. It has since adopted the University grading scale so there would be less confusion on the standards that are required for the students. The curriculum is very intensive for the students and there is not a lot of room for electives or branching outside of the program. In the coming years it is the program director's goal to adjust the curriculum to give a bit more diversity for

specialty within the program in the areas of data analysis, clinical documentation impovement and information governance. The knowledge starts with basic math and, when finished with the curriculum, the students are able to do statistical analysis. Basic English is required and when the students are finished, they have very strong writing skills in both business and healthcare. The students have strengths in both state and federal policies. While the program commences in a basic manner, it makes the students academically strong enough to show their expertise on the National exam with over a 90% pass rate that attempt to take their exam.

c. Interdisciplinary program (combining two or more into one-IT/HIM of Law/HIM) offerings …

HIM has a strong interdisciplinary program in the areas of Information Technology and Health Information Management. This gives the students more areas of expertise to choose from. With the education that is provided in this program they have the options to choose from IT Auditing, Securities and even assist with IT databases. There are also interdisciplinary options in the Legal and Health Information Management arena. This allows the students the capability to be in the Risk Management area, Quality Assurannce Area which allows them to assist legal teams.

d. How has the department curriculum responded to new directions in the discipline?

The department curriculum has been adjusted to meet the new directions that the discipline has taken over the past few years. This curriculum is expected to keep evolving to meet the demands of the changing health care industry. Over the past few years the HIM experts have gone from needing to having strong software skills, to the need for strong database skills. Previous to these changes there was the shift from paper records to electronic records. The field continues to make the adjustments needed but students are still educated on the previous core content with the new systems so they can see the actual changes.

e. What is the philosophy that has driven the establishment of the core, elective, and minor (i.e., minors offered for students in other departments) curricula?

The philosophy behind the HIM program is to prepare the students for a strong role in the healthcare information area at all levels inside and outside of the hospital setting. Currently to give the students another area of education, experience and ability, the options of minor in Clinical Documentation Improvement and Information Governance are being built for another option of speciality.

III. Outcomes

a. Evidence of student mastery of transferable skills (Principles of Undergraduate Learning and the Principles of Graduate & Professional Learning)

Students prove mastery of their school by showing their experience from their Practicum at the end of their academic career by presenting the project information to their practicum site. Students in the coming years will also present these projects at their

Capstone Week for the seniors. This will allow them to showcase the knowledge while introducing them to leaders in the field that attend to meet the new graduates that will be entering the field soon.

Evidence of student achievement of specified learning outcomes in the major …

Currently the Principles of Undergraduate Learning are used inside the classes for specific projects or exams to prove their capabilities in the many different areas of expertise. There is also tests and projects that are evaluated on the Bloom's Taxotomy scale for the secondary accrediting body.

b. External recognition of students, faculty, or graduates including awards or honors and research award

Two students have won Indiana Health Information Management Association (IHIMA) undergraduate scholarships. One IHIMA graduate scholarship has also been awarded. Two students have received the IHIMA Professional Achievement Award in 2015, and one student won the IHIMA Rising Star Award. One student also participated in the College of Healthcare Information Management Executives National Patient Identification Challenge and was one of the 16 semi-finalists.

BS in Health Information Management During the 2014–2015 academic year, the Health Information Administration program presented three assessment projects:

1 – Increase the RHIA exam pass rate to 90%

2 – Update course curricula to meet CAHIIM requirements

3 – Develop collaborative courses across departments within SOIC

Included below are the results regarding the above assessment projects for academic year 2014–2015:

Assessment Project 1 – Improve graduate's proficiency in Health Information Management (HIM) Baccalaureate Degree Entry-Level Competencies as outlined by the American Health Information Management Association

Student learning outcomes

The BS in HIM has 102 student learning outcomes divided into the following six domains:

1. Data Content, Structure & Standards (Information Governance)

2. Information Protection: Access, Disclosure, Archival, Privacy & Security

3. Informatics, Analytics and Data Use

4. Revenue Management

5. Compliance

6. Leadership

The student learning outcomes are listed in the "Baccalaureate Level HIM Curriculum Map"

Assessment

Students will pass the national Registered Health Information Administration (RHIA) examination with scores at or above the national average and be prepared for a full-time employment in the health information management field. The HIM program will continue to have a decreasing Drop, Fail, Withdraw (DFW) rate and an increasing retention rate, which both directly impact the number of students earning their BS in HIM degree within the state recommended timeframe of four years.

Teaching methods

Teaching methods include lecture, laboratory, and professional practicum experience. Curriculum analysis and revision is based on Commission on Accreditation of Informatics and Information Management Education (CAHIIM) accreditation standards and the Model Curriculum put in place by the American Health Information Management Association (AHIMA).

How could you measure each of the desired behaviors listed as assessment methods?

This is assessed by ongoing analysis of the RHIA exam scores, which is sent to the Program Director on a quarterly basis and through regular course content assessments performed by the HIM faculty and Professional Practicum Instructor. This annual assessment is a requirement for CAHIIM accreditation. The practicum sites have been expanded beyond the traditional acute care hospital setting. Students are now placed in a wide range of health information practicums, including software development, insurance settings, home healthcare, coding audit systems, physician practices, and specialty surgical facilities. This change allows the students to have greater depth in valuable real-world experience, which should translate into a wider pool of job opportunities upon graduation.

Assessment results

For the 2014–2015 academic year, students had a 90.9% pass rate on the RHIA examination, which exceeds the national average of 75.8%. It also constitutes an improvement over previous years (see below).

	Degrees Awarded	Certifications Awarded	RHIA Pass Rates	National Pass Rate	CAHIIM Accreditation	Employed	Average Salary Passed RHIA	Average Salary Without RHIA
2012-2013	29	8	67%	76.0%	Yes	86.2%	$39,000	

2013-2014	17	5	86.5%	76.5%	Yes	88.8%	$42,000	
2014-2015	29	11	90.9%	75.8%	Yes	100%	$45,000	35,900
2015-2016	35	17 Current Students *6 previous grads Total of 23 awarded	65.7%	74%	Yes	100%	$47,000	36,000
2016-2017								

Changes made based on the assessment

The Program Director, Associate Dean of Academic Affairs, and Academic Advisors have worked closely with the HIM faculty and created a proposal to revise various aspects of the HIM program. Multiple courses have been renumbered, renamed, and course content revised. These improvements were made to ensure the students are learning the level of HIM material needed to pass the RHIA examination and obtain full-time employment in HIM upon graduation.

Effective Fall 2014, SOIC is including a student tutor for the pre-HIM courses, to assist students currently in the program who are struggling. Classes with the highest DFW rate were identified (HIM M120 Data Organization and Presentation in the Healthcare Environment and HIM M200 Database Design for Health Information Management) and the instructors have been working with the Center for Teaching and Learning to make adjustments to improve student success in the classes. Course content has been expanded in HIM M490 Directed Study, renamed RHIA Exam Preparation, to include exam preparation to facilitate student success on the RHIA exam.

Assessment Project 2 – Update course curricula to meet CAHIIM requirements to make sure students would have the most current knowledge for their employment field as approved by the secondary accrediting body.

Student learning outcomes:

Updates have been taking place with comparison between courses, syllabus content, and instructors to the curricula map provided by CAHIIM. As changes are being made to the curricula, teaching methods have been enhanced, for example, to create a more interactive classroom experience. Instructors have been attending more continuing education programs to help find ways to ensure the new content is more extensive.

Assessment:

Students' outcomes in the areas that have the most significant change are still being evaluated due to the content being significantly different. While test outcomes are being looked at, it is also about the project outcomes to show the ability to complete the different content, not just the ability to recall the information. Students are beginning to put this information into practice. The results of the projects will be evaluated by a standardized rubric.

Teaching Methods:

The instructor evaluates the projects that have a significant bearing on the result of the class. The final exam and the project show whether the student successfully applies the knowledge or requires further review before progressing through the program.

How could you measure each of the desired behaviors listed as assessment methods?

Projects with the capability to show results. Testing with the areas of significance will show if the students are recalling the information. These two areas will have significant weights for the ability to move on from the classes holding the new curricula.

Assessment Project 3 – Develop collaborative courses across departments within SOIC department.

Student Learning Outcomes: An accelerated BS in Health Information Management and MS in Health Informatics has been created within the Bio Health Informatics department. The HIM and Health Informatics programs have worked together to build a bridge between these two programs enabling students to take health informatics courses in their fourth year. Students graduate with a BS after their fourth year and an MS after their fifth year.

Assessment:

The implementation of the accelerated BS/MS took place summer 2015 after being built over the previous year. There are approximately 10 courses that the HIM students can take for the HI program in their fourth year. This collaboration will allow for the students to apply and begin the program to finish the MS degree by only adding approximately one year onto their college experience.

Teaching Methods:

Simple evaluation will begin with how many HIM students enroll and begin the accelerated BS/MS program. With the implementation of this new program approximately 11 students chose to enroll and take advantage of this. As time continues there will be a measurement of enrollment and completion of the program.

How could you measure each of the desired behaviors listed as assessment methods?

Measurements will be performed by the percentage of individuals that enroll in the program over the next year.

Projects for 2015–2016

Assessment Project 1 – Increase the participation in RHIA exam to 100% to better evaluate how the curriculum is meeting secondary accrediting standards

Assessment Project 2 – Increase the enrollment of the BS/MS program to 40% of HIM students and evaluate the successfulness of the students in the HI program year one

Assessment Project 3 – Develop the area of International Student enrollment by building more on grounds and distance education courses to meet all needs.

Assessment Project 1 – Increase the participation in RHIA exam to 100% to better evaluate how the curriculum is meeting secondary accrediting standards

Student Learning Outcomes:

In the past 4 years pre-graduation participation on the RHIA exam has not been more than 34% percent. This needs to be increased to 100% in order to get good results on how the curriculum is meeting the needs of the students.

Assessment:

There will be reports run in the HIM M490 class to make sure all students have their examination date, and all papers are ready for student to sit for the exam. There have been excellent pass rates previously but the small percentage taking the exam makes this number questionable and needs to be evaluated. It is expected that we still surpass the national average pass rate of 76.4%. The areas on the exam that are broken down can then be compared to the class that meets that domain. This will show the weak areas of the curriculum. Those classes will then be revised to meet the needs of the exam and student better.

Teaching Methods:

The program director will run reports quarterly to see who is due the next semester to finish. She or a member of her team will then meet with each student, and the program director will sign off on the application and send this to the examination team. The instructor for the HIM490-Exam Prep class will then work with the students with text, study guide, practical practice and exams.

How could you measure each of the desired behaviors listed as assessment methods?

Measurements are already in place: AHIMA sends reports quarterly with the names of students, exam results, and school pass rates in comparison with the national average. There will be breakdowns of the domain areas and then the classes will be cross compared so that the weaker classes are diagnosed and addressed.

Outcome:

There was 100% participation in the RHIA exam in 2015–2016; however, there was a decrease in the pass rates. This was to be expected, and there is now data collected on each area for comparison in future class curriculum.

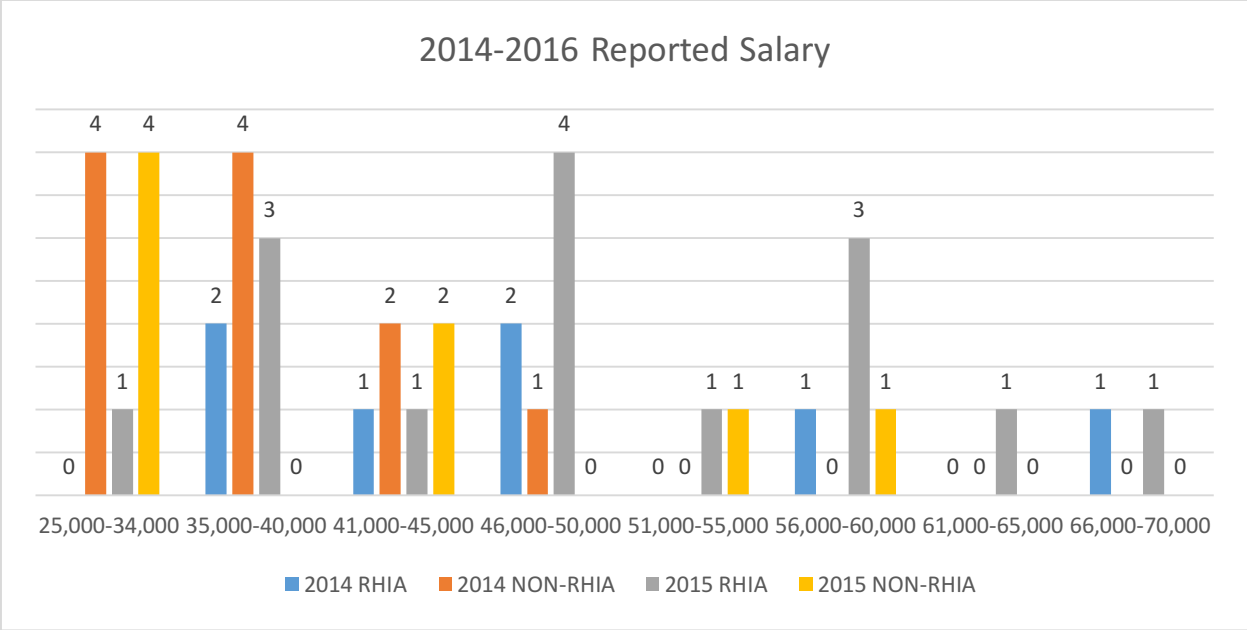
*The decease has been evaluated and the only correlation found is that those who waited until the final two weeks of the deadline showed a lack of use of resources and preparation, which led

to failure on the exam. Even with the failure, the lowest score was within 14 points of passing. With this knowledge we are making the exam window smaller, holding more conducive study sessions and will be evaluating with built in adjustment areas to the student's weaker areas as a whole.

**When comparing the students employed with the RHIA at graduation to those that did not pass, there is a median pay gap of minimum $9,000 in the past two years. This shows the career benefit of the RHIA credential.

Salary table for RHIA Positions:

To show a better break down on the various number of students in the different salary area see the table below:



Assessment Project 2 – Increase enrollment of the BS/MS program to 40% of eligible HIM students. Then evaluate the successfulness of the student in their Health Informatics (HI) classes versus the HIM.

Student Learning Outcomes:

There was previously not a bridge for the HIM program to feed into a master's program. The HI master's degree is now building this bridge. 2015–2016 was the first year for the BS/MS.

Assessment:

While it is excellent to get the students to participate in the BS/MS program and evaluation is easy by running reports on how many fourth year students are eligible and how many apply, there needs to be evaluation on the number of students that are eligible. The 3.25 cumulative GPA should be attainable if the students are given assistance and the goal to strive to become a

student of the BS/MS program. Students will be evaluated to see if they are successful in the HI classes.

Teaching Methods:

There has been a lack of simulation labs, partial real-world experience, and inability to give proper placement on practicum sites with needs in HI. The program director will work to obtain more sites for student practicum placement so the students can get more one-on-one assistance and experience. There are new simulation labs inside Mind Tap and VLab that will allow the students to work with real cases and have more practice so they can retain more and enjoy the learning process. This should allow them to have better grades increasing the ability to apply for the BS/MS. This should make them more interested in the program. This will assist in the weaker areas of knowledge to help in the area of overall student retention.

How could you measure each of the desired behaviors listed as assessment methods?

There will be a report run to check the number of eligible seniors that are allowed to apply for the BS/MS program. Of those students, there will be a comparison of how many apply and are accepted.

Outcome:

*2015–2016 had 43% apply and begin this program.

*2016–2017 had 47% apply and begin this program.

In 2015, there were 25 students that were eligible to apply and 11 applied and pursued the accelerated HI program. Of the 11, by the end of the first year, there was only 1 that chose to drop from the program. With 91% of the students continuing into the final year the number of students that are still currently successful is higher than imagined. This is a substantially different program than the HIM program due to its more technical nature, versus the memorization and structure of the HIM. The students have shown signs of weakness or struggling in the areas of writing and an increased course load. There is evaluation on the classes in the HIM area to see if this area should be expanded on and if the HIM program may be too structured around rules and guidelines and not enough critical thinking.

In 2016, 7 students applied out of 15 which is an increase in the participation of the HI program. Once again there seems to be not enough technical skills and writing strengths from the HIM to HI transition area. There are areas that need to be explored on here. The starting area will be in the Health Information Technology class and the Health Information Management class offered in the Junior year. Hopefully by adjusting the curriculum of these two classes the students can become better students and more successful in this area.

The numbers are based on the students that are eligible to apply. This coming year we will be working to increase the percentage of students that apply.

Assessment Project 3 – Increase international student enrollment by building more on-grounds and online courses.

Student Learning Outcomes:

International students stopped having the option of HIM on campus in 2014 due to the program no longer having on-grounds classes. International students may not enroll because we have changed the online option to be fully online and the on-grounds option to be fully on campus. Previously the largest barriers were the Human Anatomy and Human Physiology courses offered by the Department of Biology, which were not available through distance education. Other barriers were Math and English which also did not allow students to take the program fully online. The barrier to resident international students was that the HIM major courses were all online with only a few on-grounds courses. International students may only take one online course per semester.

Assessment:

There will need to be discussion on how to accomplish building areas online. The content will need to be compared to the on grounds content to make sure there is not any area that is weaker by offering these courses online. Once the comparison has been completed, agreement and placement online will be the next steps.

Scheduling will need to allow all classes on campus. This will enable students to apply for a visa as full-time students in the HIM program.

Teaching Methods:

Human Anatomy and Human Physiology are being placed online with the same content and coursework as on campus with simulation labs for evaluation of skills. There will be more skill labs online to make sure that the skills can be practiced. Math and English will have to evaluate their content to decide if it is possible for these classes to be taught online. Again, with these courses the content will need to remain the same as the on grounds classes. The students will need to show that they are able to be successful in the class.

How could you measure each of the desired behaviors listed as assessment methods?

The measurements will be done by comparison of the ability to deliver the same skill online as on campus. The participation will be examined but the key areas of evaluation will be the comparison of the skill lab scores that are done on campus and through distance education to determine whether there is a decrease in the students' scores. It is important that this is offered through distance education but it is more important that the content is not compromised.

There will be attempts made to schedule the courses on campus. There will be an assessment by measuring how many enroll in the on grounds classes. There will be awareness that the numbers of enrollment will be smaller in the beginning but in time the numbers on grounds and distance education should be comparable. The target is on grounds enrollment increased by 25% in next two years. And that the students that are successful in the course remains above 90%.

I. Purposes, Reputation, and Aspirations:

The massive biological data, such as data generated from the human genome project and electronic health records, has led to the great need of computational techniques and machine learning over the big data. The field of bioinformatics emerges when computing meets information. Simply speaking, bioinformatics is an interdisciplinary field among biology, computer science, and information technology. Bioinformatics has significantly contributed to the cures for human diseases, improvements of crop quality and production, creation of new technologies, and novel applications to medicine and industries. With the high throughput data generation in biological science, the necessities for bioinformaticians are on the rise. Hence, it is necessary to train the next generation of bioinformatics professionals with the required skills to prepare them as future successful bioinformaticians.

Bioinformatics programs have been offered at different levels in the US, from BS to MS and to PhD programs. Due to its multidisciplinary nature, it is important that the bioinformatics curriculum will benefit both the computer scientists and the biologists. Different approaches and strategies for bioinformatics education have been proposed in various bioinformatics programs. Especially, there are great advocate for conveying the computational and information technology skills for biologists to meet the challenges for the big data sciences. The biomedical data analytics, especially for the –omics era, is another challenging area. In addition, the program competencies have been discussed among researchers and educators. For example, some previous work concluded that biology, computer science, statistics, ethics, and core bioinformatics are the five main broad areas of competencies required for bioinformaticians.

Bioinformatics is a cutting edge graduate program in the School of Informatics and Computing (SoIC) at IUPUI, which is the first school of its kind in the US, focused on innovative research in the fast-paced and dynamic fields. The bioinformatics program is a relatively new interdisciplinary field and focuses on translational research that uses computational approaches to transform biological data into scientific discoveries that help us better under-stand life science and improve patient care. There is not an actual National Ranking for such a program due to the specialty.

II. Program Processes:

1. Program Contents and challenges

Extensive efforts have been taken by the Bioinformatics Program for improvement of the program. The emerging trend of large scale of biological data has restrained the traditional biologists from utilizing the information and has led to the needs of programming and computer software for data analytics, which led to the 'data-driven science'. At the same time, the Bioinformatics programs have to adapt to meet these new needs. In addition, as an emerging interdisciplinary field, a Bioinformatics program is facing new challenges for curriculum design, course organizations, and training delivery approaches.

The program challenges also affect the trainees ultimately. For example, it is natural for some trainees to wonder if they have been provided or will receive the best and practical training in bioinformatics so that they are career-ready upon completion of their degree programs.The bioinformatics programs are expected to have trainees from different life science and computer science backgrounds, as the bioinformatics is the bridge between life science and computer science. The programs are expected to deliver intensive training in both biology and computing skills, in order to provide the workforce with individuals with an interdisciplinary set of skills necessary for bioinformatics projects.

Students with strong computer science background are expected to have the capability in creating or modifying bioinformatics software systems and/or applications to address questions in bioinformatics research. Students with life science background are expected to have applied knowledge on how to operate on existing bioinformatics tools and to apply the tools for specific bioinformatics projects. Their strong life science background will facilitate them in the interpretation of the results .

In addition, it is necessary to include hands-on training on bioinformatics tools ,online data repositories, such as UniProt and GenBank, as well as the use of Basic Local Alignment Sequence Tool (BLAST) for identifying sequence similarities in both DNA and protein sequences. It would be better for a single application to integrate multiple bioinformatics applications for training the students in bioinformatics. Such examples include BioManager, which is used in Australia to tutor undergraduate students, and the Bioinformatics Training Network. Using the BioManager web application teaching tool, the undergraduate students are trained to be familiar with sequence alignment, microarray analysis, protein structure and function prediction, proteomics, motif searching, and many other basic technologies in bioinformatics.

It is a general perspective that the three main areas of bioinformatics are genomics, proteomics, and systems biology. Genomics includes sequencing, assembly, and analysis of DNA. Proteomics specifically deals with the protein structures and functions. Systems biology involves computational data modelling of biological systems which can be molecule, tissues, organs or whole organism.

2. Program Competencies

Existing program courses and curriculum designs are based on these three major areas of bioinformatics. The major competencies of bioinformatics programs are listed in Figure 1 based on keywords extracted from some bioinformatics web sites. The standing out competencies includes :

- biological database management,
- genomics, molecular biology, proteomics,
- statistical methods in bioinformatics,
- algorithms,
- bioinformatics programing,
- systems biology,
- structural biology,
- next generation sequencing,
- data mining,
- big data analysis,
- computer modelling,
- machine learning,
- and other major skills.

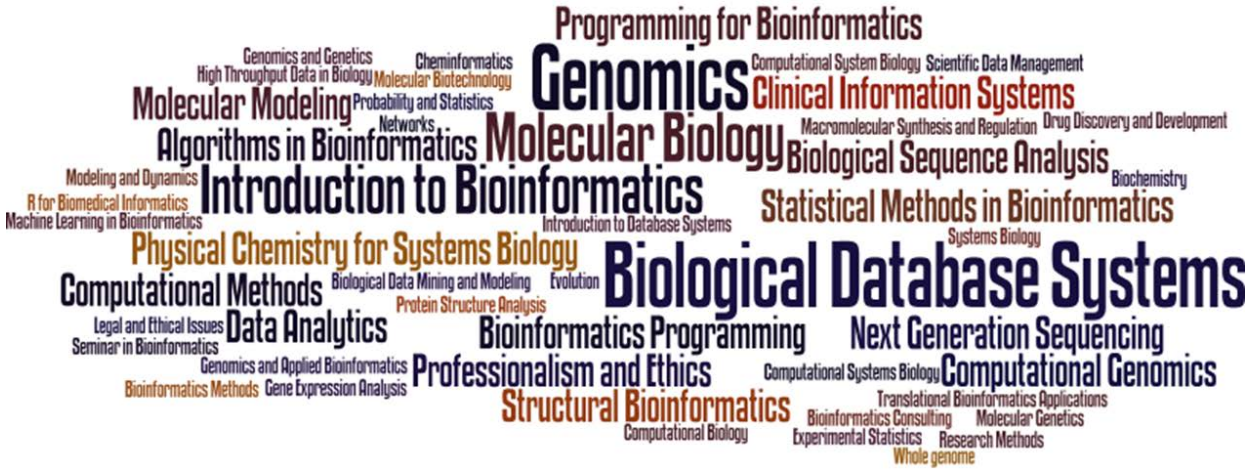


Figure 1. The major competencies of Bioinformatics program.

3. Structure, breadth, and depth of curriculum

This program is very structured and has a need to be taken in a specific order for some advanced courses. It is set up so that the program is built as blocks to help ensure the student is given its foundation to move onto the next section.

The required core courses give the basic overview of the bioinformatics program and provide hands-on experiences for the various techniques and tools used in bioinformatics. The advance core courses will prepare students to further specialize in a certain specific areas and keep up with the ever-changing emerging areas in bioinformatics. The elective courses provide the student with a wider breath to learn of related fields and reinforce their knowledge in bioinformatics. Basically, the curriculum design will ensure that, no matter what a student background is, the student can find courses in bioinformatics that suitable for their understanding of bioinformatics.

The Bioinformatics program is very diverse so each class has a specific measure to meet in order to make sure the student has the blocks to build off.

4. Interdisciplinary program

Bioinformatics, by its nature, has a strong interdisciplinary program in the areas of computational biology, computer sciences, and information technology. This gives the students more areas of expertise to choose from. For example, for the biology oriented students with limited background, the programming courses (R, Python, Matlab, Java) are taught in their first semester entering the programs. This will make sure they are ready to work on bioinformatics projects from the beginning. Students with strong computer science background will have the opportunities to learn more on biological science and computational bioinformatics.

5. How has the program curriculum responded to new directions in the discipline

The curriculum has been adjusted to meet the new directions since the program started and will continue to keep being adjusted because bioinformatics is an area that is continuously evolving. For example, over the past few years, next generation sequencing (NGS) has been the new top field in the field. There are two coures are created by professors in this area for students learning the new directions in Bioinformatics. The program is still in this adjustment as the new technologies for NGS are emerging. Our curricula and syllabus are kept updating to meet the market needs.

A curriculum committee has been formed in the department to go over the curriculums and syllabi periodically, making sure the curriculums are updated.

III. Program Outcomes

The expected program outcomes are based on the major competencies and major bioinformatics areas. Upon completion of the graduate degree program, a student is expected to possess the following bioinformatics capabilities:

a. Master the technologies and computational techniques used for data, information, and knowledge representation in bioinformatics.

b. Master the core concepts of bioinformatics, including computational biology, database design and implementation, and probability and statistics, as well as advanced skills in data analyatics, including data mining, machine learning, and algorithm design.

c. Develop a sound knowledge of statistics, computer science, biology, proteomics, and genetics and apply them in their bioinformatics projects;

d. Search and apply bioinformatics tools from a variety of sources, such as books, journal articles, and online encyclopedias;

e. have hands-on experiences and have worked on projects related to different areas of bioinformatics. Apply bioinformatics tools and skills in a professional environment via an industrial or academic internship and thesis projects in bioinformatics.

f. Design and conduct biological data management and computational experiments;

g. Analyze and interpret data based on their biological knowledge;

h. Apply their knowledge and skills to address some problems in biology oriented research and be able to program to achieve the objectives;

i. Possess soft skills, such as efficient communication among team members, good presentation skills, excellent written summary, and fluent verbal discussion;

j. Apply the best practice and follow the ethical guideline in decision making, information sharing, and privacy protections, in a global, economic, environmental, and societal context.

k. Design, develop, and implement bioinformatics solutions and communicate scientific information in written and oral form.

IV. Program Assessment

1. General Assessment Methods

Depending on the specific topics and expected outcomes, a selected list from the assessment methods below will be applied to the evaluation of a specific course:

a) The expected learning outcomes from classes will be continuously assessed by assignments, quizzes, and examinations.

b) The problem solving exercises will be evaluated by the solution design, the presentation of the solution, and the performance results.

c) The laboratory sessions will be examined by the problem solving results, the software/program developed, the running results and the written reports of the laboratory work.

d) The seminars and workshops will be assessed by the student attendances, group discussions, and innovative ideas.

e) The small group projects will be assessed by the team work environments, the design and presentation of the project, the project performance, the oral presentation, and the written report of the project.

f) The project and thesis work will be on project performance, demonstrated programming skills, oral presentations and the quality of written work.

g) The internship is evaluated by the employer feedback, the student performance at work, and the written report.

h) The independent study is assessed on the student's independence, initiative and understanding whilst undertaking the project, a final oral presentation and the submission of a final dissertation.

2. Program Assessment with external resources

The various bioinformatics programs have been studied regarding their hosting departments and schools in the United States. One of the major resources is the websites of the corresponding Bioinformatics programs, inclusing the program outcomes, students, faculty and other information. The second source is the US bioinformatics education provided by the Bioinformatics Organization which lists the bioinformatics programs, [http://bioinformatics.org/wiki/Education_in_the_United_States]. It arranges all the bioinformatics programs in the US, for each state and each university. There are total 95 Bioinformatics Programs listed from this web site, including degree programs of BS, MS, and PhD, as well as certificate programs. The other major source, the Startclass.com, provides detailed comparisons of different bioinformatics degree programs.

The comparison metrics include the smart rating, acceptance rate, average SAT range, the total number of enrolled students, the number of incoming students, the in-state and out-of-state tuition, and other informatics. For example, the smart rating will combine the information of five

attributes: the financial affordability, the career readiness, the admission selectivity, the expert opinion, and the academic excellence. These five attributes again are based on some statistics on ranking from several other sources, such as Forbes, U.S. News, etc.

2.1. Career for Bioinformatics students

Detailed examinations on the job market for bioinformaticians in the US have been performed. The summary information below are from two major job postings portal sites: indeed.com and monster.com.

a. Job opportunities and requirements

The job market for bioinformatics students is promising. The bioinformatics graduates can work on various related fields with varying titles. Sample industrial job titles include data scientist, research associate, computational biologist, bioinformatics scientist, bioinformatics scientist, bioinformatics analyst, software engineer, senior software engineer, and others. There are also openings in academia as postdoctoral fellows, research scientist, research professor, and faculty positions (such as assistant professors for PhD students in Bioinformatics). The top ranked job titles for bioinformatics job openings from Indeed.com are illustrated in Figure 2.

The salary package for bioinformaticians starts from $40,000+ and goes up to more than $120,000. With more experience in the field, one can go higher over the salary ladder. Based on more than 4000 job postings in bioinformatics only from Indeed.com, the distributions of job opportunities and the salary ranges are illustrated in Figure 3. Bioinformatics job positions for the salary range between $40,000 and $60,000 have the most openings by itself (>1600), which is the entry level jobs for bioinformaticians. The combined job postings for intermediate level in bioinformatics, salary range between $60,000 and $80,000, have about 1200 job postings. The more advanced level jobs for bioinformaticians, with salary range between $80,000 and $100,000, have many opening (>700).

The more advanced jobs, such as directors and managers, requires extensive experience in the fields, with salary more than $100,000. However, the job postings are getting less, with 280 postings in the $100,000+ category and 120 postings in the $120,000+ category. Thus, the majority of careers for bioinformatics graduates are in the entry, intermediate, and advanced levels, which are 83% of all the job postings.

Many job postings specifically state that a ***graduate degree*** in Bioinformatics or related fields are required, although there are opportunities for Bachelor's degree holders. In addition, job seekers with PhD degrees have more openings. A lot of job postings explicitly indicate that PhD degree is preferred over MS and BS degrees.

Regarding the ***working experiences***, a minimum of 3 years working experience on average was required, even for most of the entry level jobs. The required years of experience vary according to the levels of jobs. Usually, a higher paid job required more experience.

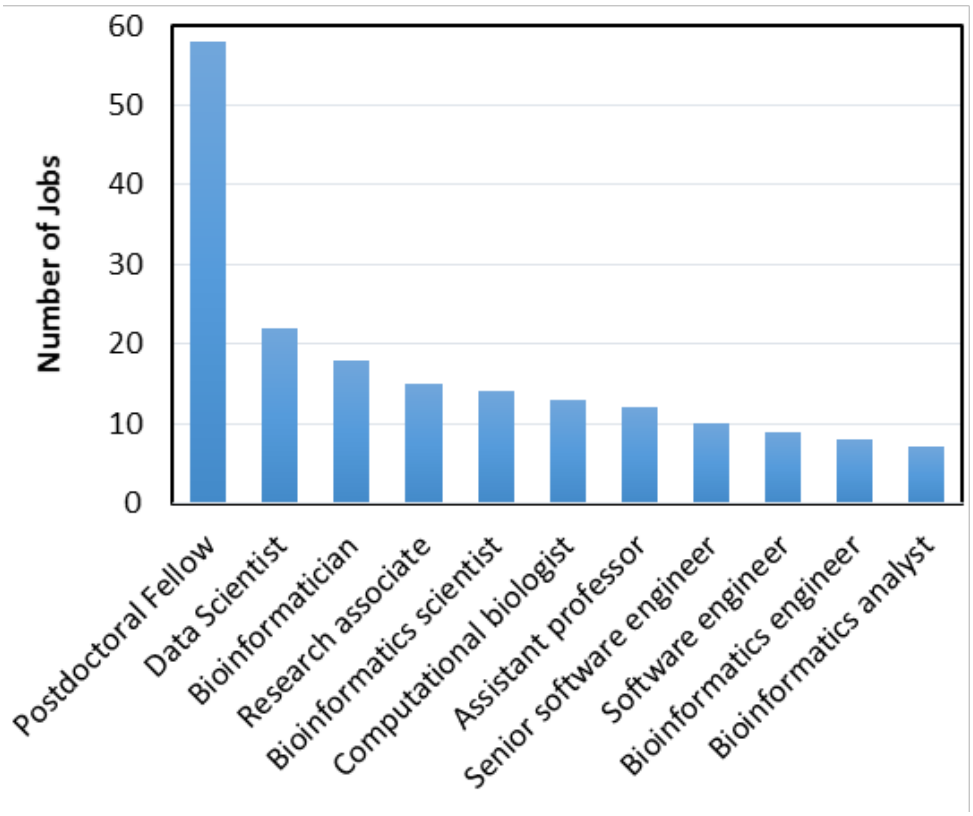


Figure 2. The job postings for different job titles (based on a search of keyword of "Bioinformatics" in April 2015 from Indeed.com).

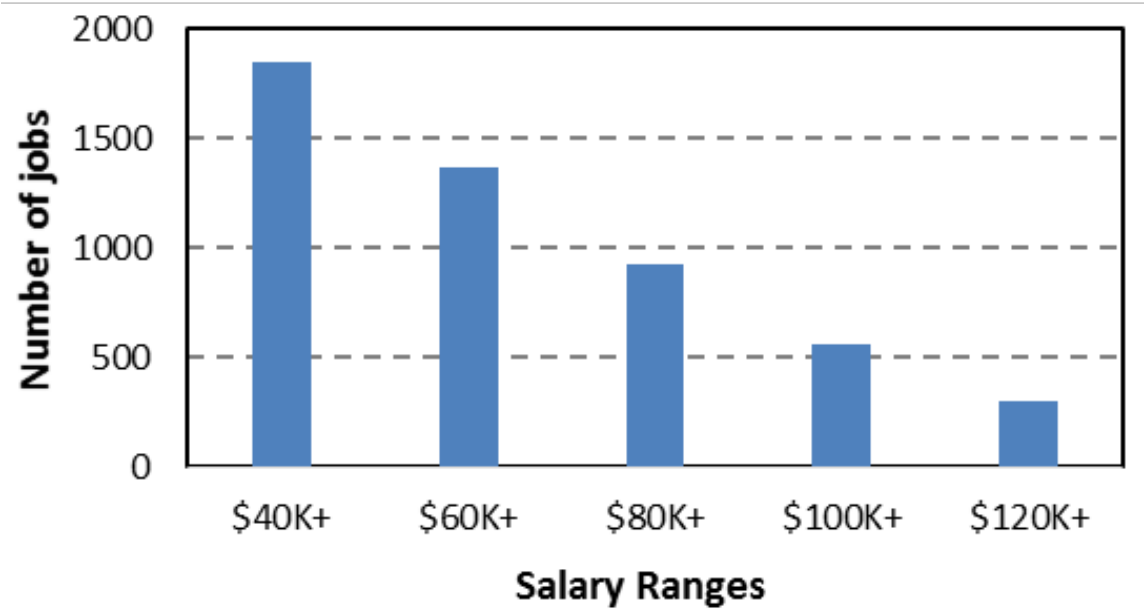


Figure 3. The salary ranges and number of job postings for Bioinformatics professionals.

b. Skill requirements

Detailed analysis of the skill requirements for different job openings has also been performed. Since the focus on this work is to guide the education program, the skills requirements for the entry level jobs have been summarized below, which are interested in by most bioinformatics degree students. Similar analytical results can be performed on intermediate and advanced jobs.

The required skills for randomly selected 100 entry levels jobs are illustrated in Figure 4 as Wordle image. The Figure showed that the most required skills for bioinformatics jobs are programming skills, bioinformatics algorithms, data mining, statistical analysis, database managements, genomics, next generation sequencing, big data analytics, bioinformatics software tools, and others. More information of the required skills in bioinformatics is summarized below:

- Bioinformatics tools: Samples tools are sequence alignment tools, such as Blast [13-14] or Bowtie [15], the Genome Analysis Toolkit (GATK) [16-17], the Integrative Genomics Viewer (IGV) [18-19], the software system for Next Generation Sequencing, Microarray & qPCR and Data Analysis (Partek), and tools for Ensembl-Havana GENCODE gene set (Ensemble).

  Some tools are for database search systems, such as the life science research tool (Entrez), scalable machine learning tools (Mllib), an open source machine learning library for the Python programming language (Scikit-Learn), and a suite of programs for interacting with high-throughput sequencing data(Samtools).

- Statistical software systems: such as SPSS and SAS. In addition, statistical analysis using R or Python is highly demanded.

Figure 4. The required skills for entry level jobs in Bioinformatics.

- Programming skills: It was required for most bioinformatics jobs to be familiar with programming languages. Other than general programing, for bioinformatics, the most popular programming languages or script languages are R, Perl, Python, Java, and Matlab. At least one of these programming languages will be listed in the job requirements.
- Biology knowledge: Knowledge from molecular biology, cancer biology, and/or modern biology is needed. This is the domain knowledge needed to understand and analyze the data, and interpret the analytical results.
- Genomics and genetics: Genomics and genetics are the core bioinformatics skill sets and are required for almost every bioinformatics job. For example, skills for high throughput sequencing technologies, next generation sequencing, and computational genomics are in high demands.
- Database management: Databases, including traditional relational database systems (e.g., SQL Server or Oracle), NoSQL databases (e.g., MongoDB), big data analytics (e.g., Vertica), and other big data databases (e.g., TCGA) are common required knowledge for potential bioinformatics job seekers. Especially, for big data management or analysis, it is a widely open field and is in great demands.
- Data mining and machine learning: for example, hierarchical clustering and decision trees are common required techniques.

Some additional skills required for the jobs are good communication skills, managerial skills, good team player, ability to multi task, and work independently. These additional skills are the small words in Figure 4.

It can also be observed that there are some overlaps between the competencies and the skill requirements. In fact, the more overlap, the better, as it will show that our program competencies meet the job market for bioinformatics.

c. Employers for Bioinformaticians

Based on the job postings, the top 15 companies who have the most job postings in bioinformatics are summarized in Table 1. It can be observed that the leading employer is Leidos, which is a biomedical research Incorporate. It develops and applies advanced technologies for translational research in cancer and AIDS treatments. The second largest company is Illumina, which is a leading developer and manufacturer for next generation life science tools and integrated systems for large-scale biological data analysis. Other tops companies all on biomedical related research and development.

Another way to investigate the bioinformatics job market is the locations of the job postings, which is summarized in Figure 5, for the top 15 locations who have the most job postings. The blue colored areas are on the west coast, mainly in California, which is about 40% for the top 15 locations. The green colored areas are on the east coast in Boston Metropolitan areas, NIH campuses, and New York. The east coast is more than 44% of the top locations. The red colored locations are in the middle areas of the US, which is only 16%, just a little more than Cambridge, MA along. Thus, most of these bioinformatics employers are in the west or east coasts.

In addition, if there is a big city with a large medical center, the employment opportunities in bioinformatics will rise, such as in Chicago or Houston. For relative small cities, the job market for bioinformatics is limited. For example, in the city and the metropolitan areas of Indianapolis, IN, there is only 6 openings in bioinformatics, although there is the largest medical school in the US and a lot of biotechnology companies, besides the giant pharmaceutic company, Lilly, is right next to the city.

Table 1. The top 15 companies who have the most job postings in Bioinformatics. The jobs column lists the number of columns in an random day in April 2015..

Company	**Jobs**	**Company**	**Jobs**
Leidos	99	MedImmune	18
Illumina, Inc.	43	Ingenuity Systems	18
Mount Sinai Medical Center	31	Cold Spring Harbor Laboratory	15
The Jackson Laboratory	21	QIAGEN	15
Thermo Fisher Scientific	21	New York Genome Center	15
Broad Institute	21	University of Chicago	14
Human Longevity, Inc.	19	Mayo Clinic	14
Genentech	19		

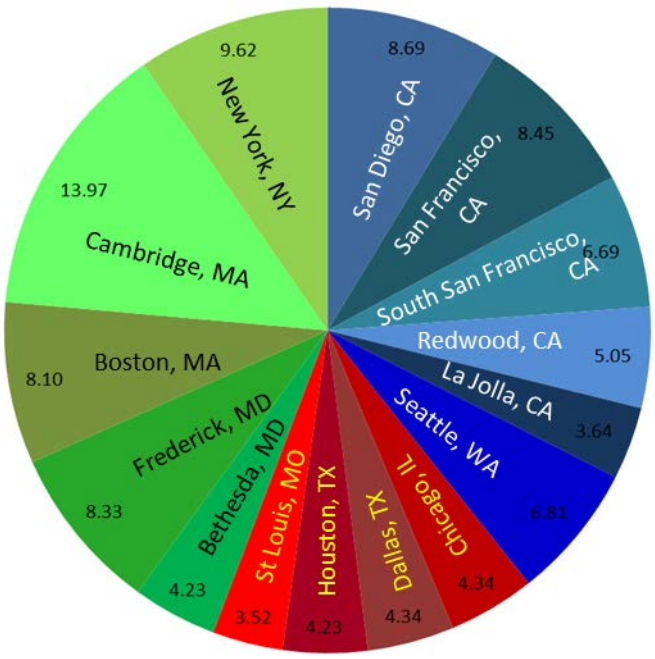


Figure 5. The geographical distribution of the job market in bioinformatics for the top 15 locations.

3. Program assessment for Bioinformatics MS program @SOIC IUPUI

3.1. The MS bioinformaics employment data

The employment rate for MS in bioinfomratics program at IUPUI is 100% after 6 months of graduation. For Bioinformaitcs MS graduates in 2015, the median salary is $58,500. The median salary increased to $70,000 for the 2016 graduates. The common position title and the company names are listed below.

Position Titles for Binformaitcs MS Graduates for 2015:

- Analyst Bioinformatics
- Application Operations Engineer II
- Big Data Consultant
- Bioinformatics Analyst / Biostatistician
- Bioinformatics Programmer
- Data Analyst
- Database Administrator
- Implementation Engineer
- Java Developer
- Programmer Analyst
- Salesforce CRM developer Intern
- Senior Imaging Analyst
- Specialist-Genomic Systems

Company Lists for Binformaitcs MS Graduates for 2015:

- Ambry Genetics
- Augusta University
- Berg, LLC
- Cincinnati Children’s Hospital Medical Center
- Closed Loop Recycling Green Stream Chemicals
- Cloudwick
- Eli Lilly and Company
- Extension Healthcare
- Intuit
- Meharry Medical College

- Techno drive Solutions
- The Genome Institute, Washington University, Saint Louis
- Validation Associates, LLC

Position Titles for Binformaitcs MS Graduates for 2016:

- Application Scientist
- Associate Consultant -IT
- Business Systems Developer - Salesforce
- Data Analyst and Software Developer
- ETL Intern/Lead Statistician and Data Modeler
- Informatics Specialist
- Sr. Analyst
- Trainee Fellowship

Company Lists for Binformaitcs MS Graduates for 2016:

- Biogen
- Eli Lilly and Company
- Home Acres Building Supply
- Jackson Laboratory
- Mayo Clinic
- Practice Fusion
- Roche
- Sikka Software/Navient Corporation
- University of Alabama

3.2. Teaching Assessment

As bioinformatics is a practical subject, the teaching methods are a combination of lectures, problem-solving exercises, laboratory sessions, seminars and workshops, small group course projects, projects or theses, internships, and independent studies.

How do you measure each of the desired behaviors listed as **assessment methods**?

- The assignments, quizzes, and exams will be graded, and the scores will be the measures.

- The projects will be measured by the professors on the quality of the written reports, posters, and peer-reviewed publications.
- The thesis will be evaluated by the thesis committee based on the quality of the thesis work, including the written report and the oral defense.
- The practical exercises, the internships, and the lab sessions will be evaluated by the practical solutions, the skills the students demonstrated, and the student career opportunities.
- Retention and graduation rates are tracked and studied.

3.3.Enrollment Assessment

The Enrollment of the MS program in Bioinformatics students has been assessed with Three metrics:

- **The total number of MS students in the Bioinformatics program**: the last 9 years of MS students in the program has been illustrated in Figure 6, which showed a steady increase over time, except for the fall 2014 when there is a major administrative changes in the program.

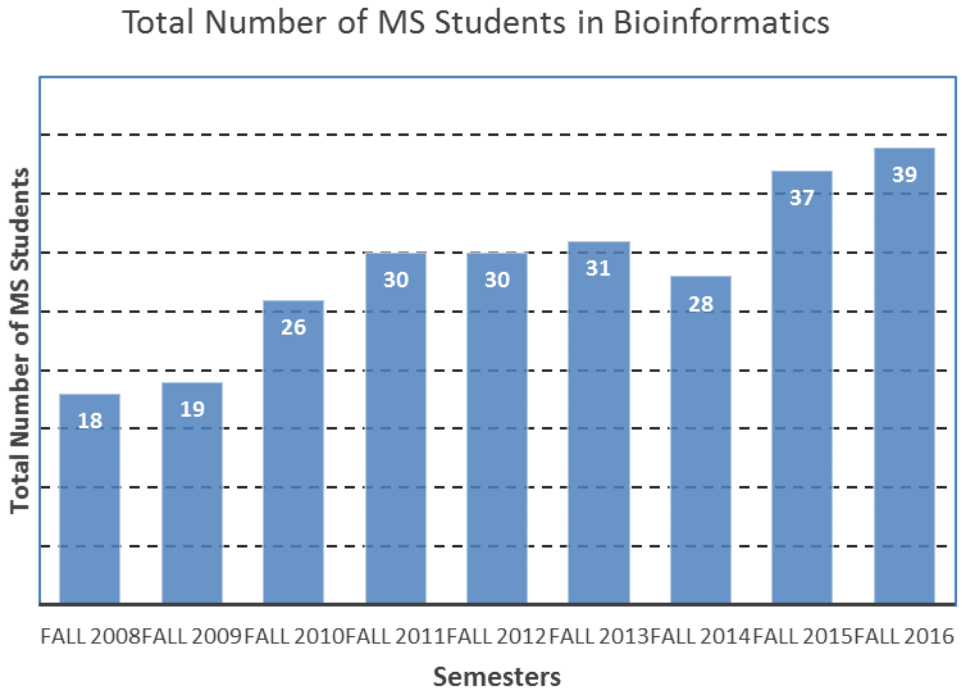


Figure 6: The total number of MS students in the Bioinformatics program.

- **The total headcount of Bioinformatics course enrollments**:

  For the last three years, the total headcounts of students enrolled in the Bioinformatics graduate courses are illustrated in Figure 7. It can been seen that more and more student headcount for the courses in the bioinformaitcs courses.

  The headcount from fall 2014 to fall 2015 has been increased by 27%, while the increase is 11% from fall 2015 to fall 206.

- **The total credit hours of the Bioinformatics course enrollments:** for the last three years, the total credit hours of students enrolled in the Bioinformatics courses are illustrated in Figure 8. The same pattern as the headcount has been observed that more and more credit hours have been taken by students for the bioinformatics courses.

  The credit hours from fall 2014 to fall 2015 has been increased by 29%, while the increase is 16% from fall 2015 to fall 2016

Combining the three metrics of the enrollment assessment, the MS in Bioinformatics program has been healthy for the last few years with increase of both program student number, course enrollment headcount and credit hours.

3.4.Additional Assessment

Assessment results

- First, several graduate courses have been assessed using the principles of graduate and professional learning. Appropriate revision of content and assessments have been made to enhance student learning experience across the curriculum.
- Second, upon timely graduation, MS in Bioinformatics graduates have been employment within their major at research centers and companies active in the field of bioinformatics, which are listed abover.
- Third, more than 80% of the MS students in Bioinformatics have been involved in projects or thesis work, with one or more faculty advisors in bioinformatics. The passing rates of their oral presentation is more than 90%.

Fourth, more than 30% of the MS students have peer-reviewed conference and/or journal publications.

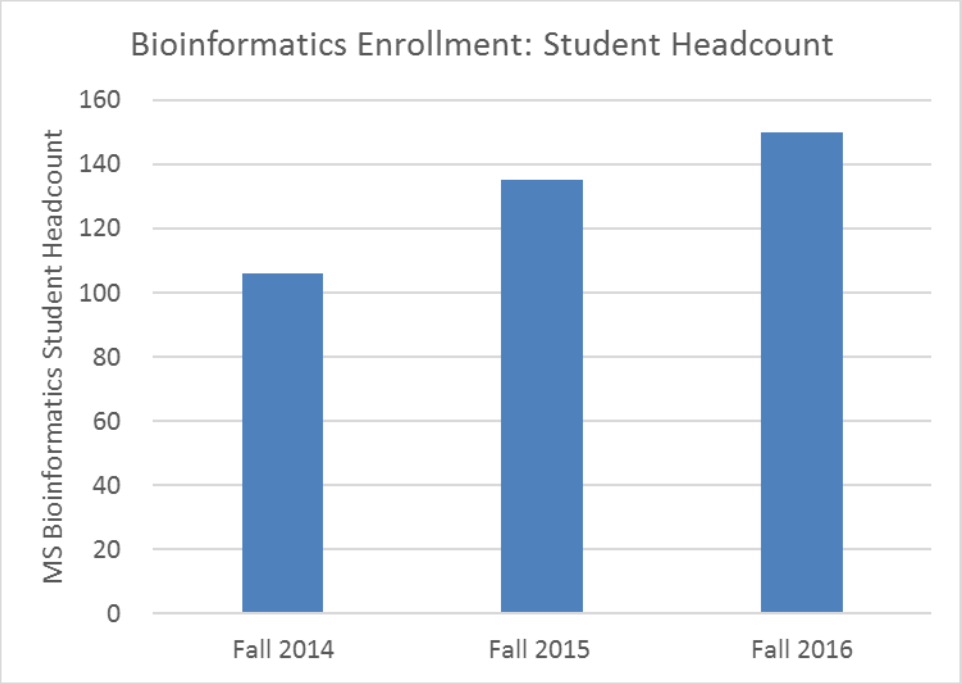


Figure 7. For the last three years, the total headcounts of students enrolled in the Bioinformatics graduate courses.

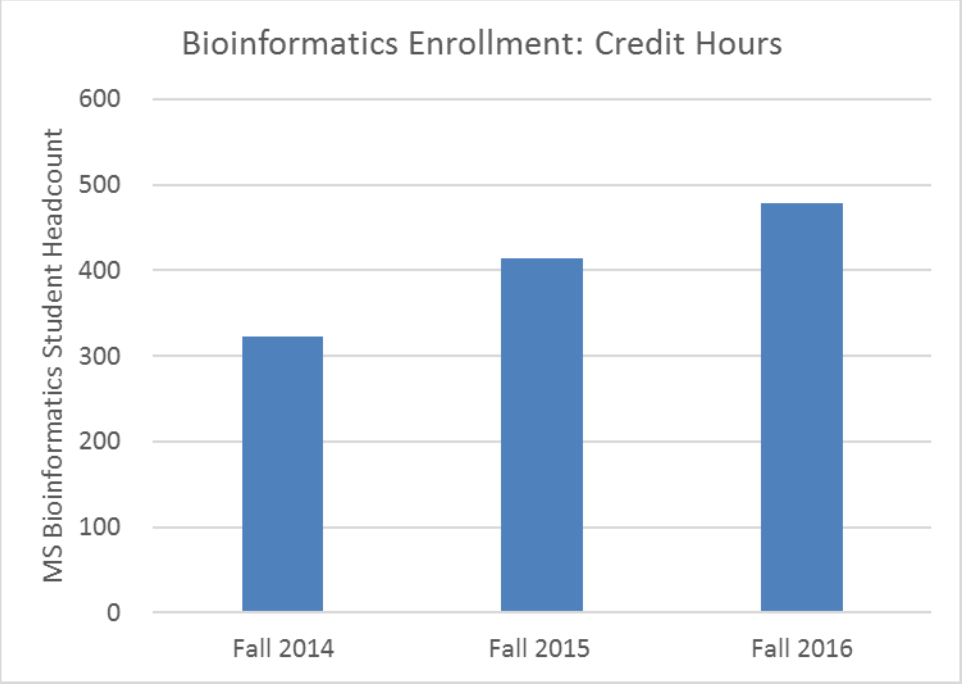


Figure 8. For the last three years, the total credit hours of students enrolled in the Bioinformatics courses.

4. Improvements of the Bioinformatics Program

The information learned from this study provides great guidance for the redesign of the curriculum, help for the students to self-evaluated their potential bioinformatics skills, and promotion of hands-on experience for bioinformatics professors, educators, and students.

The bioinformatics program at IUPUI offers both MS and PhD degrees. Based on the survey results, the curriculums have been revisited and the competencies have been examined. The information from this project help the bioinformatics programs in the following matters:

- Eliminate redundant contents: By examining the program competencies and the individual course outcomes, the redundant contents across courses have been identified and resolved.
- Develop new course modules: to cover all the required skills, modular courses of 1 or 2- credits have been designed to cover specifically of one or two required skills. This will guarantee that our students are career ready upon graduation. For example, for the biology oriented students with limited background, the programming courses (R, Python, Matlab, Java) are taught in their first semester entering the programs. This will make sure they are ready to work on bioinformatics projects from the beginning.
- Reorganize the course offering schedule: The course offering schedule has been revisited to make sure that the students meet all the prerequisites when they are ready to learn a new skill.

In addition, all the students in our bioinformatics program are provided the opportunities to have hands-on experiences, starting from the beginning of their MS programs. All full-time MS students are provided with partial scholarships and hourly research assistantship. Of course, all the PhD students are fully supported. With acceptance of the scholarships, the students are expected to work on bioinformatics projects upon entering the programs. The student records showed that this is a great way to increase the students' experiences and to improve the portfolios of the students when they are ready for jobs. The employment record shows that our students are more than 95% employed after two months of their graduation.