

Broadening the Participation of Underrepresented Minorities in the Mathematical Sciences

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Dr. Aktosun is a professor of mathematics at the University of Texas at Arlington. His research area is applied mathematics and differential equations with research interests in scattering and spectral theory, inverse problems, wave propagation, and integrable evolution equations. He is involved in various mentoring and scholarship programs benefiting students. He has been the GAANN Fellowship Director in his department since 2006, the NSF S-STEM Scholarship Director in his department since 2008, and he also acts as the Project Director for the NSF Bridge Program in his department. In the past he served as the Graduate Director and as the Undergraduate Director in his department, and he directed the NSF-LSAMP program on his campus during 2009-2014 and also directed the NSF-LSAMP Bridge-to-Doctorate program on his campus during 2010-2013.

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Dr. Yolanda Parker's education includes earning a Bachelor of Science from Texas A&M University in Applied Mathematical Sciences, a Master of Arts in Liberal Studies from Dartmouth College (New Hampshire) and a Ph.D. in Mathematics Education from Illinois State University. She has held a university faculty appointment at Texas A&M University-Commerce and University of Texas at Arlington, where she taught undergraduate, Masters and Doctoral level courses in Education and Mathematics Education. She is currently a Professor in the Mathematics Department full-time at Tarrant County College-South Campus. Her current research interests include algebra teacher efficacy, manipulatives with adult learners, and culturally relevant pedagogy in mathematics.

Prof. Jianzhong Su, University of Texas at Arlington

Dr. Jianzhong Su is professor and chair of Mathematics at the Department of Mathematics, University of Texas at Arlington (UTA). He received his Ph.D. in 1990 from University of Minnesota under Professor Hans Weinberger and he has been in higher education for over 30 years. He is an applied mathematician with research areas in partial differential equations and dynamical systems, with a particular interest in problems from computational neuroscience. He is an experienced researcher, educator, and administrator. He has served as PI/co-PI on over \$10 million federal research, education and training funding from National Science Foundation, National Institutes of Health, US Department of Education, US Department of Agriculture and other agencies, published over 70 peer-reviewed journal papers and been invited to over 70 seminars and conferences, and advised over 10 math students who attained their Ph.D. degree. He is very involved student mentoring of undergraduate students and high school students. He has been leading the development of the UTA learning communities and tutoring program for undergraduate and graduate students and has provided space and travel funds to enhance the UTA model. He is an active member of Gulf States Math Alliance and serves on its board of directors and co-organized the annual Gulf States Math Alliance conference in 2017-2021. Currently he is the PI on an NSF Math bridge to doctorate program at UTA. He also serves as a UTA site-PI on a large USDA-HSI collaboration project on smart agriculture data and mentoring students to research in data science and to pursue agricultural related career.

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1. INTRODUCTION

We describe the changes taken place to broaden the participation of URM (underrepresented minority) students at UTA (the University of Texas at Arlington). Women in certain STEM (Science, Technology, Engineering, and Mathematics) fields are still underrepresented, and hence we also describe the changes taken place to include the participation by women. In particular we describe the changes taken place in the Mathematics Department at UTA, the update on deliberate efforts started in the fall semester of 2005 and how three federally-funded scholarship and fellowship programs have helped to make the changes. We provide the appropriate data and present various plots to demonstrate the trend over the years in the student diversification since 2005.

The three scholarship and mentoring programs we have been running in the UTA Mathematics Department are the S-STEM Scholarship Program [1] supported by the NSF-DUE (National Science Foundation, Division of the Undergraduate Education), the GAANN (Graduate Assistance in Areas of National Need) Program [2] supported by the US-ED, and the UTA Mathematics Bridge-to-the Doctorate Program [3] supported by the NSF-DMS (NSF, Division of the Mathematical Sciences). Since we provided detailed information about these three programs in a previous paper [4] containing information as of February 2020, in the current paper we only present the updates for the three aforementioned programs with also an emphasis on the involvement of URM students in them.

Our paper is organized as follows. In Section 2 we provide the updated information on the UTA student enrollment and on the enrollment in the UTA Mathematics Department. In Section 3 we present the update on the NSF S-STEM program that has been running in the UTA Mathematics Department since 2008. In Section 4 we provide an update on the GAANN program that has run in the UTA Mathematics Department since 2006. In Section 5 we present an update on the NSF Bridge program that has been running in the UTA Mathematics Department since 2016. Finally, in Section 6 we present the data to demonstrate the changes in the diversification of the student enrollment at UTA and in the UTA Mathematics Department.

2. THE UPDATE ON THE STUDENT ENROLLMENT

The UTA is located in the Dallas-Fort Worth metroplex, the fourth most populated metropolitan area in the United States. It is considered to be the economic and central hub for North Texas. Based on the 2019 data, it has a population of 7,573,136, corresponding to the most populous in Texas and in the southern United States, the fourth largest in the U.S., the tenth largest in the Americas, and with the highest annual population growth. The Dallas-Fort Worth metropolitan area has the highest concentration of colleges and universities in Texas. These aspects play a positive role in attracting students to UTA, finding meaningful employment in the region after graduation, and having a diversified student population.

The city of Arlington is located between Dallas and Fort Worth, and the DFW International Airport is just to the north of Arlington. It has a population of almost 400,000. Arlington is the home to UTA, which is a major urban research university, and the city hosts several sports teams, stadiums, and entertainment centers. The top employers in the city are AISD (the Arlington Independent School District) employing 8,200 and UTA employing 5,300. These aspects again play a positive role to attract students to UTA and to have a diversified student population.

The UTA is the second largest campus of the University of Texas system. It offers doctoral, master's, and bachelor's degrees. It is designated by the US-ED (United States Education Department) to be an HSI (Hispanic Serving Institution) because the domestic Hispanic students make up more than 25% of the undergraduate student population. The number of URM students at UTA is substantial and growing, and the plots presented in Section 6 indicate this trend. According to the fall 2021 data, UTA has a student population of 49,625, including online students. The primary reason to include the online students in the student population in the fall 2021 data is due to the current covid-19 pandemic, which has caused most classes at UTA to be online classes.

The fall 2020 student population data for UTA was comparable to the 2019 student population data, which contained 42,863 students in total (not including the online students). Of this total, 30,652 were undergraduate students and 12,211 were graduate students. We present the UTA student enrollment data for the fall semester of 2020 in Table 1.

UTA student enrollment	UTA undergraduate (UG) students	UTA graduate (GR) students
Total: 49,625 72.5% UG, 27.5% GR	Total: 36,000 62.5% women, 37.4% men 94.1% domestic, 5.9% int'l URM: 49.9% of all UG URM: 53.0% of domestic UG	Total: 13,625 69.3% women, 30.7% men 81.7% domestic, 18.3% int'l URM: 32.7% of all GR URM: 40.2% of domestic GR

Table 1. The fall 2020 student data at UTA

The corresponding student enrollment data for the fall semester of 2019 is presented in Table 2.

UTA student enrollment	UTA undergraduate (UG) students	UTA graduate (GR) students
Total: 42,863 72.5% UG, 27.5% GR	Total: 30,652 60% women, 40% men 95% domestic, 5% int'l URM: 51% of all UG URM: 54% of domestic UG	Total: 12,211 64% women, 36% men 75% domestic, 25% int'l URM: 33% of all GR URM: 44% of domestic GR

Table 2. The fall 2019 student data at UTA

Let us now consider the student enrollment in the UTA Mathematics Department. According to the fall 2020 data, which is summarized in Table 3, the UTA Mathematics Department has 25 faculty members, 98 graduate students (83 PhD students and 15 master's students), and 249 undergraduate mathematics majors. In the fall of 2019 the UTA Mathematics Department had 25 faculty members, 113 graduate students (83 PhD students and 30 master's students), and 262 undergraduate mathematics majors.

UTA mathematics GR students	UTA UG mathematics majors
98 total (83 PhD and 15 master's students) 68.4% domestic, 31.6% int'l 44.9% women, 55.1% men URM: 29.6% of all math GR students URM: 43.3% of all domestic math GR	249 total 86.3% domestic, 13.7% int'l 41.8% women, 58.2% men URM: 37.8% of all UG math majors URM: 43.7% of domestic UG math

Table 3. The fall 2020 UTA mathematics students

The fall 2019 data for the UTA mathematics students was comparable to the 2020 fall data, except that in the fall of 2019 there were 15 more master's students (all were high school

mathematics teachers working for a Master of Arts degree) and there were 13 more undergraduate mathematics majors. Thus, the effect of the pandemic on the mathematics student enrollment has mainly been in the MA program in the Mathematics Department, resulting in a 50% reduction, and also slightly in the number of undergraduate mathematics majors, resulting in a 5% reduction. The fall 2019 data in the UTA Mathematics Department is summarized in Table 4.

UTA mathematics GR students	UTA UG mathematics majors
113 total (83 PhD and 30 master's students)	262 total
66% domestic, 34% int'l	89% domestic, 11% int'l
45% women, 55% men	49% women, 51% men
URM: 27% of all math GR students	URM: 29% of all UG math majors
URM: 42% of all domestic math GR	URM: 33% of domestic UG math

Table 4. The fall 2019 UTA mathematics students

3. THE UPDATE ON THE MATHEMATICS S-STEM PROGRAM

The S-STEM Program in the UTA Mathematics Department has been running since the fall semester of 2008 and has been continuously supported by three consecutive NSF grants. Currently we are in the middle of our third NSF grant period. As of February 2021 this program has provided 137 distinct domestic undergraduate mathematics majors with scholarships (based on the demonstrated financial need) and mentorship. Most of our S-STEM scholars are supported during multiple semesters until they receive their bachelor's degrees. Among the 137 supported

137 scholars supported	106 degree recipients	29 continuing
65 women (47.5%)	45 women (42.5%)	19 women (65.5%)
72 men (52.5%)	61 men (57.5%)	10 men (34.5%)
URM: 46 (33.6%)	URM: 32 (30.2%)	URM: 13 (44.8%)

Table 5. The supported student data in the UTA Math S-STEM program during 2008-2021

students by our program, 106 of them have already received their bachelor's degrees, 2 have quit without receiving their undergraduate degrees, and 29 are making timely progress toward their bachelor's degrees. We summarize the crucial data about our S-STEM program in Table 5.

We have been very careful in using our funding in order to avoid any waste of financial and other resources. We are careful in selecting students for our S-STEM program in such a way that any admitted mathematics major will most likely receive a bachelor's degree in mathematics in a timely manner and will definitely benefit from the mentoring we provide. Since the fall of 2008 we have gained experience and developed expertise to run our S-STEM program efficiently and optimally, and we share the following strategies worked well for us in our own program:

- The continuation of an S-STEM scholarship from one semester to the next semester is not automatic. Each scholar from a previous semester, like any new applicant, fills out a brief application form to be admitted into our program each semester. The application process is not burdensome for the applicants, but it allows us to screen the applicants carefully and to check their progress every semester. The S-STEM Program Director briefly interviews each applicant, and this interview forms a crucial step in the admission or re-admission to our program.
- We assess the risk factor for each applicant very carefully. For example, we know by experience that those students who have taken the Analysis I course are almost certain to graduate and do so in a timely manner. On the other hand, some students who have not yet started taking the Linear Algebra course or the Introduction to Proofs course present some risk whether they will obtain their bachelor's degrees and do so in a timely manner.
- The S-STEM Program Director collaborates very closely with the UTA Undergraduate Mathematics Advisor to assess each undergraduate mathematics major's academic progress, mathematical preparation, academic resilience, expected date for obtaining the undergraduate degree, effort spent by the student on academic studies, etc. The UTA Undergraduate Mathematics Advisor knows each of the mathematics majors very well as she is directly involved in the student's degree plan and she interacts with each student at least several times during every semester. She is in regular contact with the S-STEM Program Director and alerts him about any changes in a student's academic performance or any factors that may be affecting the student's performance in a negative manner. She is also an excellent resource person on new mathematics majors and transfer students, and she regularly informs the S-STEM Program Director about the suitability of each mathematics major for our S-STEM scholarship.

4. THE UPDATE ON THE MATHEMATICS GAANN PROGRAM

The UTA Mathematics Department has been running its GAANN program since 2006 with four consecutive grants from the US-ED. Each of these federal grants was enhanced by a 25% mandatory match by the institution, and hence the impact of the funding was substantially increased. Furthermore, according to the GAANN rules, 100% of the federal money and 100% of the match have to be used on the PhD students in the GAANN program as stipends, tuition and fees, or other educational expenses. Moreover, we have developed and implemented the appropriate effective strategies to ensure that every GAANN fellow we support will receive a PhD degree from our department and do so in a timely manner. Below, we share some of those strategies that have worked well for us in our program:

- We mainly award a GAANN fellowship to those PhD students who have passed the three required preliminary exams, who have identified their PhD advisors, and who have started working on a thesis topic under the supervision of a PhD advisor. It is almost guaranteed that such doctoral students will receive their PhD degrees and do so in a timely manner. Furthermore, the presence of an active PhD advisor assures us that the GAANN fellow will make a timely progress as we continually receive input on the student's progress toward the degree from the PhD advisor.
- We certainly do not discriminate against the students who have not yet taken their preliminary exams or who have not yet started working under the supervision of a PhD advisor. Such students are usually supported by the graduate teaching assistantships, without taking any risk on our federal funds provided by the GAANN grant.
- Our GAANN program has had the distinct feature of providing funding of \$1,500 to a GAANN fellow for the acquisition of a computer to be used in the fellow's PhD research. This has been an excellent motivating factor for our doctoral students to become GAANN fellows and to receive their PhD degrees in a timely manner.

As of February 2021, our GAANN program has supported 54 doctoral students, 48 of whom have already received their PhD degrees, and 6 remaining GAANN fellows are making timely

progress to receive their PhD degrees soon. In Table 6 we provide the crucial data related to our GAANN program, as of February 2021.

54 supported GAANN fellows	48 PhD degree recipients	6 continuing
19 women (35.2%)	17 women (35.4%)	2 women (33.3%)
35 men (64.8%)	31 men (64.6)	4 men (66.7%)
URM: 18 (33.3%)	URM: 16 (33.3%)	URM: 2 (33.3%)

Table 6. The supported student data in the UTA Math GAANN program during 2006-2021

The GAANN program has greatly helped us to improve both the quality and quantity of our mathematics doctoral enrollment and mathematics doctoral degree recipients. Because the fellowship recipients are restricted to domestic students with demonstrated financial need, it has helped us to drastically increase the enrollment of domestic students and URM students without necessarily lowering the number of our international doctoral students.

Unfortunately, since 2019 the US-ED has not included mathematics among the areas of national need, and we hope that this will change in the near future so that we can continue the success of our mathematics GAANN program in the future as well by securing further GAANN grants.

5. THE UPDATE ON THE MATHEMATICS BRIDGE PROGRAM

The Mathematics Bridge-to-the Doctorate Program in the UTA Mathematics Department has been running since the fall of 2016 and has been supported by a grant from the NSF-DMS. Most of our Bridge fellows are supported for one year and they transition to a standard PhD program at the end of the year. As of February 2021 we have had 38 graduate students who have participated in our Bridge program, and the relevant data has been presented in Table 7.

38 supported Bridge fellows	32 previous fellows	6 continuing
20 women (53%)	17 women (53%)	3 women (50%)
18 men (47%)	15 men (47%)	3 men (50%)
URM: 24 (63%)	URM: 20 (63%)	URM: 4 (67%)

Table 7. The supported student data in the UTA Math Bridge program during 2016-2021

The goal of our Bridge program has some similarities and also some differences with the LSAMP (Louis Stokes Alliance for Minority Participation) Bridge-to-the Doctorate Program

running at various universities with support from the NSF. During 2009-2014 our current NSF Bridge Project Director served as the UTA Campus Director for the UT System LSAMP Program, and he also directed the LSAMP Bridge-to-the Doctorate Program on the UTA campus during 2010-2013. That was the first ever LSAMP Bridge Program on the UTA campus. Two of the 12 LSAMP Bridge fellows supported were in mathematics and the remaining 10 were from engineering and sciences. Contrary to the LSAMP Bridge Program, all the fellows in our Mathematics Bridge Program are mathematics students and the program is efficiently run within the Department of Mathematics. Most of our former Bridge students are currently making timely progress toward their doctoral degrees in the mathematical sciences. Our first Bridge fellow has already received her mathematics PhD degree from UTA and is currently employed at the Lockheed Martin Corporation in the DFW metroplex.

Running a Bridge-to-the Doctorate program in mathematics is an excellent way to diversify the graduate student body in a mathematics department. In many mathematics doctoral programs in the U.S. the international students still form the majority of doctoral students and the number of URM students are very low if not zero. On the other hand, more mathematics doctoral programs are now interested in having some URM students in their programs. Below we share some of our experiences in our own Bridge program:

- We usually have over 80 mathematics PhD students in our department, and hence we can afford having a critical mass, a cohort of Bridge fellows, so that those students can feel a part of our mathematics PhD program and also interact with other Bridge fellows in our department. We ensure that our Bridge fellows are fully integrated into our PhD program during their participation and that they feel that they belong, and they are never treated differently than our regular PhD students.
- Our Bridge program emphasizes the strengthening of the mathematical background in two key areas: Advanced Linear Algebra and Mathematical Analysis. Most PhD programs in the U.S. consider these two areas as crucial. In our own department, all our PhD students must pass three preliminary exams, two of which are in these two crucial areas. In fact, while in the Bridge program the students learn about preliminary exams and other aspects of being enrolled in a standard PhD program.

- We encourage and help our Bridge fellows to transition to a PhD program in another institution, but we do not prevent them to join our own PhD program to receive their PhD degrees if this is their own choice.
- The application process to our Bridge program is not burdensome. We carefully screen the applicants and also encourage them to apply to other similar programs to match them with a program of their choice. Our main goal here is to help the Bridge applicants so that they all can be matched with some program in the U.S.
- We collaborate with many faculty members at underserved institutions, especially within the Gulf States Math Alliance [5], who send their students to our Bridge program. The Gulf States Math Alliance is a regional alliance of over 40 mathematics departments from Texas, Louisiana, and Mississippi. It was formally established in 2013 and has been growing since then. We have been running an annual Gulf States Math Alliance conference since 2017 and a typical attendance is over 200 students and faculty. During such conferences we interact with many potential Bridge students.

6. THE TREND IN THE CHANGES

In this section we provide the appropriate data in the UTA student enrollment since the fall semester of 2005. We also present the corresponding data in the UTA Mathematics Department since the fall of 2005, when the deliberate efforts on the diversification started. In the plots presented, the horizontal axis shows 31 data points, where 1 corresponds to Fall 2005, 2 corresponds to Spring 2006, 3 to Fall 2006, etc. In particular, 5 corresponds to Fall 2007, 10 to Spring 2010, 15 to Fall 2012, 20 to Spring 2015, 25 to Fall 2017, 30 to Spring 2020, and 31 to Fall 2020.

The number of URM students at UTA and also in the UTA Mathematics Department prior to 2015 were very low. The three aforementioned programs in the UTA Mathematics Department have greatly helped with the efforts to increase the number of URM students in undergraduate and graduate mathematics programs at UTA.

In Figure 7 we present the number of graduate students enrolled at UTA since the fall of 2005. The fall 2005 enrollment number is 6,381 and the fall 2020 number is 13,622.

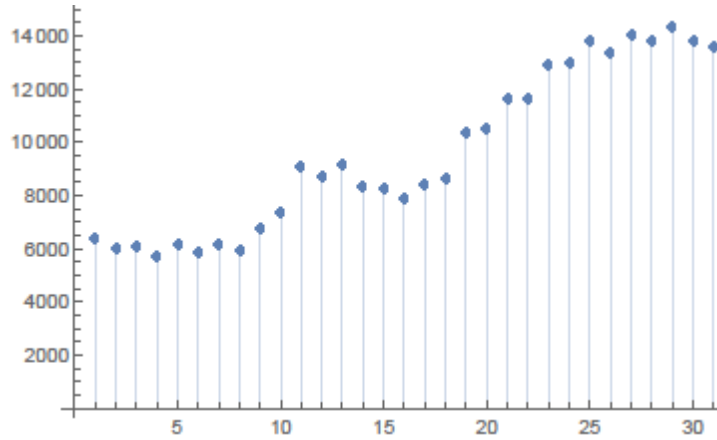


Figure 7. The UTA graduate student enrollment from Fall 2005 to Fall 2020

In Figure 8 we present the percentage of women in the UTA graduate student enrollment since the fall of 2015. The number for Fall 2005 is 3,226 (51%) and the number for Fall 2020 is 9,448 (69%). Even though there is a drastic increase in the enrollment of women as graduate students, the graduate enrollment in STEM fields by women still needs improvement. Especially in certain engineering fields at UTA there are very few women among graduate students.

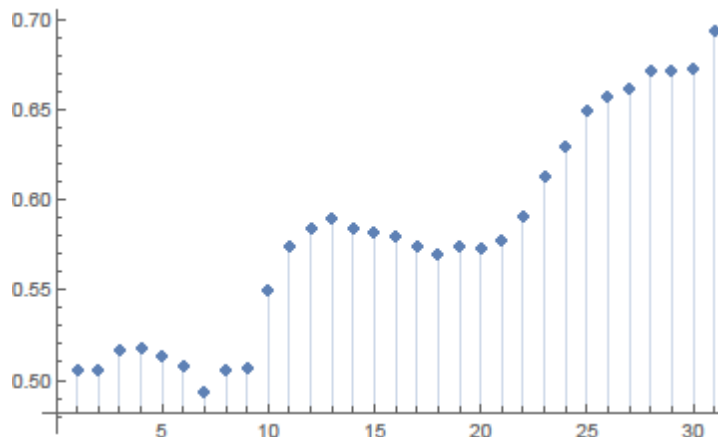


Figure 8. The percentage of women in the UTA graduate student enrollment since Fall 2005

In Figure 9 we present the percentage of international students in the UTA graduate student enrollment since the fall of 2005. The number for Fall 2005 is 2,073 (32%) and the number for Fall 2020 is 2,521 (19%).

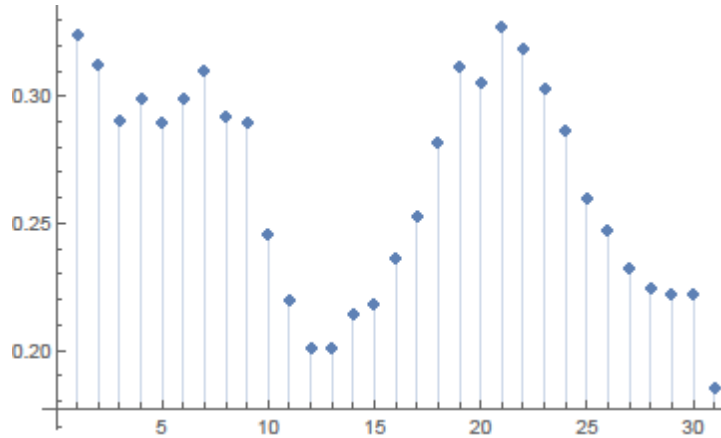


Figure 9. The percentage of international graduate students at UTA since Fall 2005

In Figure 10 we present the percentage of URM graduate students at UTA since Fall 2005. The percentage is obtained by dividing the number of URM students by the number of graduate students. We remark that URM students are American Indian or Alaska Native, African American, Hispanic or Latino, Native Hawaiian or Pacific Islander among U.S. citizens or U.S. permanent residents. The number for Fall 2005 is 976 (15%) and the number for Fall 2020 is 4,663 (35%). We remark the steady growth in the percentage.

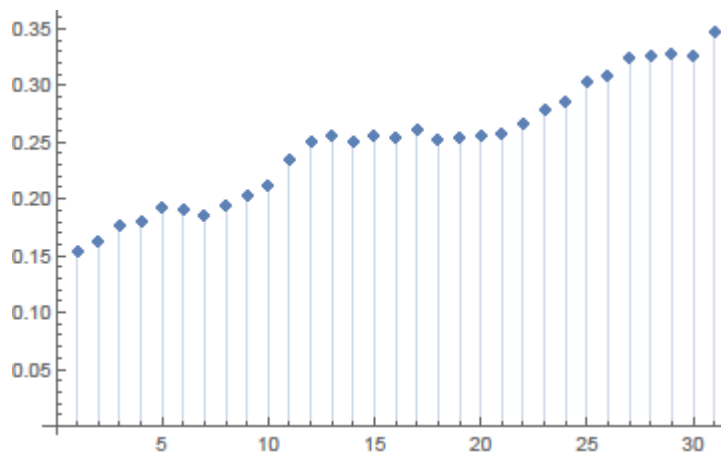


Figure 10. The percentage of URM graduate students at UTA since Fall 2005

In Figure 11 we present the percentage of URM graduate students at UTA among domestic graduate students since Fall 2005. The percentage is obtained by dividing the number of graduate URM students by the number of domestic graduate students. The number for Fall 2005 is 976

(23%) and the number for Fall 2020 is 4,663 (43%). The steady and sharp increase is clear from the figure.

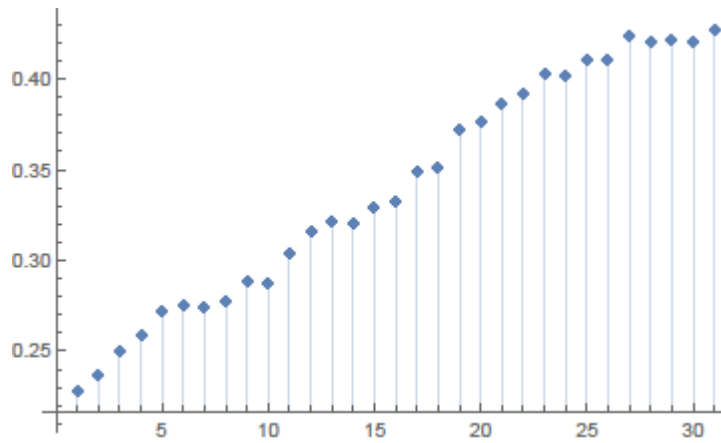


Figure 11. The percentage of URM among domestic graduate students at UTA since Fall 2005

In Figure 12 we present the enrollment of undergraduate students at UTA since the fall of 2005. The fall 2005 enrollment number is 19,644 and the fall 2020 enrollment number is 35,817. The figure shows that there is a steady but a small enrollment decrease from the fall semester to the spring semester each year. Otherwise, the enrollment shows a steady growth in the past 10 years.

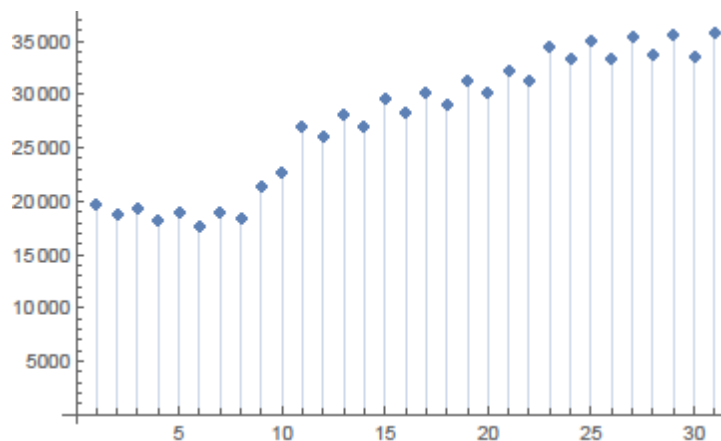


Figure 12. The UTA undergraduate student enrollment from Fall 2005 to Fall 2020

In Figure 13 we present the percentage of women in the UTA undergraduate student enrollment since the fall of 2005. The number for Fall 2005 is 10,459 (53%) and the number for Fall 2020 is 22,426 (63%).

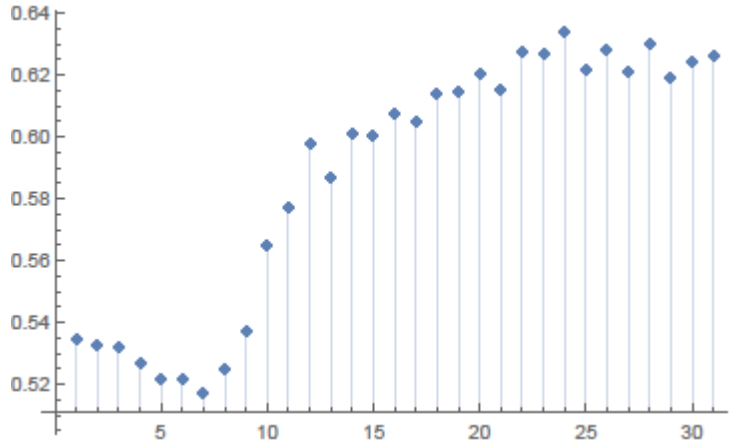


Figure 13. The percentage of women for UTA undergraduate student enrollment since Fall 2005

In Figure 14 we present the percentage of undergraduate international students at UTA since the fall of 2005. The number for Fall 2005 is 911 (5%) and the number for Fall 2020 is 2,110 (6%). As the figure shows the percentage of the undergraduate international students at UTA is small, even though their number shows some increase over the years. The ELI (English Language Institute) at UTA was very successful for a few years after 2005 and that played a key role in attracting international students to UTA. Later, the lack of support for ELI has played a negative role in attracting more international students to UTA, both at the graduate and undergraduate levels.

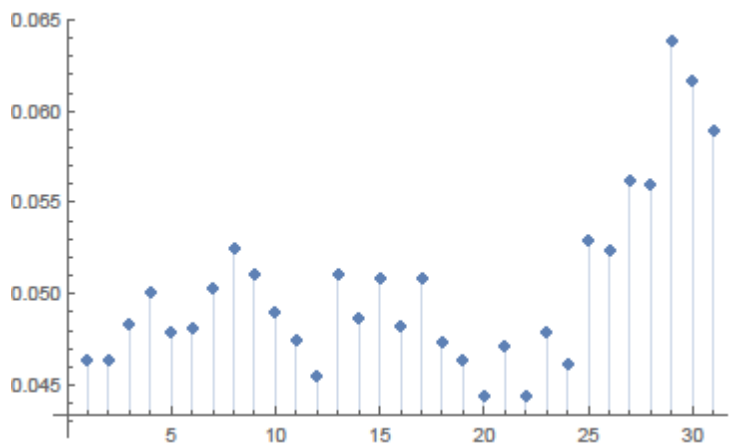


Figure 14. The percentage of international undergraduate students at UTA since Fall 2005

In Figure 15 we present the percentage of URM undergraduate students at UTA since Fall 2005. The percentage is obtained by dividing the number of undergraduate URM students by the total

number of undergraduate students. The number for Fall 2005 is 5,490 (30%) and the number for Fall 2020 is 17,906 (50%). The steady and sharp growth over the years is evident from the figure.

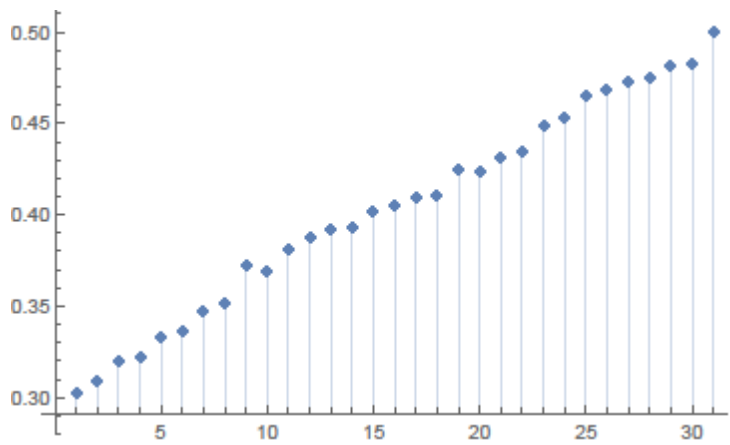


Figure 15. The percentage of URM undergraduate students at UTA since Fall 2005

In Figure 16 we present the percentage of URM undergraduate students at UTA among domestic undergraduate students since Fall 2005. The percentage is obtained by dividing the number of undergraduate URM students by the total number of domestic undergraduate students. The number for Fall 2005 is 5,490 (33%) and the number for Fall 2020 is 17,906 (53%). The steady sharp increase over the years is evident from the figure.

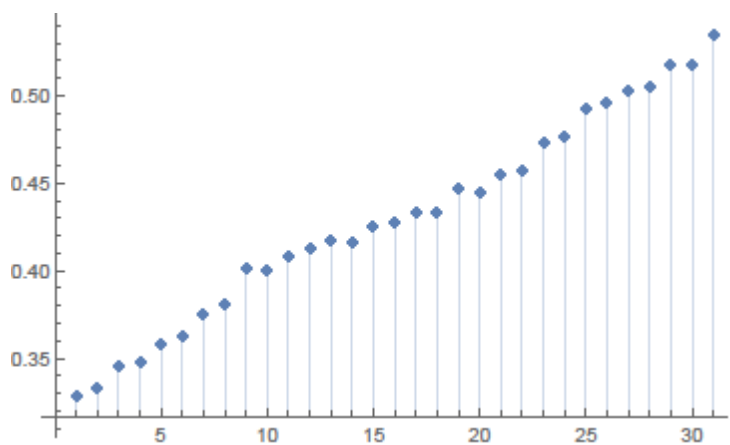


Figure 16. The percentage of URM domestic undergraduate students at UTA since Fall 2005

Next, we present the student enrollment data in the Mathematics Department at UTA. In Figure 17 we present the enrollment of graduate students in the UTA Mathematics Department since the

fall of 2005. The fall 2005 enrollment number is 59 and the fall 2020 enrollment number is 98. The percentage of PhD students compared with master's students in the UTA Mathematics Department has drastically increased. For example, in the fall semester of 2020 there were 98 graduate students, 83 of whom (85%) were PhD students and 15 of whom (15%) were master's students. As in many PhD granting mathematics departments nowadays, in the UTA Mathematics Department the funding for graduate students is now mainly for PhD students and not for master's students.

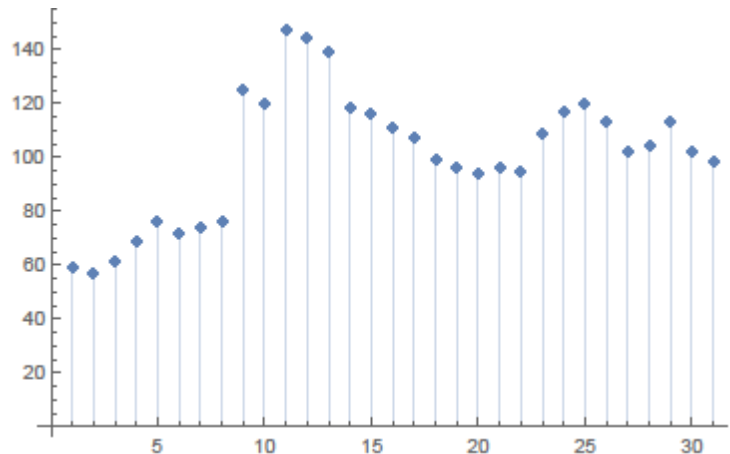


Figure 17. The UTA math graduate student enrollment from Fall 2005 to Fall 2020

In Figure 18 we present the percentage of women in the UTA math graduate student enrollment since the fall of 2005. The number for Fall 2005 is 35 (59%) and the number for Fall 2020 is 44 (45%). Since 2005 we have been making deliberate efforts to include more women among our graduate students, especially among our PhD students. Although there is space for further improvement the women in our mathematics graduate program do not feel underrepresented.

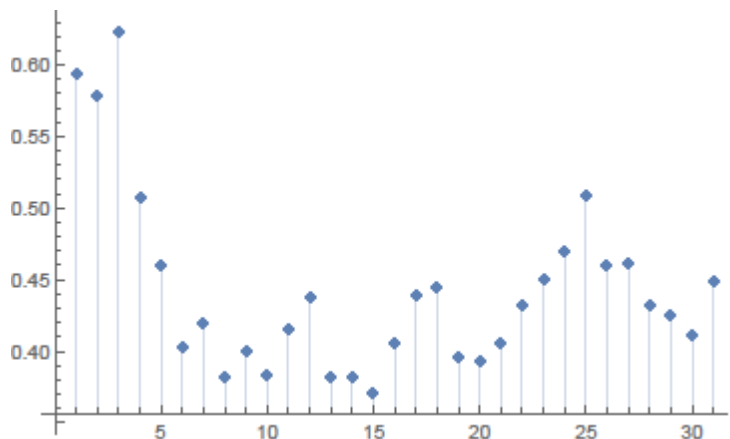


Figure 18. The percentage of women among UTA math graduate students since Fall 2005

In Figure 19 we present the percentage of international students in the UTA Mathematics Department since the fall of 2005. The number for Fall 2005 is 12 (20%) and the number for Fall 2020 is 29 (30%). In many mathematics PhD programs in the U.S. the percentage of international students are much higher than ours, and we seem to have a healthy balance in the percentage of our international students.

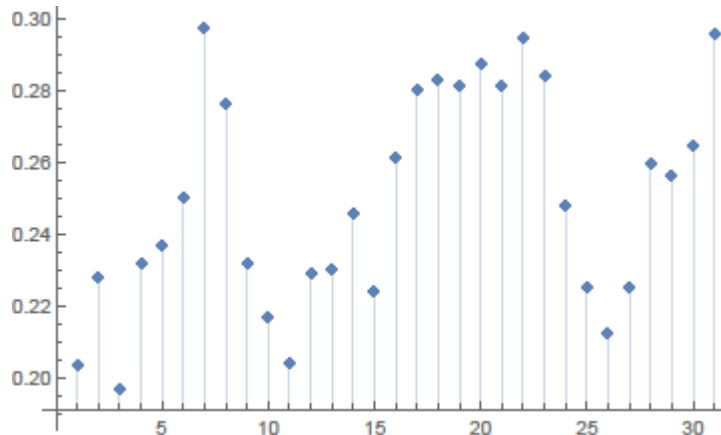


Figure 19. The percentage of international math graduate students at UTA since Fall 2005

In Figure 20 we present the percentage of URM mathematics graduate students at UTA since Fall 2005. The percentage is obtained by dividing the number of URM mathematics graduate students by the total number of mathematics graduate students. The number for Fall 2005 is 12 (20%) and the number for Fall 2020 is 29 (30%).

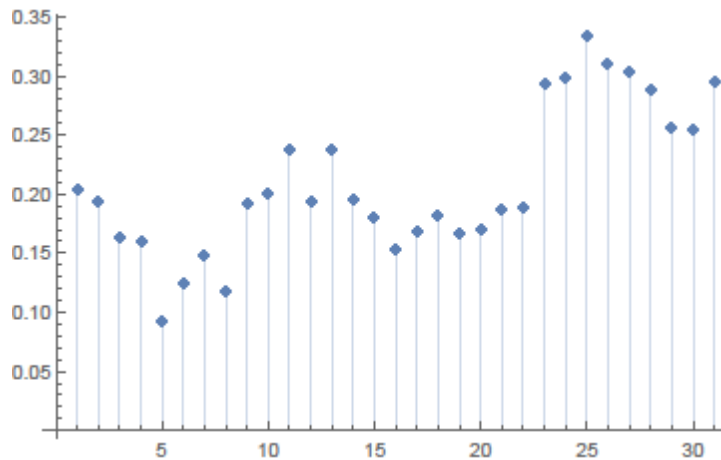


Figure 20. The percentage of URM math graduate students at UTA since Fall 2005

In Figure 21 we present the percentage of URM mathematics graduate students at UTA among domestic mathematics graduate students since Fall 2005. The percentage is obtained by dividing the number of mathematics graduate URM students by the number of domestic mathematics graduate students. The number for Fall 2005 is 12 (26%) and the number for Fall 2020 is 29 (42%). The figure indicates that we have a good record to include URM students in our mathematics graduate program.

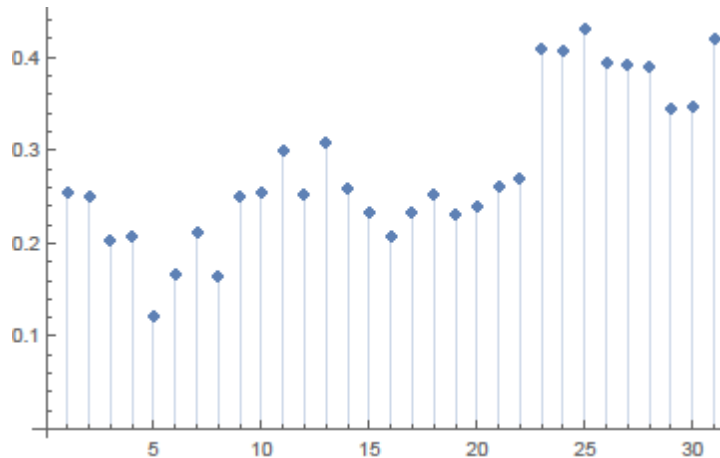


Figure 21. The percentage of URM domestic math graduate students at UTA since Fall 2005

In Figure 22 we present the enrollment of mathematics undergraduate students in the UTA Mathematics Department since the fall of 2005. The fall 2005 enrollment number is 102 and the fall 2020 enrollment number is 249. We are making further efforts to increase the number of undergraduate mathematics students at UTA. Our S-STEM grant helps us with our efforts.

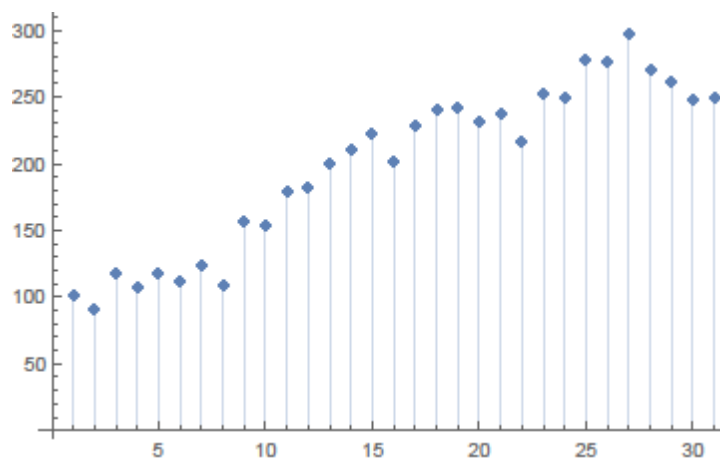


Figure 22. The UTA math undergraduate student enrollment from Fall 2005 to Fall 2020

In Figure 23 we present the percentage of women in the UTA math undergraduate student enrollment since the fall of 2005. The number for Fall 2005 is 40 (39%) and the number for Fall 2020 is 104 (42%). The percentage seems to be steady, but we are making further efforts to increase the percentage of undergraduate women studying mathematics at UTA.

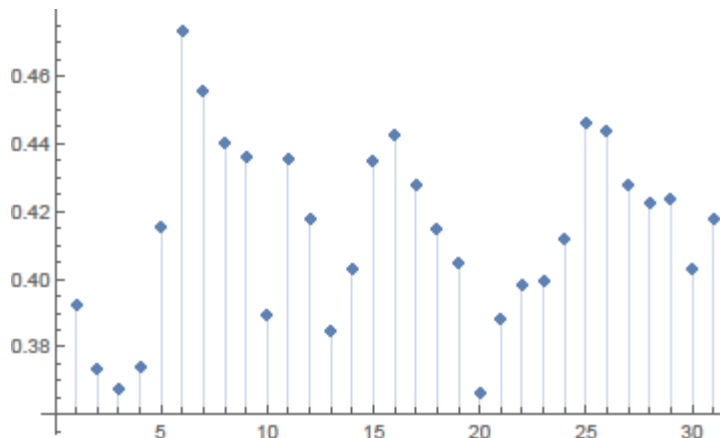


Figure 23. The percentage of women among UTA math undergraduate students since Fall 2005

In Figure 24 we present the percentage of international undergraduate students in the UTA Mathematics Department since the fall of 2005. The number for Fall 2005 is 3 (3%) and the number for Fall 2020 is 26 (10%). The lack of available funding for international students at the undergraduate level is the main cause of the low percentage of international students at UTA and that is also true in mathematics.

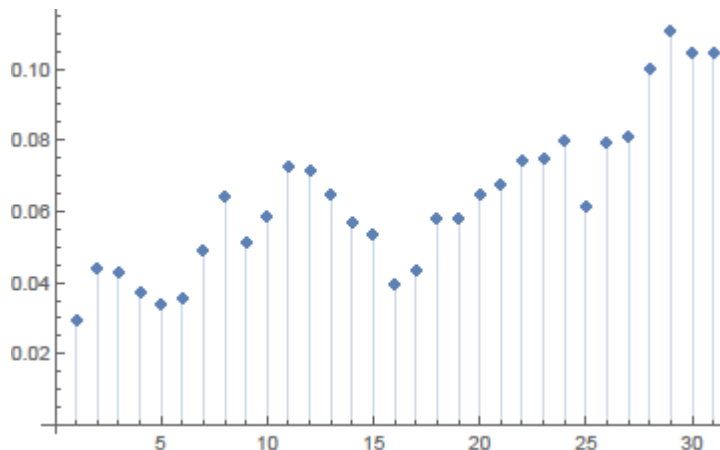


Figure 24. The percentage of international math undergraduate students at UTA since Fall 2005

In Figure 25 we present the percentage of URM mathematics undergraduate students at UTA since Fall 2005. The percentage is obtained by dividing the number of URM mathematics

undergraduate students by the number of mathematics undergraduate students. The number for Fall 2005 is 19 (19%) and the number for Fall 2020 is 94 (38%). As shown from the figure, the growth is steady. Our S-STEM grant supports a sizeable number of URM students and has been helping us to increase the number of undergraduate mathematics majors at UTA.

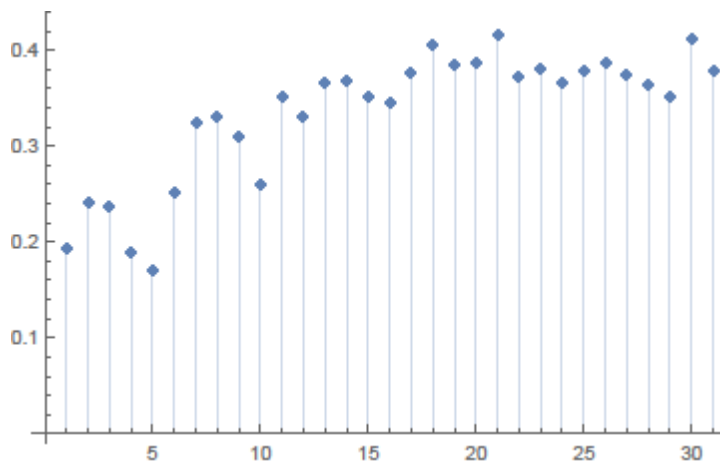


Figure 25. The percentage of URM math undergraduate students at UTA since Fall 2005

In Figure 26 we present the percentage of URM mathematics undergraduate students at UTA among domestic mathematics undergraduate students since Fall 2005. The percentage is obtained by dividing the number of mathematics undergraduate URM students by the number of domestic mathematics undergraduate students. The number for Fall 2005 is 19 (20%) and the number for Fall 2020 is 94 (42%). Since the number and percentage of international students in the undergraduate mathematics program are small, Figure 26 resembles Figure 25.

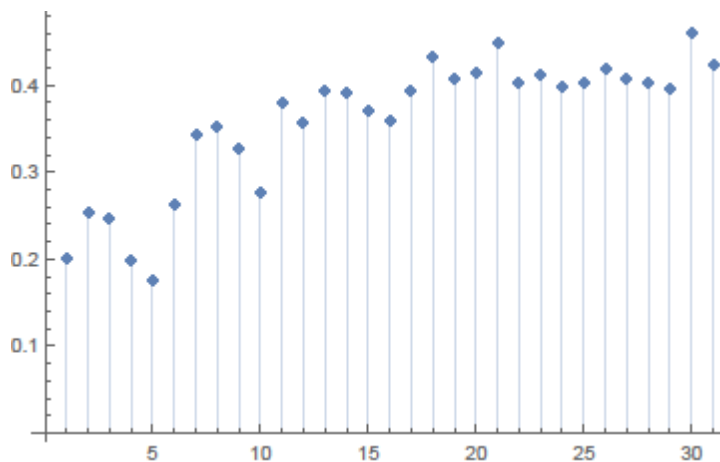


Figure 26. The percentage of URM domestic math UTA undergraduate students since Fall 2005

In the next figure, Figure 27, we present the number of mathematics PhD degrees awarded in the UTA Mathematics Department from 1990 to 2020. In the plot presented, the horizontal axis shows 31 data points, where 1 corresponds to year 1990, 2 corresponds to 1991, 3 to 1992, etc. In particular, 5 corresponds to 1994, 10 to 1999, 15 to 2004, 20 to 2009, 25 to 2014, 30 to 2019, and 31 to 2020. The efforts that started in the fall of 2005 to increase the number of PhD degrees awarded in our department can be clearly seen from Figure 27. The number of mathematics faculty in 2005 was 29, and an external evaluation at that time indicated and recommended that the number of mathematics faculty should be 35 for a balanced PhD program in our department. Unfortunately, the change in the university administration a few years later resulted in various negative changes on campus that also negatively affected the Mathematics Department. The retired faculty at UTA were not replaced, any faculty who moved to other institutions were not replaced, and the resources to departments were drastically reduced. The number of mathematics faculty was reduced to 22, and only recently it has become 25. During that dark period the upper administration reduced graduate assistantship stipends and tuition benefits provided to the graduate students. The Mathematics Department has been able to lessen the negative impact mainly due to the external funding secured for mathematics graduate students. The need to increase the number of mathematics faculty is even more urgent, as the number of PhD degrees awarded by the UTA Mathematics Department has drastically increased. In order to maintain the momentum or even to keep the pace, more mathematics faculty need to be hired to direct PhD research of our doctoral students.

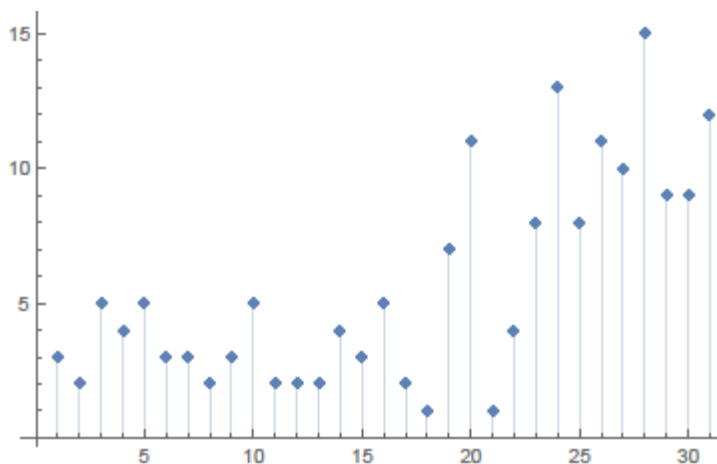


Figure 27. The annual number of math PhD degrees awarded UTA since 1990

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