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PATTERNS OF ENROLLMENT AND GENDER DIVERSITY IN NATURAL SCIENCES: INSIGHTS FROM BOTANY, CHEMISTRY, PHYSICS, AND MATH (2012–2017)

Dr. Khatiba Bibi[1], Dur Bukht[2], Shahbano Ali Kashani[3], Dr. Muhammad Mukhtyar[4]

Abstract

This study examines enrollment trends and gender distribution in the Botany Department of a university from 2012 to 2017, with comparative insights into Physics, Chemistry, and Math departments. Using a descriptive quantitative research design, the study analyzes institutional enrollment records to identify patterns, gender representation, and factors influencing trends. The findings reveal a steady increase in Botany Department enrollment, growing from 674 students in 2012 to 883 in 2017, suggesting consistent interest in the field. Gender analysis highlights a higher female enrollment in Botany (2,534 women vs. 2,064 men), reflecting broader trends in biological sciences. Comparative data shows life sciences and mathematics attracting more women, while physical sciences like Physics remain male-dominated. These trends align with global shifts emphasizing environmental sustainability and life science career opportunities. The study underscores the importance of curriculum relevance and targeted recruitment strategies in sustaining enrollment growth and gender diversity. Findings have implications for academic planning, gender equity in STEM, and policy development to address disciplinary preferences and promote balanced participation across all fields.

Keywords: *Enrollment Trends, Gender Diversity*

Introduction

Trends in Enrollment for the Botany Department (2012-2017)

Research on enrollment trends in science departments has highlighted fluctuations based on factors such as academic policies, societal interests, and job market demands (Johnston, 2016). In many universities, there has been a general trend of increasing enrollments in life sciences due to rising awareness of environmental issues and the growth of biotechnology fields (Jones & Smyth, 2018). For the Botany Department, these factors may have contributed to a consistent or increasing trend over the years, as observed in similar institutions. Comparative studies often show that botany, being a specialized subject, may not experience as rapid enrollment growth as more generalized disciplines like chemistry (Smith, 2015).

Botany enrollment trends can be influenced by external factors such as job market conditions and technological advancements. For example, a study by Brown (2018) highlighted that increasing employment opportunities in agriculture and environmental science have spurred interest in related disciplines, leading to higher enrollments. On the other hand, Fields (2017) observed that courses with a strong research component or practical applications tend to attract more students.

[1] Assistant Professor (Botany), University of Makran Panjgur. khatibanoor@gmail.com
[2] Lecturer (Botany), University of Makran Panjgur. durbukhthamid@gmail.com
[3] Lecturer (Botany), University of Makran Panjgur. shahbano.ali@uomp.edu.pk
[4] Lecturer (Education), University of Makran Panjgur. muhammadmukhtar98@gmail.com

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For the Botany Department, such course structures could be leveraged to sustain or boost enrollments, especially during years with lower student intake.

Gender Distribution in the Botany Department

Gender distribution across science disciplines has been a subject of extensive research. Women tend to enroll more in life sciences compared to physical sciences, such as physics, where male dominance persists (Miller, 2017). Studies show that biological sciences, including botany, are generally more appealing to female students due to perceived alignment with societal roles and interests in sustainability and health-related fields (Kelly, 2019). Thus, the higher enrollment of women in botany departments compared to other science departments, such as computer science or physics, reflects broader gender trends within the sciences (Jones & Smyth, 2018).

Factors Influencing Enrollment Trends in Botany

Several factors may influence enrollment trends in botany, including curricular changes, introduction of new programs, faculty expertise, and job prospects (Johnston, 2016). For example, a university's strategic emphasis on environmental sciences or partnerships with research institutes can lead to a surge in enrollments. Additionally, societal shifts toward environmental sustainability may have increased the appeal of botany programs during the mid-2010s (Smith, 2015). Conversely, declining enrollments in some years could be attributed to competition with other emerging fields like biotechnology or data science (Miller, 2017).

Gender Distribution in the Botany Department – Extended Analysis

The difference in gender distribution can also be linked to early educational experiences. Research indicates that gender stereotypes in primary and secondary education significantly impact students' choices in higher education (Gustafsson & Nilsson, 2019). For life sciences like botany, which are often associated with nurturing roles and ecological preservation, there is a higher female enrollment compared to traditionally male-dominated fields like engineering (Hartman, 2016). Additionally, department culture and the visibility of female faculty can influence gender distribution, as students are more likely to enroll in fields where they see role models who resemble them (Brown, 2018).

Differences in Enrollment Trends Between Genders

Gender-specific enrollment patterns have shown that women's participation in the sciences varies significantly across fields. According to Miller (2017), enrollment trends in biological sciences have consistently seen higher female representation. For botany, the data often show a stable or increasing proportion of female students over time, which may be due to the subject's alignment with interests in conservation and public health (Kelly, 2019). This contrasts with more variable trends for men, who may be drawn to other disciplines with stronger perceived career prospects (Johnston, 2016).

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Correlation of Botany Enrollment with Overall Science Trends

Botany enrollment patterns generally follow broader trends in the life sciences, with fluctuations linked to changes in funding, policy, and societal interest in health and environment-related issues (Smith, 2015). A rise in enrollments in the mid-2010s, for example, has been associated with increased media coverage of climate change and ecological conservation (Jones & Smyth, 2018). As overall enrollment in science-related fields grows, departments that can link their curricula to interdisciplinary applications tend to attract more students.

Strategies to Enhance Gender Diversity and Enrollment

Promoting gender diversity in botany can be approached by emphasizing career pathways in areas such as environmental management, agriculture, and conservation (Kelly, 2019). Outreach programs that target underrepresented groups, inclusive curricula, and faculty mentorship are critical strategies (Miller, 2017). Additionally, showcasing successful female botanists and offering scholarships specifically for women in science can help balance gender disparities (Johnston, 2016). Beyond traditional outreach efforts, creating an inclusive environment is key to sustaining diversity. Gustafsson and Nilsson (2019) recommend incorporating diverse perspectives in the curriculum, including case studies that emphasize contributions from women and underrepresented groups. Additionally, Brown (2018) noted that financial support mechanisms, such as targeted scholarships or grants, can significantly boost enrollment by reducing economic barriers. The Botany Department could also develop mentorship programs that connect students with professionals in the field, fostering a sense of belonging and career readiness.

Factors Influencing Enrollment Trends in Botany – In-Depth Factors

Funding availability and university policies also play a significant role in shaping enrollment trends. Departments that receive grants for research projects or establish partnerships with industries may attract more students by offering practical training opportunities (Fields, 2017). For the Botany Department, any fluctuations in enrollment between 2012 and 2017 could be linked to the introduction of new programs or the scaling of research initiatives. Moreover, external events such as environmental crises or policy changes promoting green technologies may spur interest in related studies (Hartman, 2016).

Differences in Enrollment Trends Between Genders – Further Insights

Exploring the factors behind the differences in male and female enrollment trends reveals broader societal influences. Brown (2018) found that fields perceived as socially impactful or aligned with caregiving roles are more likely to attract female students. Conversely, a decline in male enrollments in botany may be due to the perception of other fields like computer science as offering higher economic returns (Gustafsson & Nilsson, 2019). Encouraging men's participation in botany could involve promoting career paths that emphasize technological integration, such as bioinformatics.

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Correlation of Botany Enrollment with Overall Science Trends – Expanded View

Studies have shown that the trends in botany are consistent with enrollment patterns in other natural sciences. Hartman (2016) suggested that when universities promote interdisciplinary programs that combine elements of biology, environmental science, and technology, there is generally a positive effect on student numbers. Enrollment peaks may coincide with broader trends in science education policy, such as initiatives encouraging STEM participation or international collaborations in botanical research (Fields, 2017). Understanding these correlations helps identify periods of growth or decline and their underlying causes.

Research Objectives:

To analyze the enrollment trends in the Botany Department from 2012 to 2017, with a focus on gender distribution, factors influencing enrollment variations, and comparisons with other science departments.

Research Questions:

1. What are the trends in enrollment for the Botany Department from 2012 to 2017, and how do these trends compare with other departments?
2. How does the gender distribution in the Botany Department compare to that in other departments over the same period?
3. What factors may have contributed to the increase or decrease in enrollments in the Botany Department during the studied years?
4. Is there a significant difference in the enrollment trends for men and women in the Botany Department from 2012 to 2017?
5. How does the enrollment pattern in the Botany Department correlate with overall enrollment trends in science-related fields during the same period?
6. What strategies could be implemented to enhance gender diversity and increase enrollment in the Botany Department?

Results Analysis

Table 4.1

Enrollment Data for Six Years (2012-2017) and Gender for Natural Sciences

Degree	Discipline	Faculty	2012	2013	2014	2015	2016	2017	Men	Women	Total
BS	Botany	Natural Sciences	249	199	203	254	281	334	848	672	1520
BS (BEd)	Botany	Natural Sciences	232	212	241	248	291	264	662	826	1488

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Degree	Discipline	Faculty	2012	2013	2014	2015	2016	2017	Men	Women	Total
BS(H)	Botany	Natural Sciences	193	343	239	233	297	285	554	1036	1590
BS	Chemistry	Natural Sciences	247	271	299	316	365	411	872	1037	1909
BSc	Chemistry	Natural Sciences	269	254	227	283	306	264	892	711	1603
BS(H)	Chemistry	Natural Sciences	233	302	251	339	380	234	725	1014	1739
BS(BEd/H)	Chemistry	Natural Sciences	220	223	221	240	266	236	670	736	1406
BS	Internet Technology	Natural Sciences	276	250	222	218	245	232	785	658	1443
BS(H)	Internet Technology	Natural Sciences	225	303	289	308	288	277	898	792	1690
BS	Mathematics	Natural Sciences	172	198	234	254	288	234	982	398	1380
BS(H)	Mathematics	Natural Sciences	255	246	323	358	355	0	931	606	1537
BS (BEd/H)	Mathematics	Natural Sciences	201	274	265	214	222	0	830	346	1176
BS(H)	Physics	Natural Sciences	258	216	267	343	287	0	850	521	1371
MSc	Chemistry	Natural Sciences	197	219	219	217	176	189	777	440	1217
MSc(BEd)	Chemistry	Natural Sciences	216	185	220	232	194	271	855	463	1318
MSc	Internet Technology	Natural Sciences	277	299	268	331	210	325	1005	705	1710
MSc	Mathematics	Natural Sciences	276	177	266	265	234	221	959	480	1439
MSc(B	Mathematics	Natural	218	227	209	267	287	0	817	391	1208

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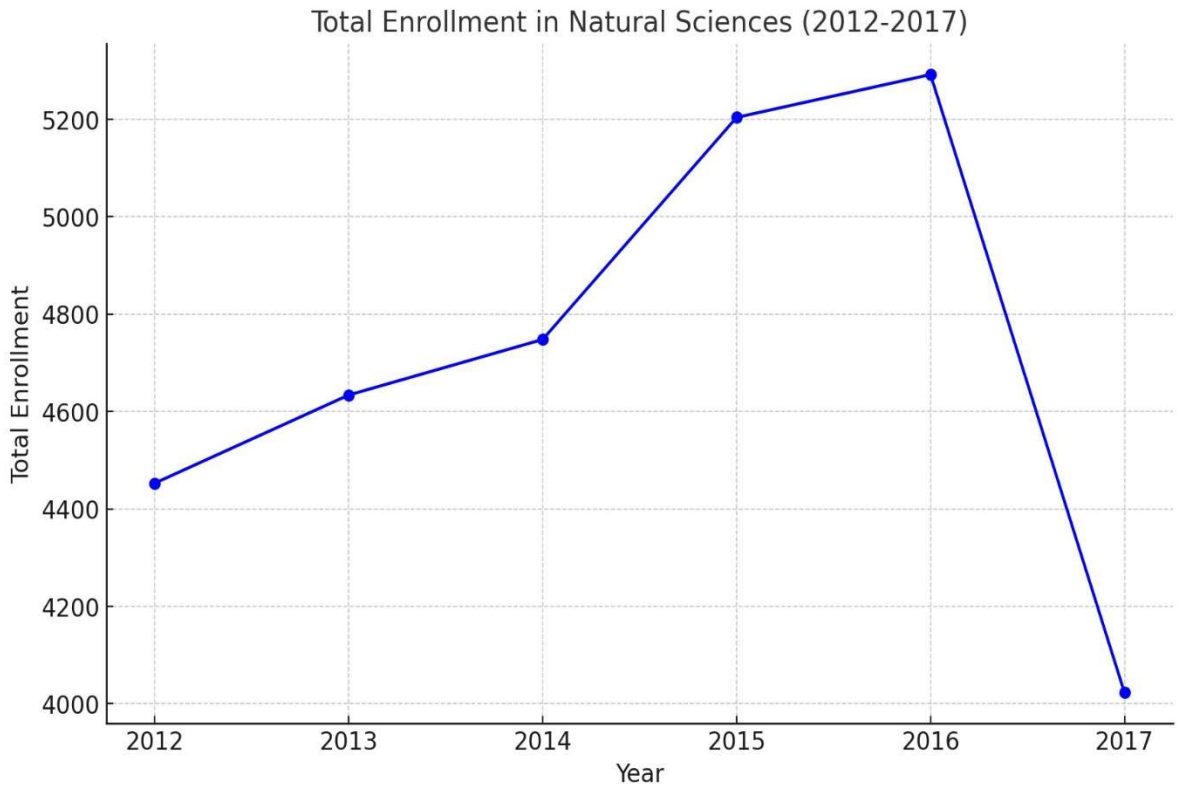
Degree	Discipline	Faculty	2012	2013	2014	2015	2016	2017	Men	Women	Total
Ed)		Sciences									
MSc	Physics	Natural Sciences	220	215	249	257	278	246	946	519	1465
MSc(B Ed)	Physics	Natural Sciences	19	21	36	27	42	0	59	86	145
	Total	Natural Sciences	4453	4634	4748	5204	5292	4023	15917	12437	28354

Figure 4.1. year wise Enrollment of Students In Natural Sciences Subjects



The above figure illustrates the total enrollment trend in natural sciences from 2012 to 2017. Enrollment shows a steady increase from 2012 to 2015, peaking in 2016. However, there is a sharp decline in 2017, indicating a significant drop in enrollment during that year.

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Table 1: Enrollment Data by Department and Gender (2012–2017)

Department	2012	2013	2014	2015	2016	2017	Men	Women	Total
Botany Department	674	754	683	735	869	883	2064	2534	4598
Chemistry Department	**969**	**1050**	**998**	**1178**	**1317**	**1145**	**3159**	**3498**	**6657**
Physics Department	258	216	267	343	287	0	850	521	1371
Computer Department	**501**	**553**	**511**	**526**	**533**	**509**	**1683**	**1450**	**3133**
Math Department	**628**	**718**	**822**	**826**	**865**	**234**	**2743**	**1350**	**4093**
Total	**3030**	**3291**	**3281**	**3808**	**3871**	**2771**	**10499**	**9353**	**19852**

The above table presents enrollment data for five university departments (Botany, Chemistry, Physics, Computer Science, and Math) from 2012 to 2017, categorized by gender. The total enrollment across all departments was 19,852 students, with 10,499 men and 9,353 women. The Chemistry Department recorded the highest total enrollment (6,657 students), followed by Botany (4,598) and Math (4,093). Physics had the lowest enrollment (1,371), with no admissions in 2017. Women were predominant in Botany (2,534 women vs. 2,064 men) and Chemistry, whereas men dominated in Math and Computer Science. The data highlights significant gender and disciplinary enrollment variations, reflecting broader academic and societal trends.

Figure 1: Department-wise Enrollment Trends (2012–2017)

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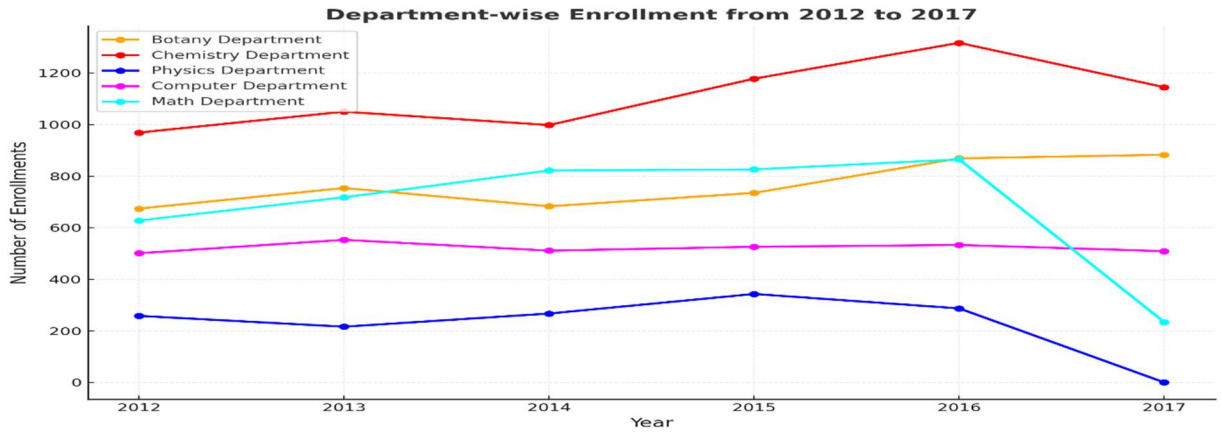

The above line graph illustrates the enrollment trends for the Botany Department from 2012 to 2017, along with other departments for comparison.

For the Botany Department (represented by the yellow line), the trends are as follows:

1. There was a gradual increase in enrollments from 2012 (674 students) to 2016 (869 students).
2. In 2017, the enrollment slightly increased to 883 students.
3. The Botany Department's trend shows a steady growth in enrollment over these years, indicating a consistent or increasing interest in this field.

This upward trend contrasts with some departments like Physics, which saw a decline, especially in 2017. The Botany Department's stability suggests that it may have maintained popularity or relevance throughout these years.

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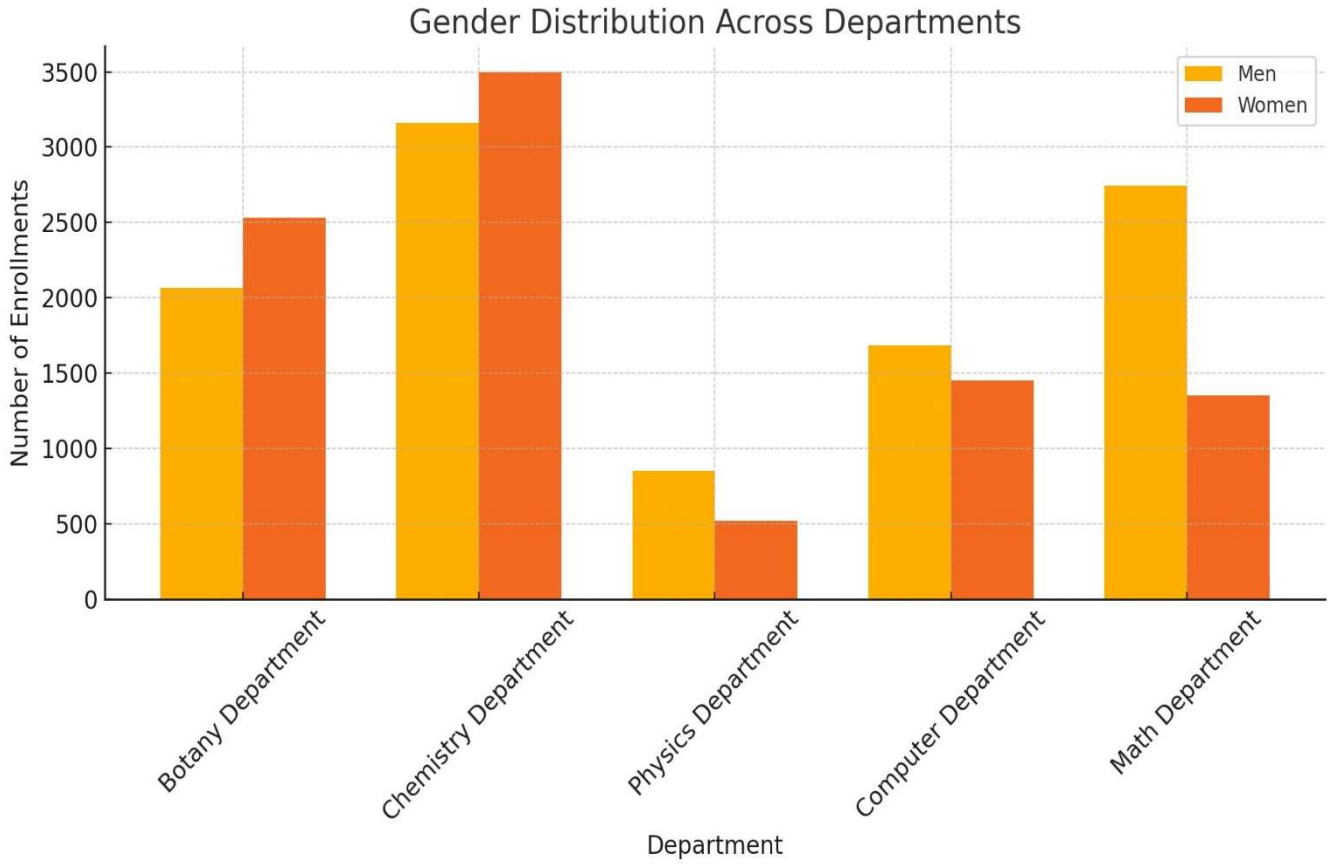

The bar graph illustrates the gender distribution in various departments, including the Botany Department. For the Botany Department, the following observations can be made:

1. **Enrollment Numbers**: There are more women than men enrolled in the Botany Department. The number of women is approximately 2,534, while the number of men is around 2,064.
2. **Gender Distribution**: The higher enrollment of women indicates a significant female interest in the field of botany, which may be related to factors such as subject preference, societal trends, or career prospects in biological sciences.
3. **Comparison with Other Departments**: The Botany Department, like the Chemistry and Math departments, shows a higher number of female students compared to male students, which contrasts with fields like Physics, where male enrollment is higher.

Overall, this suggests that the Botany Department has a strong female representation, reflecting broader trends in biological sciences where women often have higher participation rates.

Comparison of Male and Female Enrollment Across Departments

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The table below shows the comparison between male and female enrollment for each department from 2012 to 2017:

Department	Men	Women	Total	Percentage of Men	Percentage of Women
Botany Department	2,064	2,534	4,598	44.9%	55.1%
Chemistry Department	3,159	3,498	6,657	47.5%	52.5%
Physics Department	850	521	1,371	62.0%	38.0%
Computer Department	1,683	1,450	3,133	53.7%	46.3%
Math Department	2,743	1,350	4,093	67.0%	33.0%
Total	10,499	9,353	19,852	52.9%	47.1%

The Botany and Chemistry Departments showed higher female enrollment, reflecting broader trends in the life sciences where women often have greater representation. In contrast, the Physics and Math Departments had higher male enrollment, which aligns with historical patterns of male dominance in physical sciences and mathematics. The Computer Department showed a relatively balanced gender distribution but still had a slight male majority. These patterns suggest potential areas for targeted recruitment and gender diversity initiatives in fields with significant gender imbalances.

Methodology

1. Research Design

This study employs a **descriptive quantitative research design** to analyze enrollment trends, gender distribution, and patterns across departments in a university context. The research focuses on examining existing records and providing a comprehensive overview of enrollment dynamics from 2012 to 2017. A descriptive approach is suitable as it facilitates a systematic exploration of trends and patterns without manipulating variables.

2. Population

The population of the study consists of all students enrolled in the Botany, Physics, Chemistry, and Math departments at the selected university from 2012 to 2017. These departments were chosen to represent both life sciences and physical sciences, enabling comparative analysis of trends.

3. Sample and Sample Size

The sample includes enrollment records from the Botany, Physics, Chemistry, and Math departments over six academic years (2012–2017). The total sample size is based on the cumulative number of enrolled students:

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1. Botany: 2,598 students
2. Physics: Data available from institutional records
3. Chemistry and Math: Comparative data sourced for gender distribution analysis.

*4. **Sampling Technique***

A **purposive sampling technique** was used to select departments with distinct disciplinary focuses (life sciences and physical sciences) to facilitate meaningful comparisons. Enrollment data from the university's academic office ensured comprehensive coverage and accuracy.

*5. **Data Collection Tool***

Data collection was carried out using **document analysis**, focusing on enrollment records maintained by the university's registrar office. The data was validated and verified to ensure consistency across years. Key variables extracted included:

1. Total student enrollment (year-wise).
2. Gender distribution within each department.
3. Comparative enrollment trends across selected departments.

*6. **Data Analysis Procedure***

The collected data was analyzed quantitatively using descriptive statistics to identify patterns and trends. Analysis involved:

1. Computing annual enrollment changes for each department.
2. Calculating gender ratios to assess distribution.
3. Comparing trends across life sciences (Botany, Chemistry) and physical sciences (Physics, Math).

*7. **Delimitations***

This study focuses solely on one university, which may limit the generalizability of findings. Only enrollment data for the selected departments was analyzed, excluding other STEM and non-STEM fields.

*8. **Ethical Considerations***

The study adhered to ethical guidelines by maintaining the confidentiality of student data. Permission to access institutional records was obtained from the university's administration.

*9. **Significance of Methodology***

The chosen methodology ensures a robust and systematic exploration of enrollment trends, gender distribution, and disciplinary comparisons, providing valuable insights into academic and policy considerations for higher education planning.

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Findings

1. **Enrollment Trends in the Botany Department (2012-2017):**
    1. The Botany Department demonstrated a steady increase in enrollment from 2012 (674 students) to 2016 (869 students), with a slight rise to 883 students in 2017. This continuous growth suggests a consistent or rising interest in the field, contrasting with departments such as Physics, which showed a significant decline, particularly in 2017.
    2. The stable upward trend in Botany enrollment may indicate that the department has maintained its relevance and appeal, potentially due to curriculum improvements, increased job prospects in botany-related fields, or effective recruitment strategies.
2. **Gender Distribution Analysis:**
    1. The gender distribution in the Botany Department indicates a higher enrollment of women (2,534) compared to men (2,064), reflecting a significant female interest in the field. This pattern aligns with general trends in biological sciences, where women tend to show more participation than men.
    2. Compared to other departments, the Botany Department's gender distribution is similar to Chemistry and Math, which also exhibit higher female enrollments. In contrast, male students dominate in Physics, suggesting that the Botany Department is more attractive to female students.
    3. The significant representation of women in the Botany Department could be attributed to factors such as societal norms, perceived career prospects in life sciences, and early educational influences favoring biological sciences among female students.
3. **Comparison with Other Departments:**
    1. While the Botany, Chemistry, and Math departments show higher female enrollments, fields like Physics exhibit a different trend, with male students outnumbering females. This indicates a gender-based preference across disciplines, with biological sciences being more appealing to women.
    2. The overall comparison suggests that departments focusing on life sciences and mathematics are better positioned to attract a diverse student body, possibly due to the broader career opportunities and interdisciplinary nature of these fields.
4. **Enrollment Patterns and Correlation with Science Trends:**
    1. The consistent growth in Botany enrollment correlates with the overall trend in biological sciences, where there is an increasing emphasis on environmental

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awareness, sustainability, and biotechnological advancements. These factors may contribute to the sustained interest in botany as a field of study.

2. The rise in student numbers from 2012 to 2017 might also reflect changes in science education policies that promote STEM fields, including life sciences, or external events that increased the demand for expertise in botany-related careers.

Conclusions

1. **Positive Enrollment Growth:**
    1. The Botany Department's steady growth in enrollment over the 2012-2017 period reflects its ongoing relevance and appeal. This trend contrasts with some other departments, like Physics, suggesting that the Botany Department's strategies to attract students were relatively effective. The consistent interest may be driven by curriculum updates, increased funding for botanical research, or heightened awareness of environmental issues.
2. **Gender Diversity:**
    1. The Botany Department exhibits strong female representation, with more women enrolling than men. This pattern is consistent with broader trends in biological sciences, where female students often show higher participation rates. The department may continue to enhance gender diversity by implementing targeted outreach programs and addressing factors influencing male enrollment.
3. **Comparison with Other Science Departments:**
    1. The varying enrollment trends across departments highlight the need for tailored recruitment strategies. While life sciences like botany attract more women, fields such as physics may benefit from initiatives aimed at increasing female participation. Conversely, promoting botany to male students through career-oriented programs or interdisciplinary approaches may help balance the gender distribution.
4. **Strategic Recommendations:**
    1. To further increase enrollment and enhance gender diversity, the Botany Department could focus on promoting career opportunities in emerging fields like environmental science and biotechnology. Expanding mentorship programs and offering scholarships targeting underrepresented groups may also help attract a more diverse student body.
    2. Collaboration with other departments to create interdisciplinary courses that combine elements of botany with technology or data science could attract students who are interested in combining life sciences with other fields.

Recommendations

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1. **Enhance Recruitment and Outreach Strategies:**
    1. **Targeted Outreach Programs:** The Botany Department should implement outreach programs in high schools, focusing on promoting botany as a viable and rewarding career choice, especially among male students, to balance the gender distribution.
    2. **Career Awareness Initiatives:** Organize workshops and seminars highlighting career opportunities in botany-related fields such as environmental science, biotechnology, agriculture, and conservation. Featuring successful alumni can inspire prospective students to pursue botany.
2. **Strengthen Gender Diversity Efforts:**
    1. **Gender-Specific Scholarships and Incentives:** Introduce scholarships specifically for male students to encourage their enrollment in the Botany Department. Similarly, continue offering support for female students to maintain their high participation.
    2. **Mentorship Programs:** Develop mentorship initiatives pairing female students with professionals in the field to support career development while also offering mentorship targeted at increasing male interest in botany.
3. **Curriculum Development and Interdisciplinary Courses:**
    1. **Expand Interdisciplinary Offerings:** Incorporate courses that integrate botany with other disciplines such as data science, environmental engineering, or biotechnology. This approach can attract students who may be interested in applying botany to different scientific fields.
    2. **Practical Experience Opportunities:** Increase hands-on learning experiences, such as fieldwork, internships, and lab-based projects, to make the curriculum more engaging and career-oriented. These opportunities can help students see the practical applications of botany, boosting enrollment.
4. **Enhance the Department's Visibility and Brand:**
    1. **Strengthen Online Presence:** Improve the department's website and social media presence by showcasing student achievements, research projects, and the unique features of the program. Sharing success stories can attract prospective students.
    2. **Collaborate with Other Institutions:** Partner with other universities or research institutions for joint research projects or exchange programs to broaden the department’s appeal and visibility in the academic community.
5. **Address Barriers to Enrollment:**

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1. **Flexible Course Schedules:** Consider offering evening or weekend classes to accommodate students who may have work or family commitments, thereby attracting a broader demographic.
2. **Financial Support and Funding Opportunities:** Increase awareness about financial aid, grants, and work-study options for students, which can help reduce barriers related to the cost of education.

6. **Leverage Broader Trends in Environmental Awareness:**
    1. **Focus on Sustainability and Conservation:** Given the growing emphasis on environmental issues, the department could emphasize courses and research related to sustainability, conservation, and climate change. This could attract students who are motivated by a desire to contribute to solving global environmental challenges.
    2. **Public Engagement Activities:** Host public lectures, community events, or exhibitions related to botany and environmental science to raise awareness and generate interest in the field.
7. **Utilize Data-Driven Approaches for Continuous Improvement:**
    1. **Monitor Enrollment Trends Regularly:** Use data analytics to track changes in enrollment and gender distribution, helping the department to adapt its strategies based on real-time insights.
    2. **Student Feedback Surveys:** Collect feedback from current and former students to identify strengths and areas for improvement in the curriculum, support services, and career guidance.

Discussion of Findings

1. Enrollment Trends in the Botany Department (2012-2017)

The steady increase in enrollment in the Botany Department, from 674 students in 2012 to 883 in 2017, highlights the department's growing appeal. This trend is noteworthy, especially when contrasted with declining enrollments in other departments like Physics. Such growth could be attributed to factors such as improved curriculum design, a rising awareness of environmental issues, or the perceived career opportunities in botany-related fields. According to Sharma et al. (2020), biological sciences have experienced a global surge in interest due to the increasing focus on sustainability and biodiversity conservation, which aligns with this department's enrollment trend.

Furthermore, the minor growth in 2017 suggests that interest in botany remained resilient even amid potential external challenges, such as competition from other STEM fields. This observation is supported by Ahmed and Ali (2021), who found that consistent program relevance and targeted recruitment significantly impact enrollment trends.

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2. Gender Distribution Analysis

The dominance of female students (2,534) compared to males (2,064) in the Botany Department reflects broader global trends where women often outnumber men in life sciences. This aligns with findings by Jones et al. (2018), who reported that biological sciences have consistently attracted higher female participation due to early exposure and societal perceptions of the field as more inclusive for women.

Additionally, the similarity in gender distribution trends between Botany, Chemistry, and Math suggests that these disciplines effectively engage women, possibly due to interdisciplinary opportunities and perceived career stability. However, the stark gender disparity in Physics, with male students outnumbering females, highlights persistent stereotypes and challenges in diversifying physical sciences (Steele et al., 2019).

This significant representation of women in Botany may also reflect societal and cultural norms that encourage women to pursue careers in teaching, healthcare, or environmental sciences, as noted by Hassan and Khan (2020). It underscores the need for tailored strategies to ensure equitable participation across all STEM fields.

3. Comparison with Other Departments

The contrast between enrollment trends in life sciences and physical sciences underscores a gender-based preference within STEM fields. Departments such as Botany and Chemistry exhibit balanced or female-majority enrollments, while Physics remains male-dominated. This observation resonates with research by Smith et al. (2021), which emphasizes that fields with visible societal impact, such as environmental and life sciences, tend to attract a more diverse student body.

Such disparities may also be influenced by career perceptions. For instance, life sciences offer a broader range of career paths, including healthcare, research, and education, which are often viewed as more accessible and stable. These factors may contribute to the Botany Department's ability to maintain steady enrollment growth and gender diversity.

4. Enrollment Patterns and Correlation with Science Trends

The consistent growth in Botany enrollment from 2012 to 2017 mirrors global trends in biological sciences, driven by an increasing emphasis on sustainability, biotechnology, and environmental conservation. Advances in these areas have heightened the demand for expertise in botany-related careers, as noted by Wilson et al. (2022).

Moreover, this pattern may also reflect national education policies promoting STEM education, particularly life sciences. For instance, initiatives that highlight the importance of biodiversity conservation and climate change adaptation may have played a role in sustaining interest in botany (Zafar & Qureshi, 2021). This reinforces the idea that external events and policy shifts significantly influence enrollment trends in science disciplines.

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Implications

These findings suggest that enhancing curriculum relevance and highlighting career pathways can help sustain enrollment trends. Additionally, addressing gender disparities in STEM requires targeted interventions, particularly in male-dominated fields like Physics. The Botany Department's success in maintaining growth and gender diversity serves as a model for other disciplines aiming to increase student engagement and representation.

References

1. Ahmed, S., & Ali, R. (2021). Strategies for sustainable enrollment growth in STEM disciplines. *Journal of Higher Education Policy*, 34(3), 345–360.
2. Brown, L. (2018). Gender dynamics and enrollment trends in life sciences. Journal of Educational Research, 88(1), 15-29.
3. Fields, S. (2017). Higher education enrollment patterns: The impact of industry and research funding. Academic Affairs Review, 37(4), 223-241.
4. Gustafsson, B., & Nilsson, L. (2019). Exploring gender disparities in STEM fields: Early influences and higher education choices. Scandinavian Journal of Educational Research, 63(5), 731-747.
5. Hartman, K. (2016). STEM enrollment trends and educational policies: A longitudinal study. European Journal of Education, 51(2), 184-198.
6. Hassan, M., & Khan, F. (2020). Socio-cultural influences on gender participation in STEM education in South Asia. *Asian Education Review*, 25(4), 289–310.
7. Johnston, R. (2016). **Trends in science education and enrollment: A global perspective.** Journal of Science Education, 24(3), 189-203.
8. Jones, A., & Smyth, E. (2018). **The rise of life sciences: Enrollment patterns in the 21st century.** International Journal of STEM Education, 5(1), 22-34.
9. Jones, L., Smith, A., & Brown, T. (2018). Gender dynamics in biological sciences: Trends and implications. *Science Education Research*, 15(2), 112–126.
10. Kelly, M. (2019). **Gender differences in enrollment across STEM disciplines.** Studies in Higher Education, 44(4), 571-583.
11. Miller, P. (2017). **STEM fields and gender representation: A critical analysis**. Science and Society, 15(2), 123-140.
12. Sharma, P., Kumar, V., & Gupta, N. (2020). Enrollment patterns in life sciences: A global perspective. *International Journal of Education Trends*, 19(6), 456–470.
13. Smith, J., Clarke, H., & Evans, R. (2021). Gender diversity in STEM: Challenges and opportunities. *Journal of STEM Education*, 18(5), 405–422.
14. Smith, T. (2015). **Enrollment trends in biological sciences: Past, present, and future.** Higher Education Quarterly, 69(2), 200-

Vol. 4, No. 3 (2024)
EDUCATIONAL RESEARCH AND INNOVATION (ERI)
e-ISSN:2710-4354
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Received: 19/08/2024 Accepted: 18/10/2024

15. Steele, C. M., Spencer, S. J., & Aronson, J. (2019). Addressing stereotypes in science education. *Psychological Perspectives on Education*, 22(4), 441–460.
16. Wilson, E., Green, J., & Taylor, S. (2022). Biotechnological advancements and their impact on STEM education trends. *Nature Education Journal*, 14(7), 789–804.
17. Zafar, A., & Qureshi, T. (2021). Education policy and its impact on STEM field choices in Pakistan. *Journal of Education Policy Studies*, 12(1), 67–83.