جامعة المنصورة

كلية التربية

Evaluating the Academic Biology Teacher Preparation Program in English at the Faculty of Education, Mansoura University, in Accordance with International Standards

By

Prof. Dr. Hamdy A. Al-Azeem El-Banna,
Prof. Dr. Eman M. Gad Al-Mawla,
Fatma Samara

Journal of The Faculty of Education- Mansoura University
No. 129 – Jan . 2025

Evaluating the Academic Biology Teacher Preparation Program in English at the Faculty of Education, Mansoura University, in Accordance with International Standards

Prof. Dr. Hamdy A. Al-Azeem El-Banna,
Prof. Dr. Eman M. Gad Al-Mawla,
Fatma Samara

Abstract

This research aimed to evaluate the Academic Biology Teacher Preparation Program (ABTPP) conducted in English at the Faculty of Education, Mansoura University, against established international standards. Employing a descriptive approach grounded in content analysis of the academic courses for the 2023-2024 academic year, the research utilized various instruments. Three questionnaires were administered to key stakeholders: (1) students and graduates to identify deficiencies in the program and to suggest contemporary topics in biology; (2) instructors from the Faculty of Science to assess the program's strengths and weaknesses, identify current trends, and propose recommendations for improvement; and (3) teachers from language schools to evaluate labor market needs and the preparedness of program graduates. A comprehensive list of international standards relevant to the departments of Zoology, Botany, Chemistry, Physics, Mathematics, and Geology served as an analytical tool for the evaluation of program content. Following the validation of the instruments, data collection and analysis revealed significant shortcomings in the ABTPP's curriculum design, pedagogical approaches, and assessment practices. Specifically, the program exhibited deficiencies in integrating contemporary academic trends, interdisciplinary and transdisciplinary perspectives, modern teaching methodologies, technological advancements, language proficiency development, and effective assessment methods. The research advocates for a reconceptualization of the Academic Biology Teacher Preparation Program offered in English, guided by international standards, to improve both its efficacy and relevance. In addition, to address the recent changes implemented in the secondary curriculum by the Ministry of Education, ensuring that the program remains responsive to the evolving educational landscape.

Keywords: Evaluation, Biology, Academic Program, Teacher Preparation, International Standards

Introduction

Investment in education, particularly within the domains of science and technology, is essential for national progress in the contemporary interconnected world (Al-Shehria & Gharamah, 2021). Egypt, akin to many nations, confronts intricate environmental, demographic, and economic challenges that necessitate the cultivation of a scientifically literate populace (Trilling & Fadel, 2010). It is therefore imperative to equip educators with the competencies required to promote scientific inquiry and critical thinking. This endeavor demands a thorough examination and enhancement of science education programs, particularly in fundamental disciplines such as biology (Trilling & Fadel, 2010).

Furthermore, Egypt's Vision 2030 underlines the importance of high-quality education and the development of technical and technological skills for fostering innovative and competitive citizens. This vision highlights the significance of STEM education in bridging scientific knowledge with real-world applications (Jacobson, Taylor, & Richards, 2016). Nevertheless, the implementation of a unified approach to scientific pedagogy across all educational levels poses significant challenges (Jacobson, Taylor, & Richards, 2016). Frameworks such as the Next Generation Science Standards (NGSS) present a viable solution by advocating for coherence and real-world pertinence in science education. A lot of studies highlighted significant deficiencies in teacher preparation and professional development programs, which subsequently affect educator effectiveness (Abalkhail, 2019; Abu Zuhair, 2019). In response to emerging global trends, cultural shifts, and socioeconomic changes, Abdul Salam (2019) emphasized the necessity for specialized science teacher programs within the faculties of education.

Additionally, further studies have indicated the critical importance of enhancing educators' pedagogical competencies and technological proficiency (Chai, Koh, & Tsai, 2010). This necessity aligns with broader initiatives such as the Next Generation Science Standards (NGSS), the STEM approach, and Egypt's Vision 2030, all advocating for improved preparation of science teachers, particularly within the field of biology. The American Association for the Advancement of Science (AAAS), through its "Project 2061," further supports this initiative by offering valuable resources aimed at enhancing science and mathematics literacy among educators and curriculum developers.

Concerns regarding the efficacy of biology teacher education programs in Egypt are increasingly prevalent, with novice educators

frequently reporting feelings of inadequacy regarding practical skills and pedagogical content knowledge (Meyer, 2016). To address these concerns, it is essential to adopt a comprehensive and balanced approach to biology teacher preparation, one that integrates theoretical knowledge, practical skill development, and pedagogical expertise (Widodo & Agustin, 2017). This approach should prioritize the advancement of practical skills and the incorporation of interdisciplinary and transdisciplinary coursework, equipping future biology teachers to effectively address contemporary challenges and prepare students for success in the 21st century.

As outlined by Hanover (2023), effective program evaluation is a systematic and iterative process that necessitates careful planning and active engagement with stakeholders. This process involves logistical planning (identification of programs, definition of evaluation purpose, and determination of format), strategic planning (formulation of research questions, identification of key performance indicators, and establishment of timelines and resources), implementation (data collection and analysis based on key performance indicators, along with ongoing reporting and feedback), and interpretation and refinement of results to ensure transparency and the generation of actionable insights for program improvement.

Consequently, this research aimed to evaluate the academic biology teacher preparation program at the Faculty of Education, Mansoura University, contributing to the development of a curriculum that meets international standards, integrates contemporary biological advancements and equips future biology educators with essential linguistic, technological, and pedagogical competencies for success in their field.

The Rationale for the Research

The research problem was identified through a series of meticulous observations conducted by internal auditing teams, which focused on assessing the quality and academic accreditation processes of specific programs. To gather comprehensive data, questionnaires were thoughtfully distributed to various stakeholders, including current students, graduates, and faculty members within the Faculty of Science. Additionally, input was sought from teachers at language schools to enrich the findings. This data collection process was further informed by recent initiatives from the Ministry of Education, which aims to modernize and enhance secondary school curricula. A detailed overview and analysis of each component will be presented in the subsequent sections, providing a clearer understanding of the research's context and significance.

A. Perspectives of Internal Audit Teams on Quality Assurance and Program Accreditation

The research problem has been identified through the observations made by internal auditing teams for quality and the academic accreditation of specific programs. The program design necessitates the establishment of a matrix to align course proportions with national academic standards. This matrix should encompass details regarding assessment methods, references, and teaching strategies for hybrid or distance education. It is imperative to have a periodic internal review mechanism and up-to-date program review reports. The process requires improvement, and program goals need to be modified to effectively establish the program. Acknowledging the need to review learning styles and teaching strategies, the Program Review and Development Committee must conduct evaluations. Additionally, practicum files are to include approved plans, Bylaws, guides, supervision mechanisms, student needs, complaints, satisfaction questionnaires, and implementation plans. Attainment of self-learning in all academic courses is also deemed essential.

B. Assessing Gaps and Emerging Trends in Biology Program: A Questionnaire-Based Needs Assessment

Subsequently, the researcher administered several questionnaires to various groups, comprising fourth-year students enrolled in these programs, graduate students, faculty members from the Faculty of Science teaching in these programs, as well as teachers and principals in language schools. Following an analysis of the questionnaire results, the following findings from the students' opinions were derived:

Table 1

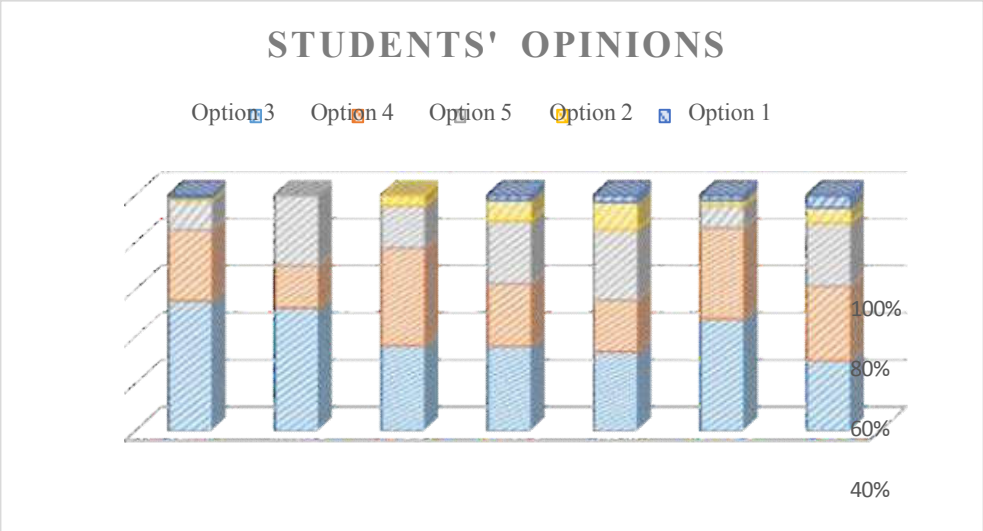
Results of Students' Questionnaire

Item	Satisfaction %
Resources	28%
Language	52.2%
Technology	36.3%
Academic Aspect	35.9%
Educational Aspect	33.7%
Training Courses	47.62%

The figure below presents a detailed depiction of the questionnaire results:

Figure 1

Results of Students' Questionnaire



It is obvious from the previous figure that:

- **Resources:** 28% of the students expressed satisfaction with the resources, while the remaining students reported satisfaction.
- **Language:** 52.2% of the students reported mastering or practicing most of their language skills during the program, while the rest feel that this aspect needs improvement.
- **Technology:** 36.3% of the students agreed that they have been trained to use design and data analysis software, while the remaining students believe that this aspect needs improvement.
- **Academic Aspect:** 35.9% of the students expressed satisfaction with the academic aspect of the program, while the rest believe that this aspect needs improvement.
- **Educational Aspect:** 33.7% of the students expressed satisfaction with the educational aspect, while the rest believe that this aspect needs improvement.
- **Training Courses:** 62% of the students reported receiving training courses over the course of the program, while the remaining students denied this.
- **Faculty Members:** Thirty percent of the students expressed complete satisfaction with the faculty members, while the remaining students did not.

In the second place, the following findings were drawn from the instructors' perspectives:

Table 2

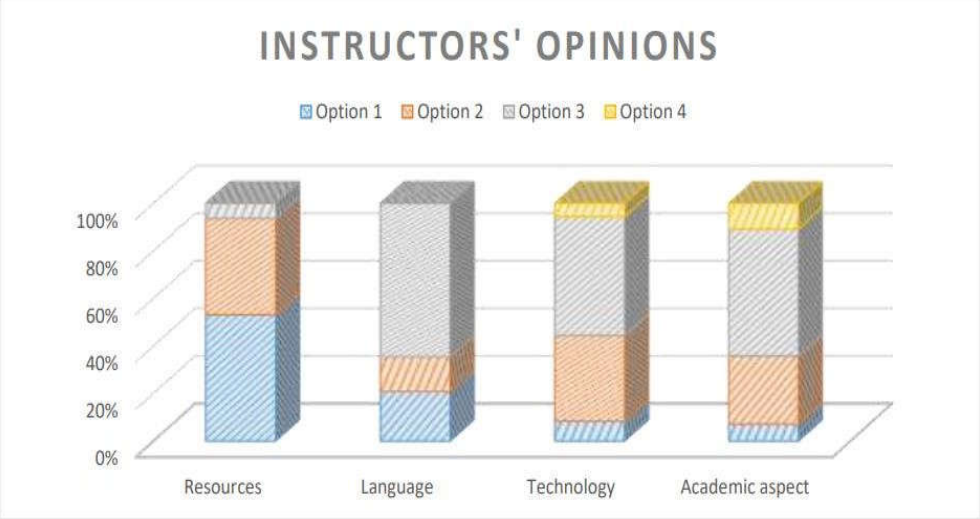
Results of Instructors' Questionnaire

Item	Satisfaction %
Resources	53.1%
Language	20.8%
Technology	8.3%
Academic Aspect	7.1%

The figure below presents a detailed depiction of the questionnaire results:

Figure 2

Results of Instructors' Questionnaire



It can be seen from the previous figure that:

- **Resources:** 53.1% of the faculty members have expressed satisfaction with the resources, while the remaining faculty members agree that this aspect requires improvement.
- **Language:** 20.8% of the faculty members have indicated satisfaction with the language aspect for the students, while the majority believe this area requires improvement.
- **Technology:** 8.3% of the faculty members have expressed satisfaction with the technological aspect, with the remainder indicating that this area requires improvement.

- **Academic aspect:** 7.1% of the faculty members have expressed satisfaction with the academic aspect, while the majority believe that this area requires improvement.

Finally, the following findings were drawn from the teachers' perspectives at language schools:

Table 3

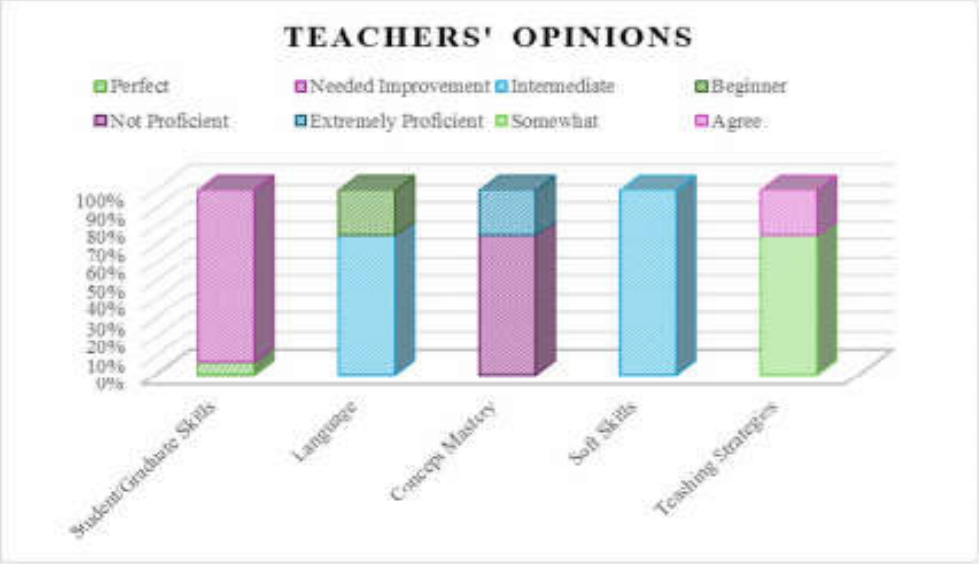
Results of TEACHERS' Questionnaire

Item	Satisfaction %	
Student/Graduate Skills	Perfect	Needed Improvement
	6.7%	93.3%
Language	Intermediate	Beginner
	75%	25%
Content Mastery	Not Proficient	Extremely Proficient
	75%	25%
Soft Skills	Intermediate	
	100%	
Teaching Strategies	Somewhat	Agree
	75%	25%

The figure below presents a detailed depiction of the questionnaire results:

Figure 3

Results of Teachers' Questionnaire



It can be seen from the previous figure that:

- The analysis of feedback from principals and teachers reveals that merely 6.7% expressed contentment with the skill set of students and graduates, while the prevailing sentiment was that there is a need for improvement.
- Approximately 75% of teachers categorized students' language proficiency as "intermediate," with the remainder deeming it "beginner." It was noted that students face challenges in articulating scientific concepts in English.
- In terms of imparting scientific knowledge, 75% of teachers perceived students as inadequately proficient, while 25% regarded them as highly skilled. Regardless, all teachers collectively observed a deficiency in students' ability to bridge prior and current knowledge, indicating a lack of foundational understanding. Additionally, the prevailing perception was that students predominantly attend school due to obligation rather than a genuine interest in education.
- With regard to students' soft skills, it was universally agreed that these skills are at an intermediate level.
- Regarding the deployment of diverse teaching strategies, 75% of educators acknowledged students' partial ability, while the remaining 25% attested to their adeptness in this area. Furthermore, all teachers concurred that students exhibit openness to address challenges and unexpected educational situations within the classroom. However, a unanimous concern was raised regarding students' inadequacy in utilizing technology effectively for educational purposes.

C. University-Ministry Curriculum Alignment: A Gap Analysis

The necessity for this research is further underscored by recent initiatives from the Ministry of Education aimed at modernizing the secondary school curricula. These initiatives focus on the integration of various scientific disciplines, including chemistry, physics, biology, and geology. A notable example is the newly launched Integrated Science course for first-year secondary students. Additionally, the content of these courses has seen substantial modifications, with both deletions and additions made to enhance this integrated approach. Therefore, this research seeks to enhance the Biology Teacher Preparation Program in English to align with international standards.

In conclusion, the program's strengths and weaknesses are assessed by internal auditing teams, academic accreditation, student feedback, instructor perspectives, and teachers' perspectives. While the program holds academic accreditation, critical areas for improvement have been identified. These include the need to align course content with national standards, incorporate appropriate assessment methods for hybrid learning, and establish a structured internal review mechanism. Student feedback revealed varying levels of satisfaction, with some expressing contentment with resources and faculty, while many underscore the necessity for enhanced language skills, technology proficiency, and academic rigor. Instructors also emphasized the need to improve language proficiency, technological competence, and pedagogical skills among students, along with addressing gaps in foundational knowledge and critical thinking abilities.

Moreover, the recent curriculum updates released by the Ministry of Education, particularly their emphasis on integration, highlight a significant discrepancy that underscores the need for a thorough revision and enhancement of the biology curriculum within the Faculty of Education. To address these shortcomings, essential measures include revising the program design, implementing interventions to enhance language skills and technological proficiency, and fostering critical thinking skills among students. Further areas for exploration and intervention encompass the development of a language proficiency program, integration of advanced technology, enhancement of academic rigor focusing on integration, improvement of student support services, implementation of instructor preparation programs, and the undertaking of longitudinal research to assess the long-term impact of program improvements. By implementing these recommendations, the program can elevate its quality and better equip graduates to tackle professional challenges.

Problem of the Research

To address the underlying issue, the research endeavored to respond to the principal inquiry: **"How effective is the Current Biology Teacher Preparation Program in English offered by the Faculty of Education at Mansoura University in preparing student teachers to meet International Standards?"** This primary query is further delineated through the subsequent sub-questions:

1. What are the pertinent international standards that necessitate adherence within the academic biology teacher preparation program in English?

2. To what extent are the international standards included in the academic biology teacher preparation program in English at the Faculty of Education, Mansoura University?

Objectives of the Research

The primary objectives of this research were to accomplish the following:

1. Compile a comprehensive list of international standards essential for inclusion in the academic biology teacher preparation program in English.
2. Assess the availability of international standards within the academic biology teacher preparation program in English at the Faculty of Education, Mansoura University.

Hypothesis of the Research

To address the study sub-questions, the following hypothesis is posited: "**The content of the current academic biology teacher preparation program in English aligns with a minimum of 70% of the established international standards for biology teacher education".**

Method

The methodology employed in this study encompassed a comprehensive descriptive analytical approach, which included a thorough review of relevant prior research and studies concerning the development of teacher preparation programs in alignment with international standards. This encompassed an examination of biology projects, national and international foundations, and academic biology programs offered at select international universities. The objective of this review was to establish a set of standards that would serve as the foundation for the development of an academic biology teacher preparation program in English.

Evaluation Aim

The evaluation of the academic biology program within the Faculty of Education is crucial to ensure it effectively prepares future teachers. This process aims to address critical issues like the shortage in academic knowledge of biology teachers. By assessing the program's strengths and weaknesses, the researcher can determine if it equips students with the necessary recent academic knowledge in biology fields and fosters a deeper understanding of biology's connection to environmental challenges. This is particularly important in the context of Egypt's Vision 2030, which emphasizes Education for Sustainable Development (ESD). A well-designed program should integrate ESD principles and move beyond siloed disciplines towards a holistic approach. This evaluation ensures our

graduates possess the essential skills for the 21st century, including critical thinking and problem-solving, as well as the technological and pedagogical expertise to effectively integrate ESD and technology into their classrooms. Ultimately, the aim is to create a new generation of biology teachers who are not only knowledgeable but also practitioner, researcher, and empowered to lead the way in sustainability education.

Therefore, to address this issue, this research seeks to answer the following sub- questions which are:

1. What are the pertinent international standards that necessitate adherence within the academic biology teacher preparation program in English?
2. To what extent are the international standards included in the academic biology teacher preparation program in English at the Faculty of Education, Mansoura University?

Evaluation Instrument Design

The development of a curriculum evaluation instrument for an academic biology teacher preparation program offered in English involved several critical stages. Initially, a comprehensive list was created to address the first question: **"What are the pertinent international standards that necessitate adherence within the academic biology teacher preparation program in English?"** This phase included a thorough incorporation of best practices observed in leading international universities, ensuring that the program aligns with recognized benchmarks in the field. This encompassed:

- **Leading Biology Programs:** Practices from premier biology programs at institutions such as the University of Pennsylvania, Anderson University, Caltech, Harvard, and California (Berkeley).
- **General Biology Programs:** Standards from programs at universities including Stanford, the University of Pennsylvania, Oxford, Manchester, the Massachusetts Institute of Technology (MIT), and Bristol.
- **International Undergraduate Biology Teacher Preparation Programs:** Insights from programs at institutions like Grand Canyon University, Arizona State University, and Louisiana State University.

Furthermore, a comprehensive inventory of courses offered at these universities was meticulously compiled. This process involved the elimination of redundancies and the indication of course availability at each institution, with the frequency of each course being diligently calculated. The findings revealed that certain courses exceeded a 30% representation,

such as Introduction to Biology - The Molecular Biology of Life + lab, Intermediate Biology: Molecular Biology and Genetics, General Chemistry I, General Physics: Mechanics, Heat and Sound, Calculus, Part I, Statistics for Biologists or Introductory Statistics, Programming Languages and Techniques II, among others. Conversely, other courses fell below this threshold, as detailed in the accompanying appendix. However, the researcher was able to identify several critical topics and distill relevant indicators. These indicators were deemed essential for the formulation of courses that align with the program's goals, the anticipated qualities of its graduates, and the demands of the job market. Moreover, the formulation of this evaluation instrument took into consideration key elements such as:

1. **International and National Benchmarks:**
    - **International:** Standards and guidelines from organizations such as the National Science Foundation (NSF), Trends in International Mathematics and Science Study (TIMSS), the National Association of Biology Teachers (NABT), National Science Education Standards (NSES), "A New Biology for the 21st Century," Advanced Placement Biology, and The Biology Project (University of Arizona), etc. (See Chapter Two)
    - **National:** Initiatives and development projects within Egypt's faculties of education aimed at enhancing the quality of biology education, as well as standards set by the National Authority for Education Quality Assurance and Accreditation. (See Chapter Two)
2. **Alignment with Egypt Vision 2030:**
    - **21st-Century Skills:** Integration of skills and knowledge essential for the modern workforce.
    - **Strategic Goals:** Development of programs aligned with national strategic goals.
    - **Teaching and Learning Methodologies:** Enhancement of pedagogical approaches and practices.
    - **Accreditation and Quality Standards:** Adherence to established accreditation and quality standards.
3. **Programmatic Frameworks:**
    - **Unified Bylaws:** Compliance with standardized bylaws for bachelor's-level teacher preparation programs, incorporating credit hour systems as implemented across various Egyptian faculties of

education, with particular emphasis on the bylaw of the Faculty of Education at Mansoura University.

- **Internal Bylaws:** Guidelines tailored to STEM teacher preparation programs at the bachelor's level within Egyptian universities, incorporating credit hour systems.
- **Council for the Accreditation of Educator Preparation (CAEP):** Utilization of the CAEP Revised 2022 Standards Workbook.

4. **Informed by Research and Trends:**
   - **Research Reviews:** Analysis of previous studies on innovations in biological teacher preparation programs.
   - **Current Trends:** Integration of recent trends and bioethical issues relevant to biology education.

In this context, the researcher developed the initial framework of international standards in various disciplines, including zoology, botany, chemistry, physics, mathematics, and geology. This framework underwent thorough review and refinement through feedback obtained from a panel of experts. Following the completion of these modifications, the evaluation instrument has been formalized across all disciplines. It is currently being applied to assess the integration of its indicators into the existing academic courses of the biology teacher preparation program.

Sampling

The finalized list of international standards served as the evaluative framework for all courses within the current academic biology teacher preparation program offered in English at faculty of Education, Mansoura University.

Data Analysis

This phase entails a comprehensive analysis of the data collected to assess the alignment of the academic biology teacher preparation program offered in English with recognized international standards. The analysis will specifically identify indicators within each course that exemplify the program's capacity to meet these standards. Quantitative methods will be utilized to evaluate the extent of alignment in zoology, botany, chemistry, physics, mathematics, and geology courses, thereby addressing the research question: **"To what extent are international standards included in the academic biology teacher preparation program in English at the Faculty of Education, Mansoura University?"** This analysis is

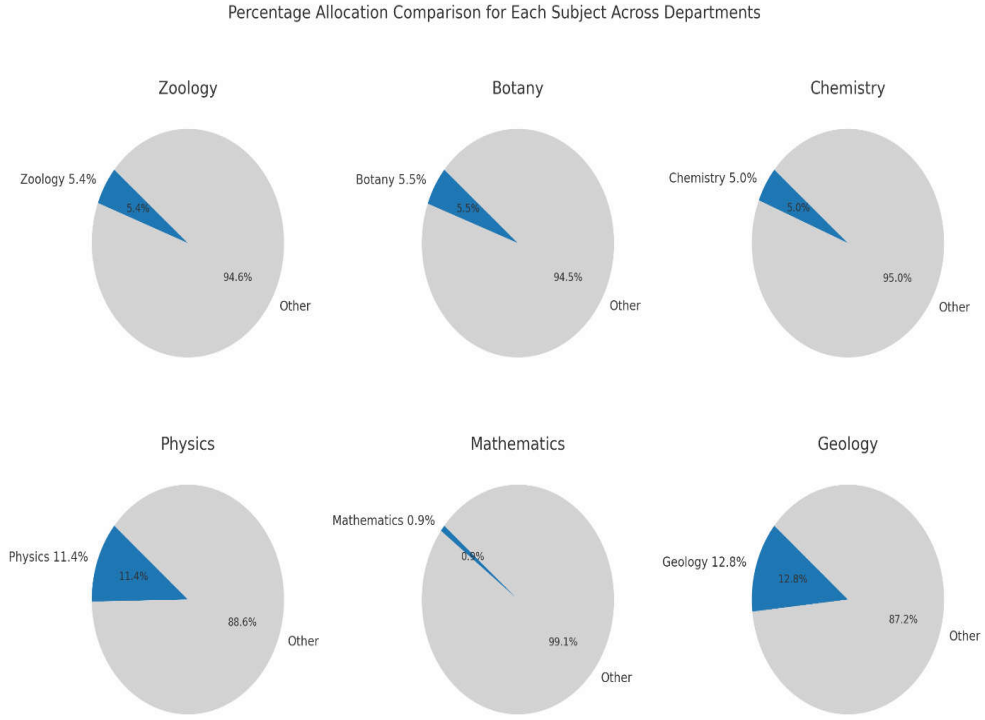
underpinned by the hypothesis that the program's academic content corresponds with a minimum of 70% of the established international standards for biology teacher education. The following section provides a detailed representation of these findings:

Findings

The figure below presents a summary of the findings from a content analysis of the courses within the academic biology teacher preparation program in English, using international standards as the benchmark for analysis.

Figure 4

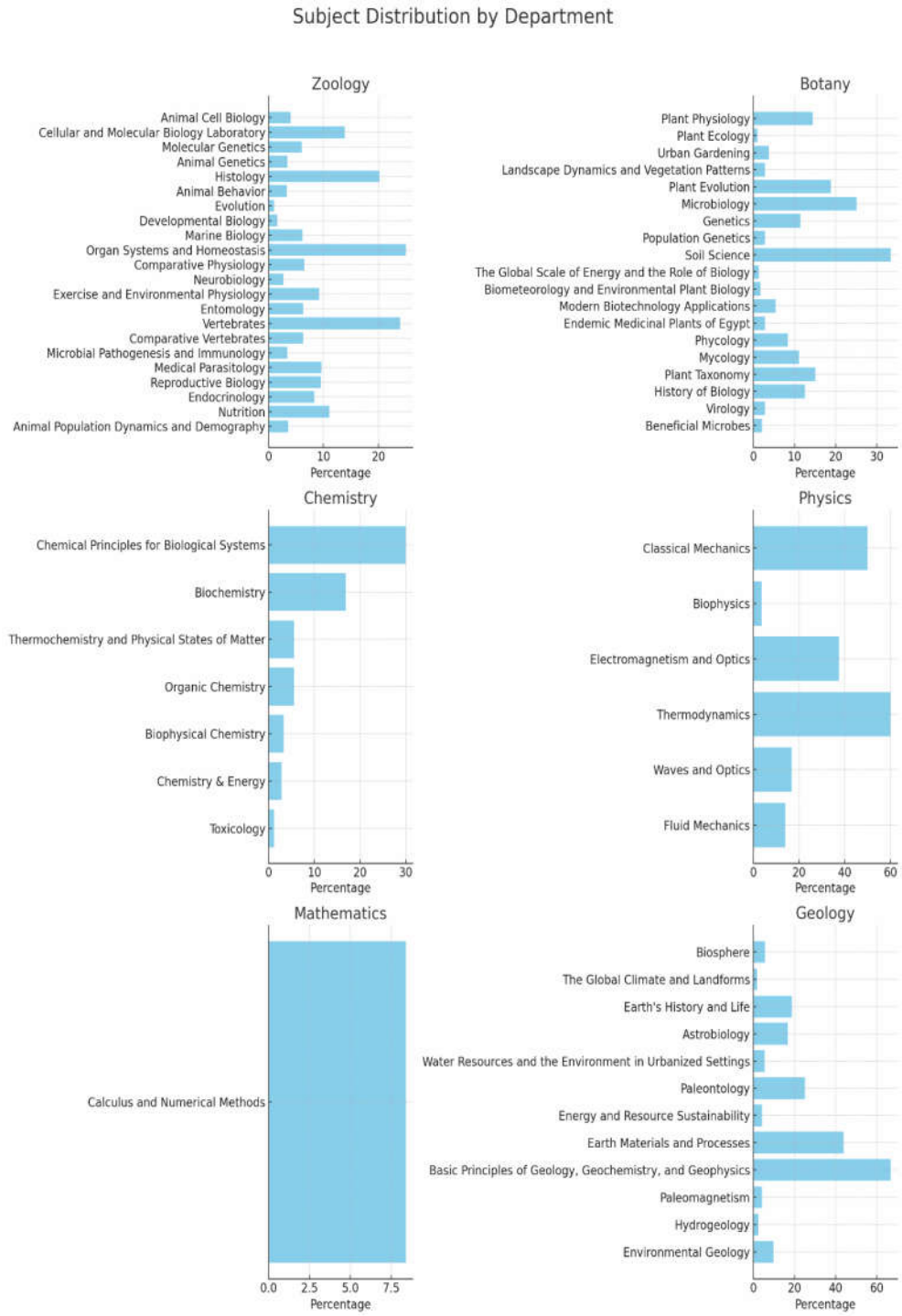
Departmental Compliance: Percentage of Standards Met



The following is a detailed review of these results.

Figure 5

Measuring Up: Standards Achievement Across Key Scientific Disciplines


Subject Distribution by Department
Zoology
Animal Cell Biology
Cellular and Molecular Biology Laboratory
Molecular Genetics
Animal Genetics
Histology
Animal Behavior
Evolution
Developmental Biology
Marine Biology
Organ Systems and Homeostasis
Comparative Physiology
Neurobiology
Exercise and Environmental Physiology
Entomology
Vertebrates
Comparative Vertebrates
Microbial Pathogenesis and Immunology
Medical Parasitology
Reproductive Biology
Endocrinology
Nutrition
Animal Population Dynamics and Demography
0 10 20
Percentage
Botany
Plant Physiology
Plant Ecology
Urban Gardening
Landscape Dynamics and Vegetation Patterns
Plant Evolution
Microbiology
Genetics
Population Genetics
Soil Science
The Global Scale of Energy and the Role of Biology
Biometeorology and Environmental Plant Biology
Modern Biotechnology Applications
Endemic Medicinal Plants of Egypt
Phycology
Mycology
Plant Taxonomy
History of Biology
Virology
Beneficial Microbes
0 10 20 30
Percentage
Chemistry
Chemical Principles for Biological Systems
Biochemistry
Thermochemistry and Physical States of Matter
Organic Chemistry
Biophysical Chemistry
Chemistry & Energy
Toxicology
0 10 20 30
Percentage
Physics
Classical Mechanics
Biophysics
Electromagnetism and Optics
Thermodynamics
Waves and Optics
Fluid Mechanics
0 20 40 60
Percentage
Mathematics
Calculus and Numerical Methods
0.0 2.5 5.0 7.5
Percentage
Geology
Biosphere
The Global Climate and Landforms
Earth's History and Life
Astrobiology
Water Resources and the Environment in Urbanized Settings
Paleontology
Energy and Resource Sustainability
Earth Materials and Processes
Basic Principles of Geology, Geochemistry, and Geophysics
Paleomagnetism
Hydrogeology
Environmental Geology
0 20 40 60
Percentage

The figure outlined the key areas of emphasis within the fields of zoology, botany, chemistry, physics, mathematics, and geology.

Zoology:

- **Core Areas:** "Organ Systems and Homeostasis," "Histology," and "Vertebrates" dominate the field.
- **Secondary Areas:** "Nutrition" and "Medical Parasitology" receive moderate attention.
- **Missing Areas:** A notable absence of "Cancer Biology" and "Synthetic Biology" suggests a lack of emphasis on emerging or specialized fields.

Botany:

- **Core Areas:** "Soil Science" and "Microbiology" are the primary subjects.
- **Secondary Areas:** "Plant Taxonomy" and "Plant Physiology" receive additional focus.
- **Missing Areas:** The exclusion of "Ethnopharmacology" and "Toxicology and Environmental Safety" indicates limited interest in applied or therapeutic plant research.

Chemistry:

- **Core Area:** "Chemical Principles for Biological Systems" is the primary focus.
- **Secondary Areas:** "Biochemistry" and "Thermochemistry and Physical States of Matter" receive moderate attention.
- **Missing Areas:** Specialized fields like "Bioanalytical Chemistry" and "Pesticide Action" are not represented.

Physics:

- **Core Areas:** "Thermodynamics," "Classical Mechanics," and "Electromagnetism and Optics" are heavily emphasized.
- **Missing Areas:** A lack of representation in "Radiation Therapy" and "Medical Imaging" suggests a lower emphasis on applied or medical physics.

Mathematics:

- **Core Area:** "Calculus and Numerical Methods" is the sole focus, indicating a traditional approach with limited emphasis on computational methodologies.

Geology:

- **Core Areas:** "Basic Principles of Geology, Geochemistry, and Geophysics" and "Earth Materials and Processes" form the foundation.

- **Secondary Areas:** "Paleontology" and "Earth's History and Life" indicate interest in evolutionary history and geobiology.
- **Missing Areas:** Limited coverage of applied fields like "Hydrogeology" and "Environmental Geology" suggests a focus on foundational knowledge rather than specialized environmental or resource-based geology.

Discussion

Through the evaluative study conducted by the researcher on the current English-language Biology teacher preparation program, and examining its curricula under both the semester system and the current credit-hour system, the researcher reached the following conclusions:

- Despite the curricular transition from a semester to a credit hour system, the core of the Biology Teacher Preparation Program remains substantially unchanged. The program continues to offer the same academic courses as the standard Biology program, thereby failing to differentiate itself.
- The current curriculum lacks alignment with contemporary educational trends, sustainability goals, and the vision of Egypt 2030. Consequently, it falls short in producing graduates equipped to be innovative, research-oriented practitioners capable of integrating knowledge across disciplines.
- The program's interdisciplinary and transdisciplinary integration of courses is inadequate for preparing graduates for the demands of the modern workforce.
- Supporting courses in chemistry, physics, geology, and mathematics, while offered as minors, are not effectively integrated into the biology curriculum. This deficiency hinders graduates' ability to apply interdisciplinary knowledge in their teaching practice.
- While English language proficiency is a cornerstone of the program, the current curriculum inadequately supports language development. The absence of dedicated English language courses throughout the program compromises graduates' ability to deliver instruction and communicate effectively in English.
- The program's pedagogical approach is outdated, relying predominantly on traditional teaching methods that may stifle students' scientific inquiry and enthusiasm.
- Furthermore, the program's assessment system is ineffective. Excessive reliance on a final exam, coupled with a dearth of continuous assessment, undermines students' learning progress. The

limited variety of assessment methods, particularly the overemphasis on multiple-choice questions, fails to comprehensively evaluate students' critical thinking and communication skills.

- Finally, the program's integration of technology is insufficient. Graduates lack the technological proficiency necessary to leverage digital tools for effective teaching and learning.

Conclusion

The Biology Teacher Preparation Program demonstrates significant shortcomings in its curriculum design and implementation. The failure to modernize course content and pedagogical approaches is particularly concerning, as it hinders the development of graduates equipped for the demands of 21st-century education. The program's limited emphasis on interdisciplinary studies, language proficiency, and technological integration further compromises its effectiveness in preparing future educators. Moreover, the reliance on traditional assessment methods is outmoded and insufficient for evaluating students' comprehensive abilities. These deficiencies collectively undermine the program's capacity to produce highly qualified biology teachers. According to these results, the hypothesis is rejected, and alternative hypothesis is accepted as "**The content of the current academic biology teacher preparation program in English does not align with a minimum of 70% of the established international standards for biology teacher education".**

References

AbalKhail, M. S. (2019). The reality of professional development for teachers in light of the Kingdom's Vision 2030 from their point of view. In *The First International Conference: The Teacher: Development Requirements and Future Aspiration for the Saudi Scientific Society for Teacher (Jisem)* at King Khalid University in the Kingdom of Saudi Arabia, during the period from 4-5 / 12 / 2019 (pp. 186-205).

Abazhair, Z. A. (2019). Challenges of professional development for teachers in the Kingdom of Saudi Arabia. In *The First International Conference: The Teacher: Development Requirements and Future Aspirations for the Saudi Scientific Society for Teacher (Jisem)* at King Khalid University in the Kingdom of Saudi Arabia, during the period 4-5 / 12 / 2019 (pp. 498-518).

Abdul Salam, A. M. (2019). Development of programs and decisions for preparing science teachers in faculties of education in light of global trends and societal and economic changes. In *The First International*

Conference: The Teacher: Development Requirements and Future Aspirations for the Saudi Scientific Society for Teacher (Jisem) at King Khalid University in the Kingdom of Saudi Arabia, during the period 4-5 / 12 / 2019.

Al-Shehria, M. S., & Gharamah, H. (2021). A proposed vision to achieve the requirements of professional development for biology teachers of the secondary stage in light of the Kingdom's Vision 2030. *Cypriot Journal of Educational Sciences*, *16*(1), 148–166. https://doi.org/10.18844/cjes.v16i1.5517

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2010). Facilitating preservice teachers' development of technological, pedagogical, and content knowledge (TPACK). *Educational Technology & Society, 13*(4), 63–73. https://www.ifets.info/journals/13_4/7.pdf

Hanover. (2023). *Best practices: Program evaluation and KPIs*. Retrieved from https://www.graydi.us/blog/gray-insights/what-is-an-academic-program-evaluation-process

Jacobson, M. J., Taylor, C. E., & Richards, D. (2016). Computational scientific inquiry with virtual worlds and agent-based models: new ways of doing science to learn science. *Interactive Learning Environments*, *24*(8), 2080–2108. https://doi.org/10.1080/10494820.2015.1079723

Meyer, J. H. (2016). Threshold concepts and pedagogic representation. *Education + Training*, *58*(5), 463–475. https://doi.org/10.1108/et-04-2016-0066

Trilling, B., & Fadel, C. (2010). *21st century skills: Learning for life in our times*. Choice Reviews Online, 47(10), 47–5788. https://doi.org/10.5860/choice.47-5788

Widodo, A., & Agustin, R. (2017). Exploring the implementation of biology teacher education curriculum through productive pedagogy framework. *Semantic Scholar*. https://www.semanticscholar.org/paper/Exploring-the-Implementation-of-Biology-Teacher-Widodo-Agustin/fb3084a185aadec5011c97bd8a2b6e4190e21517