# The Impact of Attendance on Academic Performance in Forensic Science Undergraduate Programs: A cohort Analysis

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**Abstract:** Attendance in educational settings has long been regarded as a crucial factor influencing student performance and outcomes. In the field of forensic science, where both theoretical knowledge and practical skills are essential, regular attendance in lectures, laboratories, and tutorials may have a significant impact on students' academic success. Previous research has indicated a positive correlation between attendance and grades across various disciplines; however, there is a need for discipline-specific studies to understand the nuances and specific requirements of different fields of study. This study investigates the relationship between attendance and academic performance in forensic science undergraduate cohorts during the 2023/2024 academic year. Attendance records and final grades for first, second, and third-year students were analyzed to determine how attendance impacts students' academic outcomes. Using regression analysis and Pearson correlation coefficients, the study reveals significant positive correlations between attendance and grades in several modules across all three years. First-year modules exhibited strong correlations, with most showing significant relationships (r ranging from 0.6768 to 0.9573, $p < 0.05$). Second-year data also indicated significant correlations in many modules, though with some variability (r up to 0.9773, $p < 0.05$). The third-year results demonstrated significant correlations in selected modules, but also instances of non-significant correlations, highlighting a shift in the factors influencing academic performance as students' progress. These findings underscore the critical role of attendance in academic success and suggest that targeted educational strategies to improve attendance could enhance student outcomes in forensic science programs.

**Keywords: attendance; performance; grades; forensic; university**

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## Introduction

Higher education plays a critical role in shaping the future workforce and driving innovation. Within this context, forensic science education is particularly crucial as it prepares students to work in fields that are vital to public safety, law enforcement, and the judicial system (1,2). Ensuring that forensic science students receive high-quality education is imperative for maintaining the integrity and efficacy of forensic investigations.

The relationship between class attendance and academic performance has been a subject of extensive research across various disciplines in higher education (3–5). This relationship is especially significant in forensic science undergraduate programs because of the field's practical and applied nature (6).

Forensic science education uniquely blends theoretical knowledge with hands-on laboratory experience, necessitating consistent engagement in both classroom and laboratory settings (6). This dual modality of learning presents an ideal framework to investigate how attendance influences student performance, not only in theoretical understanding but also in practical competencies (2,7).

Previous research in various academic disciplines has consistently shown that regular class attendance is positively correlated with academic performance (3,5,7). Students who attend classes regularly tend to have higher grades, better understanding of the material, and greater overall success in their courses. Findings of this ilk, however, are generalized across fields and may overlook the unique blend of practical skills and theory in forensic science education. However, these findings are often generalized across different fields of study and may not account for the unique aspects of forensic science education, which tends to foster more critical thinking and hands-on experience with forensic tools. Lectures, seminars, laboratory and practical sessions provide students with opportunities to apply theoretical knowledge, develop critical thinking skills, and gain hands-on experience with forensic tools and techniques (2,6). Therefore, regular attendance in both lectures and laboratory sessions is presumed to be integral to achieving high levels of competency in forensic science education. Illes *et al.*, (7) studied the reasons behind the high engagement levels of students in a forensic science course. A survey of 88 third-year undergraduate students on a forensic course revealed that hands-on collaborative learning, particularly laboratory practicals were the most favoured sessions. The study found that the attendance rates of students in the lab sessions were around 99.59%, whereas the lectures were slightly lower with a 90.60%

attendance rate. However, as there is a decrease in attendance in lectures, there is also a decrease in laboratory attendance as they are not always mandatory (8,9).

Students may skip lectures and other sessions for a variety of reasons, including responsibilities outside of academia, social issues, the need to work, as well as neurodiversity and physical issues (10). In addition, students may learn better from recorded lectures, rather than the attendance of live lectures. This has been shown by Voelkel *et al*. (11). After the impact of COVID-19 on the education systems, more students find it feasible to work more from home or check in on recorded lectures in their own time. This indicates that absenteeism may not necessarily harm student learning (11,12). Nordmann *et al*., (13) showed that performance could be predicted using both attendance and use of lecture recordings. Again, this suggests that regular lecture attendance may not be essential for highly motivated students with stronger attainment and self-discipline skills who are more adept at effectively managing their workload (13,14).

Despite the established link between attendance and academic performance in general education, specific studies focusing on forensic science students are limited. In addition, most existing research focuses on one or two modules, and does not consider a bigger picture. Furthermore, many studies do not account for the varying levels of student participation and engagement within these classes. There is a need for more nuanced research that examines how different instructional methods and class formats influence attendance and, subsequently, academic performance in forensic science programs.

This study aims to investigate the relationship between attendance and academic performance in forensic science cohorts at the undergraduate level. By analysing the attendance records and grades of first-year, second-year, and third-year students during the 2023/2024 academic year, this research seeks to provide empirical evidence on how attendance in modules with different types of educational activities—lectures, laboratories, and tutorials—affects students' grades. This study will seek to quantify the strength, and direction, of these relationships, thereby contributing to the development of effective educational strategies and policies within forensic science programs.

## Methods

### *Ethics*

This study has received ethical approval from the University of Hull ensuring it meets the university's ethical guidelines. Ethics no: 23-24-101.

### *Academic modules*

The data analysed in this study was from students enrolled on the first, second, and third year cohorts of the 2023/2024 academic calendar. The data used is only of those students who finished the academic year. Students who have not attended or completed assessments by the end of the academic year were not included in this study. The only students included in this study were those enrolled on the core Forensic Science BSc. Modules consist of a unit of study within the programme itself, covering a specific topic within forensic science. The first and second years consists of six modules, each baring 20 credits, taken over two semesters. The final year consists of 5 modules, with an individual research project which is doubly weighted at 20 credits. The indicative content and indication of the practical based modules is shown in **TABLE 1**.

**TABLE 1** *Breakdown of module content.*

| Year | Module Number | Indicative content | Practical based module | Credits |
|---|---|---|---|---|
| 1 | 1 | Chemical and biological forensic science | Yes | 20 |
| | 2 | Biological sciences | No | 20 |
| | 3 | Skills based (essays, statistics and presenting) | Yes | 20 |
| | 4 | Chemical and biological forensic science | Yes | 20 |
| | 5 | Biological sciences | No | 20 |
| | 6 | Biological and Chemical Sciences | No | 20 |
| 2 | 1 | Forensic Science | Yes | 20 |
| | 2 | Skills for scientists (statistics, job searching, critical analyses) | No | 20 |
| | 3 | Crime scene investigations/forensic science | Yes | 20 |
| | 4 | Biological Sciences | No | 20 |
| | 5 | Biological Sciences | No | 20 |
| | 6 | Crime scene investigations/forensic science | Yes | 20 |
| 3 | 1 | Student lead research project | Yes* | 40 |
| | 2 | Research on forensic science topic | No | 20 |
| | 3 | Biological sciences | Yes[a] | 20 |
| | 4 | Chemistry/biological forensic science | Yes | 20 |
| | 5 | Biological forensic sciences | No | 20 |

** Students can choose to do a non-lab-based project*

*[a] Dependent upon optional module (only one of three contains practical elements)*

*Attendance Data*

Attendance data was collected for all lectures, laboratory sessions and tutorials within each module. However, in the final year, one module spans both semesters, therefore only a total of five modules are taken.

The university operates a 'self-scan' system, whereby students scan their student cards to indicate their attendance at sessions. This data is digitally stored against each student record, indicating their overall attendance for the module.

Student numbers fluctuate between 23-30 for each year, with students re-taking modules, leaving the university or deferring modules. Year 3, which started in 2021, occurred during the pandemic, a period that significantly affected student attendance at universities, resulting in less students within the cohort (15).

*Academic Performance Data*

The overall grades were collected for all modules. These modules are composed of one, two, or three assessments with differing weightings to the overall module grade. Only the final grade was taken for comparison against the attendance on that particular module.

*Data Analysis*

Data was collated and averaged into the grade classification of 1st (70-100%), 2:1 (60-69%), 2:2, (50-59%), 3rd (40-49%) and fail (0-39%). Regression analysis was then performed to analyse the data and Pearson correlation coefficients were calculated to determine the relationship between attendance rates and grades. The Pearson correlation coefficient indicats the strength of the linear relationship between two variables. Values closer to 1 (or -1) indicate a stronger relationship. Separate analyses were conducted for each cohort. Statistical significance was used to assess the significance of the linearity. P-values at <0.05 indicate a significant relationship between attendance and grades.

## Results

*Year 1*

The results for the first-year modules are shown in **TABLE 2**, with **FIGURES 1 and 2** showing the averages across each grade classification in each of the modules for the two terms. All modules exhibited positive correlations between attendance and grades (with correlation coefficients ranging from 0.6768 to 0.9573, p <0.05). However, no significant correlation was found in module 4 (r = 0.3620, p = 0.691). The highest correlation was observed in module 6 (r = 0.9164), suggesting a very strong relationship between attendance and academic performance.

**TABLE 2** *Module data for the first year showing average grades with attendance and Pearson correlation. Statistical significance is shown at <0.05.*

| Module | Grade (%) | Attendance (%) | n | $R^2$ | r | *p* |
|---|---|---|---|---|---|---|
| **1** | 56.52 (±33.99) | 77.94 (±25.55) | 25 | 0.6114 | 0.7819 | 0.0001 |
| **2** | 60.84 (±28.19) | 64.39 (±27.22) | 30 | 0.4581 | 0.6768 | 0.0001 |
| **3** | 56.65 (±18.00) | 59.90 (±24.98) | 23 | 0.4592 | 0.6787 | 0.0004 |
| **4** | 69.85 (±16.23) | 73.02 (±23.72) | 26 | 0.131 | 0.3620 | 0.0691 |
| **5** | 52.97 (±13.49) | 53.35 (±28.99) | 29 | 0.5417 | 0.7360 | 0.0001 |
| **6** | 48.55 (±20.73) | 54.39 (±32.94) | 23 | 0.9164 | 0.9573 | 0.0001 |

n= number of students completing the module; r= Pearson correlation coefficient; p= statistical significance. ± denotes standard deviation.

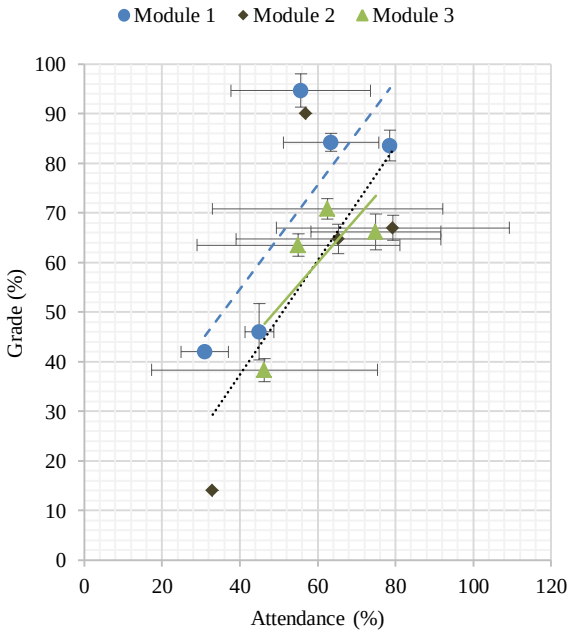


**FIGURE 1** Average results by classification, term one (modules 1-3) from the first-year cohort. Error bars denote standard deviation.

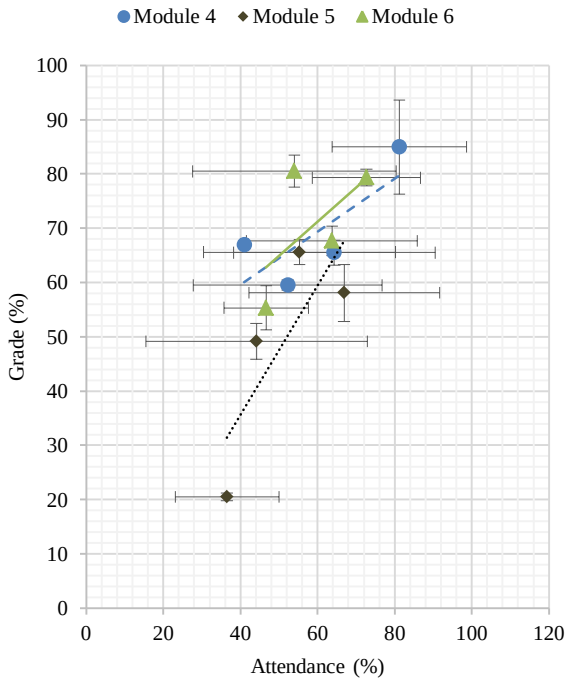


**FIGURE 2** Average results by classification, term two (modules 4-6) from the first-year cohort. Error bars denote standard deviation.

*Year 2*

The results for the second-year modules are shown in **TABLE 3**, with **FIGURES 3 and 4** showing the averages across each grade classification in each of the modules for the two terms. In the second year, all modules showed positive correlations (*r* ranging from 0.7686 to 0.9773). Modules 2, 4, and 6 did not show significant correlations despite relatively high r values (r = 0.9591, 0.7686 and 0.9063 respectively, p > 0.05).

**TABLE 3** *Module data for the second year showing average grades with attendance and Pearson correlation. Statistical significance is shown at <0.05.*

| Module | Grade (%) | Attendance (%) | n | $R^2$ | r | *p* |
|---|---|---|---|---|---|---|
| **1** | 67.55 (±8.08) | 76.13 (±19.77) | 29 | 0.9551 | 0.9773 | 0.0227 |
| **2** | 56.17 (±56.17) | 44.97 (±31.55) | 29 | 0.9198 | 0.9591 | 0.0988 |
| **3** | 70.97 (±9.71) | 65.07 (±65.07) | 29 | 0.8608 | 0.9277 | 0.0244 |
| **4** | 70.50 (±14.53) | 75.15 (±22.57) | 24 | 0.5907 | 0.7686 | 0.2314 |
| **5** | 53.05 (±9.97) | 56.91 (±29.41) | 24 | 0.8658 | 0.9305 | 0.0217 |
| **6** | 69.28 (±10.48) | 50.64 (±17.06) | 25 | 0.8213 | 0.9063 | 0.2778 |

n= number of students completing the module; r= Pearson correlation coefficient; p= statistical significance. ± denotes standard deviation.

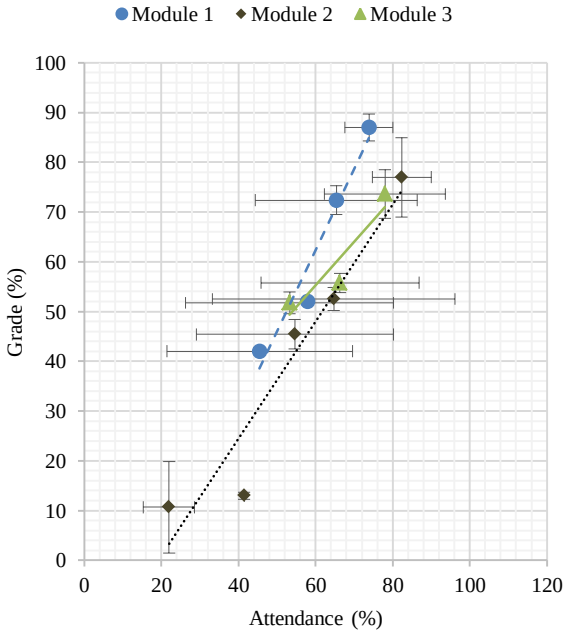


**FIGURE 3** Average results by classification, term one (modules 1-3) from the second-year cohort. Error bars denote standard deviation.

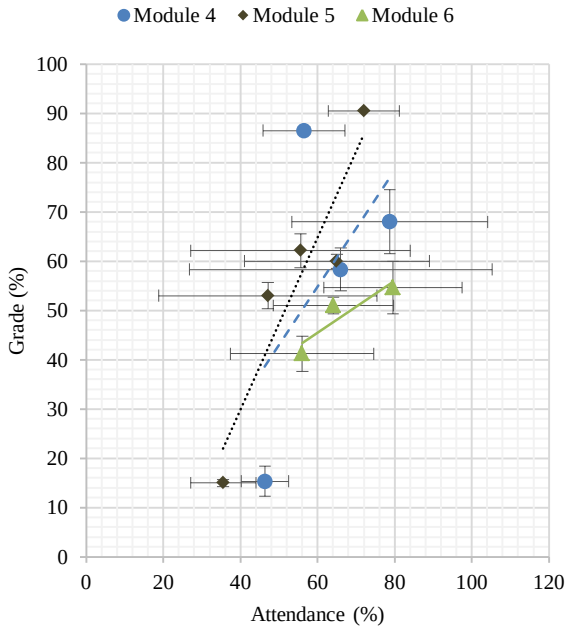


**FIGURE 4** Average results by classification, term two (modules 4-6) from the second-year cohort. Error bars denote standard deviation.

*Year 3*

The results for the third-year modules are shown in **TABLE 4**, with **FIGURES 5 and 6** showing the averages across each grade classification in each of the modules for the two terms. In the final year modules 3, 4, and 5 had significant positive correlations (r ranging from 0.8705 to 0.9520, $p < 0.05$). Module 1, however, showed a negative, non-significant correlation ($r = -0.5390$, $p = 0.6376$), while the second module had a positive correlation which was not significant ($r = 0.6564$, $p = 0.0544$). Module 1 showed a negative correlation between attendance and grade ($r = -0.5390$), which was not statistically significant ($p = 0.6376$).

**TABLE 4** *Module data for the third year showing average grades with attendance and Pearson correlation. Statistical significance is shown at <0.05.*

| Module | Grade (%) | Attendance (%) | n | $R^2$ | R | *p* |
|---|---|---|---|---|---|---|
| **1** | 63.63 (±6.89) | 46.19 (±17.76) | 16 | 0.2905 | -0.5390 | 0.6376 |
| **2** | 68.65 (±10.12) | 73.88 (±23.66) | 17 | 0.4309 | 0.6564 | 0.0544 |
| **3** | 66.94 (±9.86) | 64.33 (±27.44) | 15 | 0.9630 | 0.9520 | 0.0480 |
| **4** | 66.06 (±16.49) | 80.44 (±15.51) | 16 | 0.8158 | 0.9032 | 0.0001 |
| **5** | 54.59 (±15.31) | 61.88 (±27.08) | 17 | 0.7578 | 0.8705 | 0.0001 |

n= number of students completing the module; r= Pearson correlation coefficient; p= statistical significance. ± denotes standard deviation.

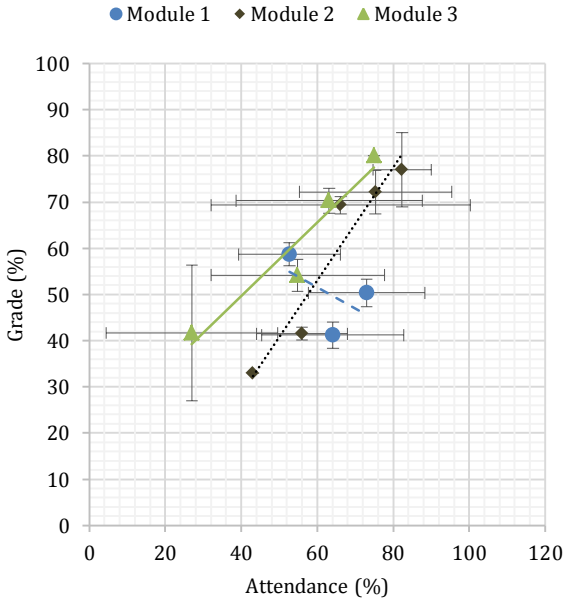


**FIGURE 5** Average results by classification, term one (modules 1-3) from the third-year cohort. Error bars denote standard deviation.

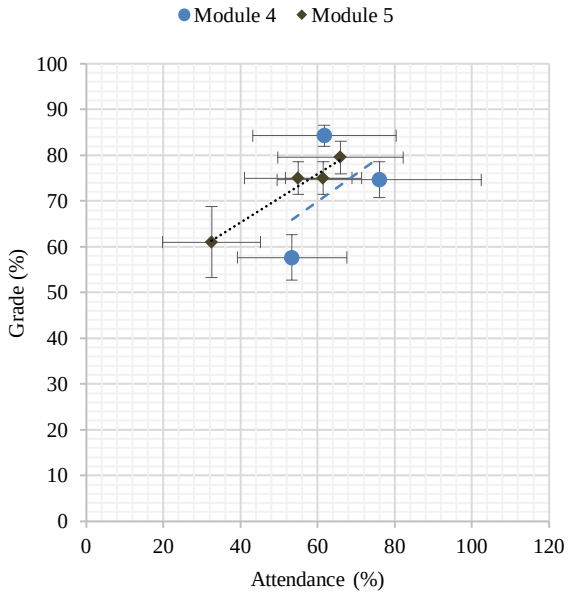


**FIGURE 6** Average results by classification, term two (modules 4-5) from the third-year cohort. Error bars denote standard deviation.

## Discussion and Conclusion

The results of this study show that across all three years, most modules show significant positive correlations between attendance and grades, reinforcing the importance of regular attendance for academic success (16).

The first year exhibits strong correlations in most modules, indicating that early engagement in course is crucial for setting a foundation for academic success. However, for module 4, the study found a weak and non-significant correlation between attendance and academic performance. This suggests that other factors beyond attendance likely played a more substantial role in determining students' grades in this module. Which could be the workload, or the methods of assessments. Although, it should be noted, that this module had the second highest attendance rate at 73.02%. The second year continues the trend of significant correlations, though with some variability, suggesting that consistent attendance remains important as students delve deeper into their studies. The third year, however, shows significant correlations in some modules, but also presents cases of non-significant or negative correlations, indicating a possible shift in factors affecting academic performance, such as increased individual research and project work. Within the second year the variability in significance for Modules 2, 4, and 6 could indicate differences in how attendance impacts learning in these modules, or it could be due to variability in attendance patterns.

First-year modules generally show higher variability in both grades and attendance correlations compared to the second and third years. This could be due to many factors, getting used to the change in lifestyle, learning environment, or the knowledge of the grades not impacting their degrees. In the first year of the degrees, the students must obtain an average of 40% in each module to pass, but this grade will not impact their degree classifications. However, years two and three do have a significant impact to their overall classification.

While attendance continues to be important through the second and third years, certain modules (like Module 1 in the third year) show a lack of significant correlation, suggesting other factors might influence academic performance more strongly in these cases. The results of module 1 in year 3 however, can be interpreted in a few ways. This module comprises of 40 credits over the course of the year, where students work on their own projects. There are several lectures linked to this module, with tutorials/meetings with their project supervisors.

Although it may seem like some students are not engaging (with attendance being 46.19% on average), it may be a case of the students not needing meetings on certain sessions, or are working in the lab on their projects and prioritising this over the lectures This would result in a non-attendance mark being put against their record automatically by the system, and unless the facilitator goes in and changes this, then the result is a negative result. Therefore, the negative correlation noted (r= -0.5390) is not likely to bare any significance with this particular module.

### *Practical Modules*

Within scientific courses of this ilk, it is also important to consider the amount of practical aspects that are included in the modules. As with many studies, Rasool *et al.,* (17) shows a strong correlation between attendance and the practical laboratories that are conducted. This however, is not considered in the research conducted here, but needs further exploration. For example, in module 1 in the first year, there is a total of 11 laboratory sessions which students are encouraged to attend, and find generally interesting with attendance at 77.94 (±25.55) %. When this is compared to module 3 for example, which has only one practical session, the attendance is generally a lot lower at 59.90 (±24.98) %. This is something that is garnered throughout all the years. Furthermore, the subject matter is of great importance. Whist the students have enrolled to study forensic science, a lot of the underpinning of the science is taught through core science modules such as biochemistry, anatomy, and histopathology for example

(2). It can be seen in some of these core science modules, the attendance is generally a little lower than modules solely focusing on forensics.

*Implications for Educational Strategies*

Overall, the findings of this study suggest that enhancing student attendance could positively impact academic performance within forensic science. In order to bolster the grades of students, further educational strategies could be introduced into programmes. Firstly, implementing mandatory attendance policies in line with university strategies and course requirements could be introduced (18). This could be further influenced by accrediting bodies, such as the Chartered Society of Forensic Science in the UK. This would encourage more engagement from the students and enhance their academic performance (19). In addition, this could have further implications for job prospects, as standardizing attendance at certain practical sessions would indicate to potential employers that the graduate has specific practical skills due to a mandatory attendance in order to pass modules/courses (1).

Engaging students through more interactive and varied teaching methods is a must to introduce more diversity in learning. Previous studies have used different methodologies to enhance learning through different strategies. These include things like case study jigsaw methods (20), collaborative, problem and team-based learning (21), laboratory-based learning (22,23) and case-based (24). Due to the type of work that forensic scientists will end up doing, problem-based learning appears to have a greater value in approach. By incorporating newer methods of pedagogy over the didactic method has been shown to engage students more and give them a greater understanding and development (24–26).

Providing support for students struggling to attend classes is salient in universities. Many lectures are recorded, and students do rely on these. The results show there is engagement with the material, even when attendance is poor, as some students have a generally poor attendance, but obtain very good results. Which has been previously noted by (27). By providing the flexible learning options, these students have the ability to study in their own time. This is particularly vital for students who struggle with learning in classes, health issues, or have caring or parental responsibilities amongst other issues (28). However, in scientific courses, the physical skills are vital to complement the theoretical knowledge. Without learning the skills to use laboratory equipment, students will lack knowledge vital for their working career (1). Accessible learning models, such as simulated online crime scenes have been utilized in forensics, allowing students to access online practical based investigations (29,30).

Whilst it can be argued that this simulated software can expand on students critical thinking skills at crime scenes, it does not teach them the skills on how to collect, process, and store evidence in a real-world scenario. In addition, when it comes to the more core science, such as analysing deoxyribonucleic acid (DNA), or using instruments such as gas chromatography mass spectrometry, the intricacies of the methodologies require skills that must be learned through practice (2,31). Therefore, getting students to engage more in laboratory-based modules is important for engagement and learning (31). As the study conducted here indicates, the laboratory-based modules have more engagement from students, but this needs to be further explored in a forensic context.

*Limitations and Future Research*

As with studies of this nature, there are varying factors which affect the results, despite the overall trends which are visible. Whilst this research agrees with previous works, where attendance indicates a better academic outcome, there are differences between studies and the nature of the degrees being studied (16,32,33).

One of the factors is sample size, and longevity of studies. For example, in this particular study, the data is a snapshot of one year. Following one cohort throughout their degree and considering additional variables such as study habits, access to resources, mental health, and socio-economic background to provide a greater understanding of the factors affecting academic performance within forensic science.

Future research could also involve longitudinal studies tracking multiple cohorts over several years to provide a more comprehensive understanding of the relationship between attendance and academic performance. The study indicates that modules featuring more laboratory practicals tend to have higher attendance rates compared to those that are predominantly lecture-based. Although there could be various reasons for this, such as hands-on active learning, assessments, perceptions, engagement, interest etc, this study shows a positive engagement in these modules.

Detailed attendance tracking for different types of sessions such as laboratories, practical sessions, tutorials and lectures would provide a greater insight into attendance patterns. In addition, comparing attendance rates and academic performance across different types of modules (forensic, core science, hybrid, lab based, lecture based) can help isolate the impact of practical sessions on student engagement and learning outcomes. This will help academics create a more balanced approach to student learning, that combines lectures with practical sessions where possible, to increase attendance and engagement, and would cater to diverse learning preferences (2,34).

By addressing these limitations and exploring further avenues of future research, a more comprehensive understanding of the relationship between attendance and academic performance can be achieved, ultimately contributing to more effective educational strategies and improved student outcomes (1,24).

*Conclusion*

This study provides valuable insights into the relationship between attendance and academic performance among forensic science undergraduate students. This study has illuminated the significant relationship between attendance and academic performance in forensic science undergraduate programs.

The findings reinforce the long-standing understanding that regular attendance is positively correlated with better academic outcomes. Specifically, this correlation is strongest in the first and second years of study, highlighting the critical role of early and consistent engagement in shaping students' academic success. In the third year, the relationship between attendance and performance becomes more complex, with some modules showing non-significant or negative correlations. This suggests that factors such as increased individual research and project work might play a more influential role in academic outcomes at this advanced stage.

Moreover, practical modules consistently exhibit higher attendance rates, underscoring the importance of hands-on learning in forensic science education. Several implications for educational strategies within forensic science programs. Firstly, enforcing mandatory attendance policies could be beneficial, particularly in practical sessions that are crucial for developing essential skills. Additionally, incorporating varied and interactive teaching methods, such as problem-based learning and case studies, can enhance student engagement and understanding.

Flexible learning options, including recorded lectures and online simulations, should be maintained to accommodate students facing various challenges, though it is essential to ensure that these do not replace vital practical experiences. Investigating the specific reasons behind different attendance patterns across various types of modules and sessions will provide deeper insights into optimizing educational strategies. By doing so, forensic science education can better align with the diverse learning preferences of students, ultimately enhancing both engagement and academic performance.

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