Department for Education

Further Education Output Specification

Technical Annex 2K: Building Performance Evaluation Methodology

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Document Control

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Summary

Technical Annex 2K provides the minimum requirements for the evaluation of buildings. It defines the methodology to be used. It is to be read in conjunction with the Generic Design Brief (GDB) and the College-specific Brief (CSB).

Review Date

Review dates for this document shall be at 6-month intervals.

Who is this publication for?

This document is for technical professionals involved in the design and construction of college premises, as part of the Employer's Requirements of the DfE Construction Frameworks (the DfE Construction Framework 2021 and the Offsite Schools Framework (incorporating Modular and MMC delivery) (MMC)). It may also be used as the basis of similar documentation for other procurement routes using the Further Education Output Specification.

Uniclass Codes

This document captures Uniclass codes for the management of exchange of information. To access all codes and associated titles reference should be made to Uniclass 2015 | NBS (thenbs.com)

1. Introduction

1.1. Overview

1.1.1. This document is one of the Further Education Output Specification (FE-OS) Technical Annexes that forms part of the Generic Design Brief (GDB). [PM_10_20]

1.1.2. The definitions listed in the GDB shall apply to this Technical Annex and all other parts of the FE-OS. [PM_10_20]

1.1.3. This document shall be read in conjunction with the GDB and all other Technical Annexes as well as the College-specific Brief (CSB), including the College-specific Annexes. [PM_10_20]

1.1.4. This document sets out the required technical standards and performance criteria for Building Performance Evaluation Methodology. [PM_10_20]

1.1.5. The information exchange required at each stage of the design, build and completion process is detailed in the DfE's EIR. [PM_10_20_28]

1.1.6. The requirements in this Technical Annex shall apply to all parts of the works; New or Refurbished. [PM_10_20]

2. Building Performance Evaluation Methodology

2.1. Overview

2.1.1. Research carried out by the Department for Education (DfE) into newly completed and occupied school buildings has identified there is often a performance gap between the Contractor's design intent and the in-use performance of the Building. It is anticipated to transfer this learning into the FE Sector with the introduction of the FE-OS. [PM_70_95_64]

2.1.2. As a result, the DfE has developed a strategy to carry out a Building Performance Evaluation (BPE) of all new educational buildings. [PM_80_10_65]

2.1.3. The aim for the evaluations, as part of the normal procurement process, is to:

a) Indicate the factors impacting on the operational performance of the Building in use. [PM_80_10_65]
b) Identify the root cause of performance issues. [PM_80_10_65]
c) Inform action to improve performance. [PM_80_10_65]

2.1.4. Many factors impact the performance of educational buildings including:

a) Design strategies and complexity of systems. [PM_10]
b) Cost cutting during the design development and construction phases. [PM_10]
c) Configuration of controls. [PM_10]
d) Commissioning of systems, handover and aftercare service. [PM_10]
e) User understanding of systems and training in their use. [PM_10]
f) Operational management of the site. [PM_10]

2.1.5. Poor performance increases running costs and can have a detrimental impact on educational attainment. For example, poor ventilation can affect concentration levels as teaching spaces become increasingly stuffy through the day. [PM_10]

2.1.6. The focus of this methodology is on providing a structured and auditable procedure for uncovering poor performance issues. In conjunction with the Employer and end users, the Contractor shall decide upon the most appropriate course of action to remedy the problems. [PM_80_10_65]

2.1.7. Contractors and their designers are key players in unlocking good building performance. Therefore, the BPE methodology has been specifically designed to be used within the first year of operation of the Building whilst there is still a Contractor responsibility with the College through the defects liability period. [PM_80_10_65]

2.1.8. The DfE's Further Education Output Specification contains a requirement for the Contractor to ensure that BPE's are provided and is a specific contract deliverable. [PM_80_10_65]

2.1.9. Whilst there are various approaches that can be taken to achieve a successful BPE, the methodology described in this document provides a robust set of instructions for meeting the requirements. [PM_10]

2.1.10. The process is designed to be led by Contractors who have a good understanding of the Building and its systems. [PM_80_10_65]

2.1.11. Some of the issues highlighted through the BPE process are addressable through the normal snagging/defects resolution activities carried out by Contractors. However, it is fully expected that some of the issues go beyond the Contractor's original responsibilities and therefore shall be considered on a case-by-case basis. [PM_80_10_65]

2.1.12. The BPE methodology is intended to be used on new and Refurbished Buildings. [PM_80_10_65]

2.1.13. The installed Building's metering systems shall allow data to be logged for the electricity, gas and water consumption. For more information on these requirements see Technical Annexes 2H and 2I. [FI_30]

2.2. Methodology

2.2.1. Scope of the Building Performance Evaluation (BPE) Process

2.2.1.1. The scope of the BPE process is:

a) To provide an objective understanding of what is successful and what are areas for improvement. [PM_80_10_65]

b) To monitor the result of fine tuning the building performance through seasonal adjustments to the building controls. [PM_80_10_65]

c) To establish across the range of educational buildings where there are common issues in order to learn lessons for future educational building projects. [PM_80_10_65]

2.2.1.2. Two BPE reviews shall be carried out. An initial Review at 3-6 months and a Final Review at 9-12 months after handover in accordance with the DfE's Exchange Information Requirements (EIR). [PM_10_20_28]

2.2.1.3. This is a process that looks at various interrelated aspects of education buildings. The assessment looks for areas that can be improved and then suggests actions. It comprises:

a) A desktop analysis of specific design and construction information on the project before the site visit, with option for BPE client team to attend. [PM_80_10_65]

b) A two-part site visit with a walk around the College – generally with the Estates or accommodations manager (responsible budget holder), site supervisor (Caretaker/Premises Manager), the Contractor (including M&E and controls specialists), with option for BPE client team, to attend, including the completion of questionnaires. [PM_80_10_65]

c) Records made through photos, notes, observations and conversations on walk around. [PM_80_10_65]

d) A review of the Building Management System (BMS) demonstrated by site staff. This provides an easy indication of the level of training provided by the Contractor to the on-site technical staff and the level of commissioning of the systems. [PM_80_10_65]

e) Post site visit: A desktop analysis of the energy data and questionnaire responses with a write up of the findings using evidence of data; action plan for the different parties, i.e., Contractor, College and DfE. This is supported by analysis of any further energy, temperature or CO2 data that can be obtained. [PM_80_10_65]

f) A report on all the findings, energy trends and observations from each site – issued to DfE using DfE templates for the Initial and Final BPE Reports. [PM_80_10_65]

g) An action plan prioritised according to the most significant risks as agreed between all parties. [PM_80_10_65]

h) A short summary report for the College. [PM_80_10_65]

i) An overall report on the batch of buildings for DfE if part of a wider campus. [PM_80_10_65]

2.2.1.4. The BPE process is primarily concerned with evaluating the performance of buildings in use, however in order to get meaningful outputs it is necessary that preparations for the main BPE activities are made at the design and construction stages. [PM_80_10_65]

2.2.1.5. These preparations revolve around the provision of suitable data monitoring and collection systems for the electricity, gas and water consumption in the Building and training that forms part of the building handover. [PM_10_20_82]

2.2.1.6. Once the Building is in-use these monitoring systems shall be vital in providing the hard technical data used in the assessment of the building's performance. [PM_10]

2.2.1.7. The activities carried out in the first year of operation are split over two distinct stages, post-handover.

a) The first stage shall be performed within the first 6 months after handover and is focused on ensuring the Building is set up correctly for the purpose of accurately reporting its ongoing performance. [PM_80_10_65]

b) The second stage is a more detailed assessment of the overall building performance and allows annual energy/water consumption to be recorded based on actual figures. [PM_80_10_65]

2.2.1.8. The stages and activities used in the methodology are shown in the following table. [PM_80_10_65]

Stage	**When Undertaken**	**Activities**	**Information to be provided / Employers Requirements Deliverables**
Stage 1 - Data collection set up	Commissioning	Ensure data monitoring and sub-metering systems are correctly collecting data and automatically reporting.	Results of 7 day monitoring during soak test (forms part of O&M Manual).
Stage 2 - Initial performance review	3-6 months post occupancy	Site visit and walk around with Site management team and Contractors. Collect and review initial building performance iSERV data and BMS energy consumption data (electricity, gas, water, temperature, CO_2 in classrooms) and compare against design predictions. Conduct structured interview of facilities staff/ questionnaire. Complete teaching staff questionnaires. Collate all information into the initial report template and provide commentary on the findings. Develop action plan to address any issues identified e.g., further training,	Initial BPE performance report showing top 5 issues and initial energy and water consumption/ performance. Action plan to resolve issues before the end of the defect liability period and final BPE review.

Stage	When Undertaken	Activities	Information to be provided / Employers Requirements Deliverables
		seasonal adjustments and fine tuning. Report findings back to the College.	
Stage 3 - Final performance review	9-12 months post occupancy	Collect and review longer term building performance iSERV data and BMS energy consumption data (electricity, gas, water, temperature, CO_2 in classrooms). Conduct structured analysis of data collected accounting for any unexpected results. Collate all information into the final report template and provide commentary on the findings. Develop any further action plan. Report findings back to the College and DfE.	Final BPE report showing confirmed performance and actual annual energy and water consumption figures achieved with a comparison against the design predictions and DfE benchmarks. Any further actions to improve performance?

Table 1 – BPE stages and requirements

2.2.2. Stage 1 - Data Collection Set up (Handover Period - Pre-Occupancy)

2.2.2.1. The set-up of the data collection systems is an important step to achieve building performance in use. [PM_10]

2.2.2.2. In line with the DfE requirements, the College shall be provided with main metering for all the incoming utilities and sub-meters as described in Technical Annexes 2H and 2I.

2.2.2.3. These meters, along with any additional and specialist meters, are required to be logged at 15-minute intervals via an Automatic Meter Reading (AMR) system. [Ac_05_50_54]

2.2.2.4. During the commissioning stage the Contractor shall be responsible for ensuring all the sub-metered data is both collected by the AMR system and accurately represents the actual performance of the systems being monitored. [FI_30]

2.2.2.5. The BPE shall utilise the data collected from the metered systems and so it is important that they are correctly commissioned. [FI_30]

2.2.2.6. The data collected from the meters is not the only source of technical data on the performance of an education building, data collected by the BMS can also provide useful feedback. [FI_30]

2.2.2.7. Where room temperature and CO_2 data are being sent to the BMS then this too shall be logged and is to be drawn on during the BPE data analysis phase. [FI_30]

2.2.2.8. Upon completion of the setting to work and commissioning of the building services, a “soak test” shall be performed of the systems installed by running the systems continuously for a 7 day period as defined in Technical Annexes 2F, 2G & 2I.

2.2.3. Stage 2 - Initial Performance Review (3 - 6 Months Post Occupancy)

2.2.3.1. General

2.2.3.1.1. An initial BPE shall be carried out between 3 - 6 months after handover. This shall comprise:

a) analysis of information relating to the project before the visit such as Contractors’ Proposals design information, as installed (record) information, controls philosophy, M&E schematics, sub-metering schematic, Building User Guide [PM_10_20_82]

b) a site visit and walk around/meeting with the College – generally with the Estates or accommodations manager, site supervisor (Caretaker/Premises Manager), the Contractor (including contract manager, M&E and controls specialist) [PM_10_20_82]

c) photos of the College and elements reviewed [PM_10_20_82]

d) a completed FM questionnaire [PM_10_20_82]

e) completed Teaching Staff questionnaires [PM_10_20_82]

f) review of the BMS system and energy data, and comparison against design predictions and DfE benchmarks. [PM_10_20_82]

2.2.3.1.2. Follow up actions after the initial meeting shall comprise:

a) analysis of the data collected for each site [PM_10_20_82]
b) compilation of a report on all findings, energy trends and observations from each site issued to DfE with clear actions by the Contractor [PM_10_20_82]
c) compilation of a short summary report for the College [PM_10_20_82]
d) overall report on the batch of buildings for DfE, if part of a wider campus [PM_10_20_82]
e) all reports to follow the standard DfE format for BPE reviews. [PM_10_20_82]

2.2.3.1.3. Seasonal commissioning adjustments shall be conducted throughout the first year of the Building's performance following handover by the Contractor. [PM_10_20_82]

2.2.3.1.4. The primary purpose of the initial BPE is to identify any obvious gaps in the handover process and ensure that the college's data collection systems are providing useful information. It is a sense check that the Building is performing within the expected range and to put in place any necessary corrective actions. [PM_10]

2.2.3.2. Desktop analysis

2.2.3.2.1. The desktop analysis identifies the areas of focus for the visit by the BPE team, with knowledge on what to expect on the systems and components known to impact on the building performance. It involves a review of the design information available against what was finally constructed. [PM_80_10_60]

2.2.3.3. Site walk around

2.2.3.3.1. This is an invaluable exercise providing a quick and effective visit as:

a) the College gets an early indication they are going to benefit from this process, which builds trust and engages them to talk about how they use the Building, which impacts on building performance. [PM_10]
b) it provides buy-in by the College to complete the supporting questionnaires. The one for technical staff is completed there and then, whilst teaching staff are left copies to complete in a staff meeting (10 minutes long). Colleges shall find it easier to coordinate responses through Heads of Departments. [PM_10]
c) it quickly gives a feel for the College's attention to managing behaviour which impacts on building performance [PM_10]
d) the Contractor sees the ability of the College to use, operate and manage components they have designed and built where the focus for effective training needs to be e.g., Site Facilities/Premises Manager/Caretaker confident in

heating, electrical controls, seasonal maintenance, however not confident in BMS operation. [PM_10]

2.2.3.4. Facilities staff questionnaires/interview

2.2.3.4.1. An interview shall be conducted with one or more members of the facilities staff. These interviews are based around a set of multiple-choice questions, See Appendix A. There is an opportunity for the interviewee to provide additional information to support their answers. [PM_10_20]

2.2.3.4.2. It is intended that the interviewer asks all the questions provided, but it is acknowledged that it might be necessary to ask further site-specific questions to get to the root cause of certain issues. Where this occurs the additional questions and answers shall be recorded at the end of the standard questions. [PM_10_20]

2.2.3.5. Teaching staff questionnaires

2.2.3.5.1. This stage seeks feedback from building users on their experiences of working in the Building. [PM_40_60_62]

2.2.3.5.2. This is done via a questionnaire, which is primarily aimed at the teaching staff, but other staff can also be included. [PM_40_60_62]

2.2.3.5.3. Learners shall not be directly asked about their experience of the Building. Instead, it is anticipated that teaching staff shall reflect the experience of the students in their answers. [PM_40_60_62]

2.2.3.5.4. The aim should be to gather as many survey responses as possible, to maximise the understanding of the Building's operation. [PM_40_60_62]

2.2.3.5.5. The survey questions are focused on the following building conditions:

a) Winter temperature. [PM_10_20]

b) Summer temperature. [PM_10_20]

c) Ventilation and general air quality. [PM_10_20]

d) Lighting, both from daylight and electric lights. Glare from the lights shall also be considered. [PM_10_20]

e) Noise levels. [PM_10_20]

2.2.3.5.6. A copy of the questionnaire is included at Appendix B. [PM_40_60_62]

2.2.3.6. Energy data collection and review

2.2.3.6.1. As the Building has been operational for a relatively short period of time care shall be taken when attempting to interpret the metered data as it may not be providing an accurate picture of the energy consumption patterns. [PM_70_95_64]

2.2.3.6.2. This is because there may not have been enough time for all the systems to run-in to their full operating state and the impact of any seasonal variations have not been experienced. In addition to this there may still be a Contractor presence on site which could contribute to the energy consumption seen. Despite this, collecting and reporting this data is still a worthwhile exercise as problems with systems can be identified if utilities are being used out of hours unnecessarily. [PM_70_95_64]

2.2.3.6.3. The data shall be presented in a table showing at least the following information for each meter and sub-meter:

a) Utility being monitored (e.g., gas, electricity etc). [PM_10_20]
b) Meter ID. [PM_10_20]
c) Consumption since start of building occupation. [PM_10_20]
d) Average consumption per day. [PM_10_20]
e) Average out of hours consumption per day. [PM_10_20]

2.2.3.6.4. Reports on daily peak demands shall be included to allow any anomalies to be spotted as well as confirming the correct operation of the controls. [PM_10_20]

2.2.3.6.5. The use of iSERV to continually monitor energy consumption is the required system for reporting the data. The web-based iSERV database shall be reviewed to ensure the data is being reported correctly. The data reporting takes the form of an automated email sent to iSERV that contains the monitored energy consumption data in a CSV format. The database has been designed to aid in providing operational feedback of buildings, and to make energy analysis simple, unambiguous and robust. The reports produced by the iSERV system are to be used directly in the summary BPE reports. Further details of in use energy monitoring are given in Appendix E. [Ac_05_50_54]

2.2.3.7. Analysis of the performance data and user feedback

2.2.3.7.1. It is important to consider the relationship between the findings of the survey questions, the interviews, and the performance data. For example, a general response from building users of low internal temperatures may correspond with a low gas consumption compared to benchmarks and increasing the temperature may take the gas consumption well above the benchmark. This would indicate that there is a technical issue with the

Building's heating that needs to be investigated fully in order to increase winter temperatures, without significantly increasing fuel consumption. [PM_10_20]

2.2.3.8. Reporting format for initial BPE review

2.2.3.8.1. The Initial Performance Review Report template is provided in Appendix C. [PM_10]

2.2.3.9. Action plan for resolving issues identified

2.2.3.9.1. Investigating the issues highlighted by the analysis in the previous step shall result in a list of actions for the Contractor to take forward or potentially raise as an action in conjunction with the College. Any action that is required to bring the Building in line with the Contractor's original scope shall be implemented as soon as possible with the provision of additional training or recalibration of controls and metering. [PM_60_30_05]

2.2.3.9.2. All actions identified shall be presented as a plan that shall allow further success to be achieved by the final BPE review date after 12 months of building occupation. [PM_60_30_05]

2.2.3.9.3. Once the action plan has been prioritised it shall be presented to the College along with the rest of the findings of the BPE. [PM_60_30_05]

2.2.4. Stage 3 - Final Performance Review (9 - 12 Months Post Occupancy)

2.2.4.1. General

2.2.4.1.1. The Final Performance Review builds on the work undertaken in the Initial Performance Review by reviewing additional energy data following up on the initial BPE review outcomes and the results of the Contractors' action plan. All conclusions are then presented in a final BPE report using the template provided in Appendix D. [PM_10_20]

2.2.4.1.2. The initial BPE review conducted after the College has been in use for 3-6 months gives the users a chance to settle into their new building and allow them an understanding of its day-to-day operation. [PM_10]

2.2.4.1.3. It also allows a more measured approach to be taken to calibration and reporting from the sub-metering and identifies any additional training requirements. [PM_10]

2.2.4.1.4. Allowing these issues to be addressed early provides an opportunity to collect more relevant data about the building operation and success of the second BPE review held towards the end of the Defects Liability Period (DLP). [PM_10]

2.2.4.1.5. The extent of this final BPE review shall vary depending on the College – at best it provides data collection around the energy performance of the Building giving a full year of results and shall show results of seasonal adjustments; at worst it may involve a further site visit and analysis of data if this was unsuccessful following the first site visit. [PM_10]

2.2.4.2. Energy data collection and review

2.2.4.2.1. The readings from the main meters and sub-meters shall be collected for the entire period since the building was occupied. [PM_10_20_82]

2.2.4.2.2. The trends shall be shown as monthly summaries to allow seasonal variations to be easily seen. [PM_10_20_82]

2.2.4.2.3. In addition to this the consumption for at least two different days shall be shown graphically (as per the example in Figure 1). The days chosen shall be full college days, and ideally be from the winter and the summer to allow the full variation in consumption to be seen. [PM_10_20_82]

2.2.4.2.4. These daily profiles shall provide clear visibility on how the Building is performing on a more detailed level than is possible from simple daily meter readings. [PM_80_10_60]

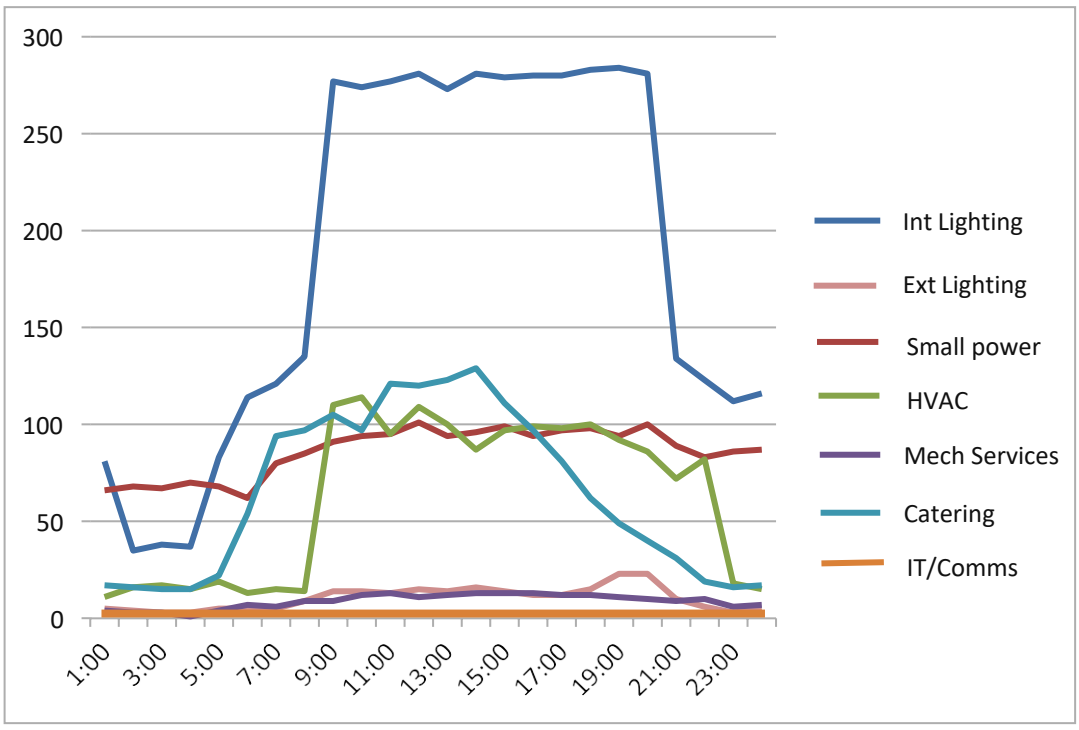


Figure 1 – Example of a daily energy profile for a single day in a school (as reference)

2.2.4.2.5. By examining the daily consumption profile in detail, it shall be possible to see when the main systems such as the heating, lighting and ventilation are switched on and off. [PM_10]

2.2.4.2.6. Any systems that are operating out of hours unnecessarily can be clearly identified and rectified. [PM_10]

2.2.4.2.7. An attempt shall be made to reconcile the energy use pattern with the known activities taking place on site. [PM_10_20_82]

2.2.4.2.8. Any inconsistencies noted between energy use and the activities that drive it shall be investigated further. [PM_10_20_82]

2.2.4.3. Energy data comparison against energy targets

2.2.4.3.1. Energy and carbon data comparisons against the energy and carbon targets given in Technical Annex 2H shall be made as follows:

a) For all New Buildings, whether a Partial or Whole Site Project, an energy review shall be undertaken against the energy targets as described in Technical Annex 2H, and also against the Contractors' design predictions. [PM_70_95_20]

b) Energy targets are expressed as electricity equivalent kWhe. [PM_10_20_82]

c) kWhe is calculated by multiplying the different fuel kWh consumptions by the relevant energy weighting factor. [PM_10]

2.2.4.3.2. In addition to the metered data collected by the AMR, the additional data on temperature and CO_2 levels within classrooms available on the BMS shall be reported. It provides confirmation of correct operation of controls and allows fine tuning and seasonal adjustments to be made to minimise energy consumption. [FI_30]

2.2.4.4. Facility staff

2.2.4.4.1. The structured interviews with the facilities staff shall ask the same questions that were asked during the Initial Performance Review and progress on the issues previously identified is to be fully tracked. [PM_70_85_25]

2.2.4.4.2. It is also possible that new issues may have come to light in the intervening time with regards to systems which are only required at certain times of the year such as heating or cooling. [PM_70_85_25]

2.2.4.4.3. The issues raised by teaching staff in their responses to the questionnaires shall be confirmed through the facilities team as having been suitably actioned since the initial BPE visit. [PM_70_85_25]

2.2.4.5. Teaching staff

2.2.4.5.1. Further teaching staff questionnaires are not required to be completed as resulting actions from the initial BPE review shall have been completed through the initial review action plan. [PM_10_20_82]

2.2.4.5.2. In the event of significant issues being identified at the initial BPE review in some circumstances it may be appropriate to re-survey the teaching staff so that these updated results can be included in the final BPE report. [PM_70_85_25]

2.2.4.6. Analysis of the performance data and user feedback

2.2.4.6.1. Overall analysis of the building performance, supported by actual annual energy consumption data and seasonal performance of the Building shall now be provided. A commentary against benchmarks and the design prediction can be made. [PM_80_10_60]

2.2.4.6.2. The results of the action plan undertaken as a result of the initial BPE review shall record any seasonal commissioning adjustments that resulted in improved building performance. [PM_80_10_60]

2.2.4.7. Reporting format for final BPE report

2.2.4.7.1. The Final Performance Review Report template is provided in Appendix D. [PM_10]

2.2.4.8. Action plan for any outstanding items

2.2.4.8.1. Include details of any proposed further action that is required. [PM_10_20_82]

Appendix A
Building Performance Evaluation – Facilities staff questionnaire

1. Overview

1.1. The facilities staff interview is a vital part in achieving better performing educational buildings. [PM_10]

1.2. It forms part of the Building Performance Evaluation and provides the insight into the criteria which effect educational and operational performance. [PM_10]

1.3. It will help the building users (staff and learners) and the site's technical and operational team to get a clear understanding of how the Building is performing in use in order to inform necessary action. [PM_10]

1.4. It shall also inform the design and operation of future educational buildings. [PM_10]

2. Completing the interview

2.1. If any question has a qualifying remark, note this is under the question. [PM_10_20]

2.2. Try to summarise any long answers into the key points(s) relating to the question. [PM_10_20]

2.3. If the interviewee does not have the experience with the system in question, skip all the questions on that system. [PM_10_20]

1) Do you have any responsibility for the operation and/or maintenance of the Building's heating systems?

   Yes / No

   Additional Comments

2) The training provided on the operation and maintenance of the heating system was:

   Good / Inadequate / Too complex

   Additional Comments

3) The heating controls are:

Simple to use / Moderately simple to use / Complex to use

Additional Comments

4) The level of feedback on the heating system provided by the control system is:

Good / Inadequate / Too detailed

Additional Comments

5) Issues with the heating systems are:

Easy to identify / Slightly difficult to identify / Difficult to identify

Additional Comments

6) Maintenance of the heating system is:

Easy / Moderately Difficult / Difficult

Additional Comments

7) Do you have responsibility for the operation and/or maintenance of the Building's cooling and ventilation systems?

Yes / No

Additional Comments

8) The training provided on the operation and maintenance of the cooling and ventilation systems was:

Good / Inadequate / Too complex

Additional Comments

9) The cooling and ventilation controls are:

Simple to use / Moderately simple to use / Complex to use

Additional Comments

10) The level of feedback on the cooling and ventilation systems is:

Good / Inadequate / Too detailed

Additional Comments

11) Issues with the cooling and ventilation systems are:

Easy to identify / Slightly difficult to identify / Difficult to identify

Additional Comments

12) Maintenance of the cooling and ventilation systems is:

Easy / Moderately difficult / Difficult

Additional Comments

13) Do you have any responsibility for the operation and/or maintenance of the Building's lighting?

Yes / No

Additional Comments

14) The training provided on the operation and/or maintenance of the lighting systems was:

Good / Inadequate / Too complex

Additional Comments

15) The lighting controls are:

Simple to use / Moderately simple to use / Complex to use

Additional Comments

16) Access to the light fittings for cleaning, replacement and maintenance is:

Easy / Moderately difficult / Difficult

Additional Comments

17) Using the metering system to compare energy consumption over the weekend with the weekday consumptions is:

Easy / Difficult / Not possible

Additional Comments

18) Comparing the energy consumption of this week with last week with the metering system is:

Easy / Difficult / Not possible

Additional Comments

19) The training provided for monitoring and reporting the site's water and energy use was:

Good / Inadequate / Too complex

Additional Comments

20) In terms of helping to understand, operate and manage the site, the contractor's Aftercare Service was:

Full and Complete / Partly Complete / Inadequate

Additional Comments

21) Cleaning the site building is:

Completely straight forward / Partly straightforward / Difficult

Additional Comments

Please add any further comments and expand on any answers where improvement measures are required.

Comments

Appendix B
Building Performance Evaluation - Teaching staff interview questionnaire

1. Overview

1.1. The Teaching Staff Survey is a vital part in achieving better performing educational buildings. [PM_10]

1.2. It forms part of the Building Performance Evaluation and provides insight into the criteria which effects educational and operational performance. [PM_10]

1.3. It shall help the staff and learners, and the site's technical and operational team to get a clear understanding of how the Building is performing in order to inform necessary action. [PM_10]

1.4. It shall also inform the design and operation of future educational buildings. [PM_10]

2. Completing the survey

About you: Female / Male

Classroom name / number

Your answers should refer to the room you spend the most amount of time in. The following refers to a classroom but can relate to a learning area (workshop etc). Place a tick or cross to identify which is the most relevant answer to you.

1) In winter, the temperature in my classroom in the morning is:

   Too hot / Too cold / Comfortable

2) In winter, the temperature in my classroom at the end of the day is:

   Too hot / Too cold / Comfortable

3) In winter, my classroom's temperature is suitable for different teaching scenarios (e.g., lecturing, group work, practical work etc.):

   For all scenarios / For some scenarios / For no scenarios

   Provide further details if heating is not suitable for some or all teaching scenarios.

4) The winter air quality in the classroom is best described as:

Stuffy / Dry / Good / Draughty / Humid

5) The heating controls for the classroom provide:

Poor temperature control / Good temperature control / N/A (i.e., no controls)

Provide further details if the temperature control is poor.

6) The heating controls (thermostats, radiators etc.) in the classroom are:

Difficult to use / Easy to use / N/A (i.e., no controls)

Provide further details if controls are difficult to use.

7) The level of training given on how to regulate the winter temperature in my classroom was:

Missing / Inadequate / Good

8) In winter, the temperature in the corridors is:

Too hot / Too cold / Comfortable

9) In winter, the temperature in the gym/assembly hall/cafeteria/toilets is:

Too hot / Too cold / Comfortable

Provide further details if too hot or cold in some or all these spaces.

10) In summer, the temperature in my classroom in the morning is:

Too hot / Too cold / Comfortable

11) In summer, the temperature in my classroom at the end of the day is:

Too hot / Too cold / Comfortable

12) In summer, my classroom's temperature is suitable for different teaching scenarios (e.g., lecturing, group work, practical work etc.):

For all scenarios / For some scenarios / For no scenarios

Provide further details if the summer temperature is not suitable for some or all teaching scenarios.

13) The summer air quality in the classroom is best described as:

Stuffy / Dry / Good / Draughty / Humid

14) The summer ventilation controls for classroom provide:

Poor temperature control / Good temperature control / N/A (i.e. no controls)

Provide further details if ventilation control is poor.

15) The summer ventilation controls in the classroom are (give details in the comments section below):

Difficult to use / Easy to use / N/A (i.e., no controls)

Provide further details if ventilation controls difficult to use.

16) The level of training given on how to regulate the summer temperature in my classroom was:

Missing / Inadequate / Good

17) In summer, the temperature in the corridors is:

Too hot / Too cold / Comfortable

18) In summer, the temperature in the gym /assembly hall/cafeteria/toilet is:

Too hot / Too cold / Comfortable

Provide further details if too hot or cold in some or all these spaces.

19) Do you always turn the lights on when you enter the classroom?

No / Yes / Automatic lights

20) During the day can you teach successfully under solely daylight conditions?

No / Yes

21) The lighting in the classroom is:

Too bright / Too dim / Appropriate

22) Are there any issues with light quality?

Light colour issues / Light flicker issues / None

23) Are there any issues with glare from sunlight in the classroom?

No / Yes

24) It is difficult to read from display screens due to glare from:

Sunlight / Electric Lights / Neither Both / N/A

25) Are there areas within the classroom which are under or over lit?

Underlit / Over lit / Even light throughout

26) Do the lighting controls allow sufficient adjustments in the lighting to meet changing teaching scenarios?

No / Yes / No controls (automatic)

27) Teaching is sometimes interrupted by:

Noise from outside / Noise from other rooms / Neither / Both

Please add any further comments and expand on any answers where improvement measures are required.

Appendix C
Initial Performance Review (Name of Site)

1.1. Introduction

1.1.1. The introduction should include a description of the College covering the following information as a minimum:

a) Brief description of the Building (location, floor area, layout, storeys, special facilities, taught curriculum models etc.). [PM_10]

b) Date the Site was opened. [PM_10]

c) Number of Learners. [PM_10]

d) Name of Contractor. [PM_10]

e) Name of Architect. [PM_10]

f) Name of M&E designer. [PM_10]

g) Facilities management arrangements (in-house or outsourced). [PM_10]

h) Date of the Initial Performance Review. [PM_10]

i) Name(s) of individual(s) who conducted the review. [PM_10]

j) Name(s) of facilities staff interviewed. [PM_10]

1.2. Overview of the design

1.2.1. Overview of design

1.2.1.1. This section shall include an overview of the College's design with sufficient detail to allow the reader to understand the main operating principles of the main Building Services as well as the overall design strategy for energy management. [PM_40_20_26]

1.2.1.2. Most of this information is also found in the building logbook. [PM_70_85_60]

1.2.1.3. Each building service shall be provided with its own sub-heading. Any design targets for the systems should be stated. [PM_40_30_27]

1.2.2. Heating

1.2.2.1. Details of the heating system shall include the operating hours, temperature set points, fuel types, an overview of the local controls and distribution method for heat i.e., via hot water or warm air. [PM_40_20_38]

1.2.2.2. Where there are multiple heating systems such as a biomass boiler and supplementary gas boiler, the interaction between these systems shall be described. [PM_40_20_38]

1.2.3. Lighting

1.2.3.1. Details of the lighting shall cover the type of lamps used, whether they have automatic controls and the level of controls available to teachers in the individual classrooms. [PM_40_20_47]

1.2.3.2. Details shall also be provided regarding how the rooms have been designed to utilise daylight. [PM_40_20_21]

1.2.4. Ventilation

1.2.4.1. Details of the type of ventilation and the controls available to teachers shall be described. [PM_40_20_94]

1.2.4.2. Areas with specific ventilation needs such as kitchen, changing rooms, larger curriculum spaces (for example construction activities) and sports halls shall be noted. [PM_40_20_94]

1.2.4.3. The design maximum CO_2 levels shall also be stated. [PM_40_20_94]

1.2.5. Cooling

1.2.5.1. If cooling is provided, the reason for its use shall be explained. [PM_40_20_38]

1.2.5.2. The details of the controls shall include information on whether it is possible for the heating and cooling systems to be operating at the same time. [PM_40_20_38]

1.2.6. BMS Controls

1.2.6.1. A list of all the systems that are connected to the BMS shall be provided, along with the level of control provided over them. [PM_40_30_52]

1.2.6.2. For example, the BMS may only provide information on whether plant is running or not for some systems, whereas for others it may provide full control including changing of set-points. [PM_40_30_52]

1.2.7. Other major systems (including renewables)

1.2.7.1. Any system which has a significant impact on the building’s performance shall be noted. [PM_40_20_26]

1.3. Issues with the Building

1.3.1. This section shall be used to provide information on any issues with the building performance that affect energy consumption, facilities management and building user comfort. [PM_80_10_60]

1.3.2. The walk-around tour of the Building shall be undertaken with a member of the facilities staff in order to view all the systems in operation. [PM_10_20_82]

1.3.3. It shall be illustrated with photographs taken during the site visit walk around. [PM_10_20_82]

1.3.4. Wherever possible the root cause of the issues shall be described. [PM_80_10_60]

1.4. Initial Energy and Utility consumption

1.4.1. A brief overview shall be provided of the energy monitoring systems in place and the process required to extract the data from them. For example, it shall be possible to download the meter readings in an easily readable format. [PM_40_20_26]

1.4.2. The ease of investigating energy consumption trends over time shall be stated. For example, is there a computer interface that displays energy consumption in a graphical format on the BMS that the College uses regularly? [PM_40_20_26]

1.4.3. The initial energy and utility data shall be recorded here. As a minimum the following information shall be presented:

a) Utility being monitored (e.g., gas, electricity etc.). [PM_10_20]
b) Meter ID. [PM_10_20]
c) Consumption since start of building occupation until present day. [PM_10_20]
d) Average consumption per day. [PM_10_20]
e) Average out of hours consumption per day. [PM_10_20]

1.4.4. A brief description of the energy monitoring process used by the College shall be provided. [PM_10_20]

1.4.5. It shall provide details on who has overall responsibility for monitoring and managing the energy consumption. [PM_10_20]

1.4.6. The energy total consumptions since the start of the occupation, as recorded on the BMS system, shall be extracted and the results shown by completing the table below. [PM_10_20_82]

Utility	Total consumption since start of occupation as recorded by the BMS on date of initial BPE review	Average daily consumption based on number of days since opening	Energy used Kwhr/m^2/day based on GIFA m^2	Typical benchmark Kwhr/m^2/annum from CIBSE TM46 2008	Design energy target from DfE energy efficiency guide 2014	Contractors' proposals as shown in BRUKL, Kwhr/m^2/annum	Actual energy used, kwhr/m^2/annum
Electric	Kwhr	Kwhr	Kwhr/m^2/day	40	32	N/A	N/A
Gas	m^3	m^3	Kwhr/m^2/day	150 (fossil fuel)	62	N/A	N/A
Water	m^3	m^3	N/A	not shown	2.3l/person/day	N/A	N/A

Table 2 – Energy Consumption

1.5. Facilities staff interview results

1.5.1. The facilities staff interview is based on a multiple-choice format and as such the responses can be presented in the following table. [PM_10]

1.5.2. There shall also be a written summary of the main findings from the interview. [PM_10_20_82]

No.	Questions	Multiple choice answer 1	Multiple choice answer 2	Multiple choice answer 3
1	Do you have any responsibility for the operation and/or maintenance of the Building's heating systems?	Yes	No	N/A
2	The training provided on the operation and/or maintenance of the heating system was	Good	Inadequate	Too complex
3	The heating controls are	Simple to use	Moderately simple to use	Complex to use
4	The level of feedback on the heating system provided by the control system is	Good	Inadequate	Too detailed
5	Issues with the heating systems are	Easy to identify	Slightly difficult to identify	Difficult to identify
6	Maintenance of the heating system is	Easy	Moderately difficult	Difficult
7	Do you have any responsibility for the operation and/or maintenance of the Building's cooling and ventilation systems?	Yes	No	N/A
8	The training provided on the operation and/or maintenance of the cooling and ventilation systems was	Good	Inadequate	Too complex

No.	Questions	Multiple choice answer 1	Multiple choice answer 2	Multiple choice answer 3
9	The cooling and ventilation controls are	Simple to use	Moderately simple to use	Complex to use
10	The level of feedback on the cooling and ventilation systems provided by the control system is	Good	Inadequate	Too detailed
11	Issues with the cooling and ventilation systems are	Easy to identify	Slightly difficult to identify	Difficult to identify
12	Maintenance of the cooling and ventilation systems is	Easy	Moderately difficult	Difficult
13	Do you have any responsibility for the operation and/or maintenance of the Building's lighting?	Yes	No	N/A
14	The training provided on the operation and/or maintenance of the lighting/shading/blinds systems was	Good	Inadequate	Too complex
15	The lighting/shading/blind controls are	Simple to use	Moderately simple to use	Complex to use
16	Access to the light fittings for cleaning, replacement and maintenance is	Easy	Moderately difficult	Difficult
17	Using the metering system to compare energy consumption over the weekend with the weekday consumption is	Easy	Difficult	Not possible
18	Using the metering system to compare the energy consumption of this week with last week is	Easy	Difficult	Not possible

No.	Questions	Multiple choice answer 1	Multiple choice answer 2	Multiple choice answer 3
19	The training provided for monitoring and reporting the college's water and energy use was	Good	Inadequate	Too complex
20	In terms of helping to understand, operate and manage the college, the Contractor's Aftercare Service was	Full and complete	Partly complete	Inadequate
21	Cleaning the college building is	Completely straight forward	Partly straight forward	Difficult

Table 3 – Example Results Format

1.5.3. If any additional questions are asked in order to obtain a more detailed understanding of the issues raised, they shall be noted along with the corresponding response. [PM_10_20_82]

1.6. Teaching staff survey results

1.6.1. A summary of the main findings in all areas shall be provided and any trends in poor building performance should be highlighted. [PM_10_20_82]

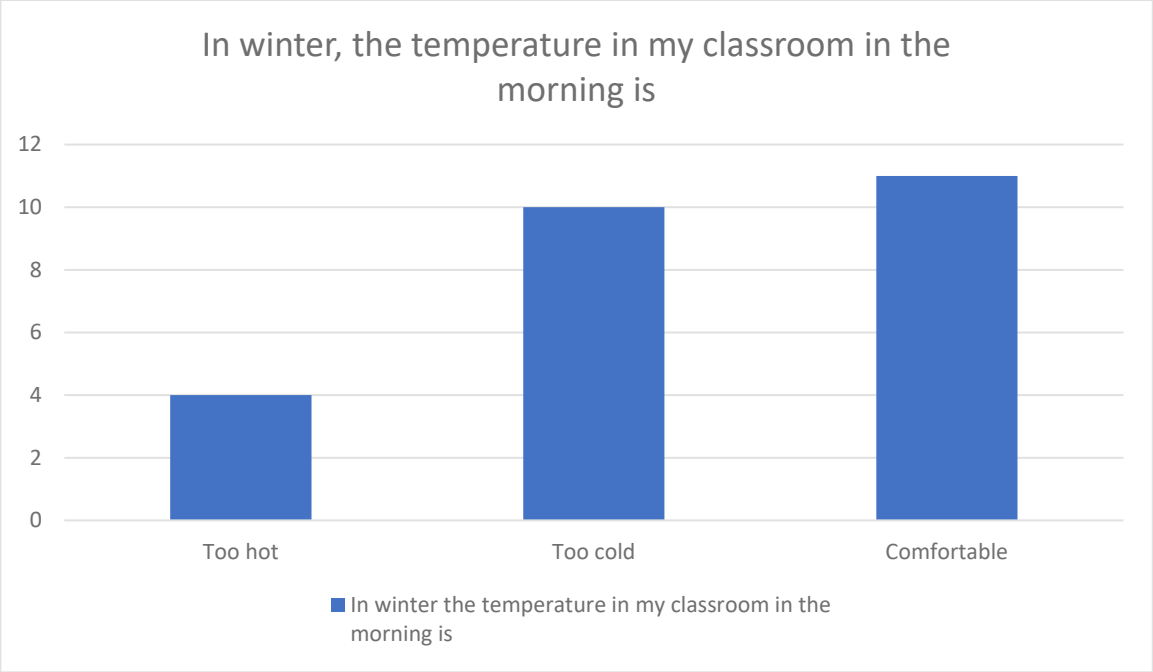
1.6.2. It is important when interpreting the staff survey results to look at the broad trends in the opinions rather than focusing on single points from individuals. [PM_10_20_82]

1.6.3. In addition to the summary, the responses to the individual questions shall be presented in a graphical format. [PM_10_20_82]

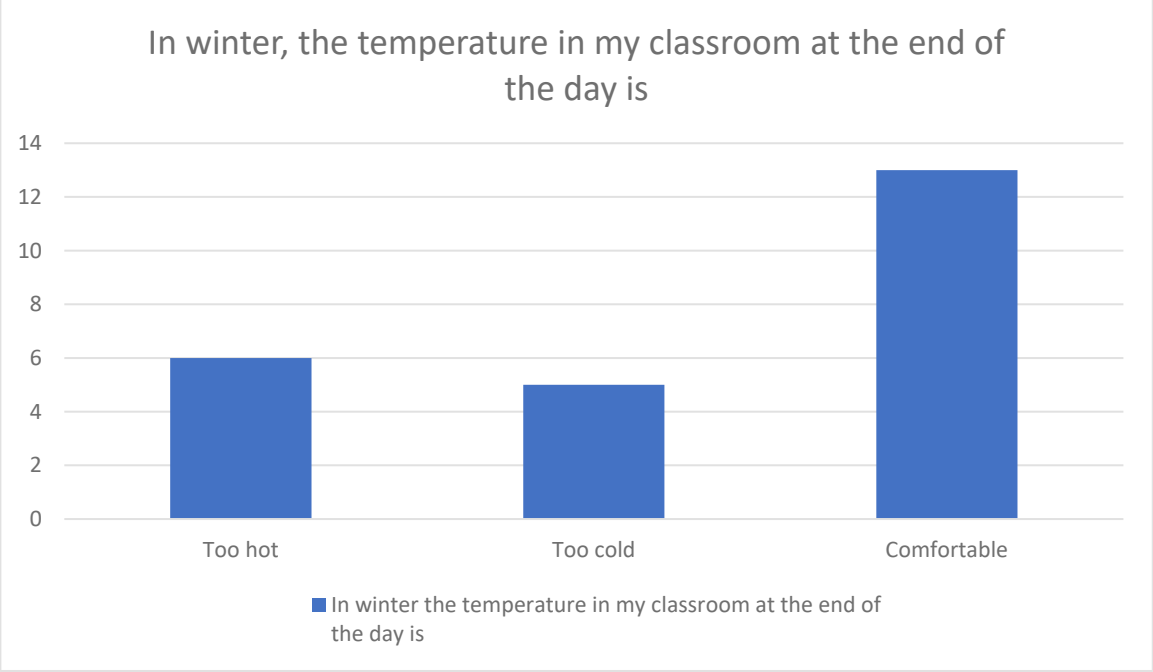
1.6.4. A spreadsheet answer template is available to assist with this process. [PM_10]

1.6.5. Although the questions are multiple choice there are spaces on the answer sheet for the respondents to provide further details if required. [PM_10]

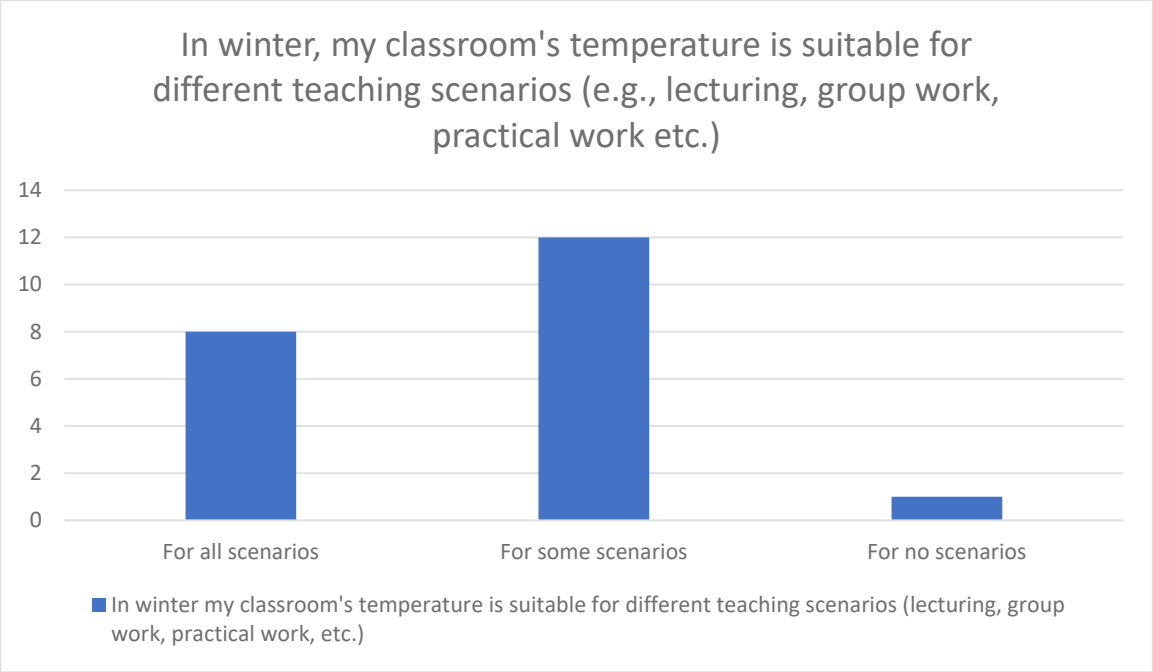
1.6.6. These additional responses shall be reported below the graphs. As shown in the following examples. [PM_10_20_82]



Question 1 - Winter morning temperature in the classroom

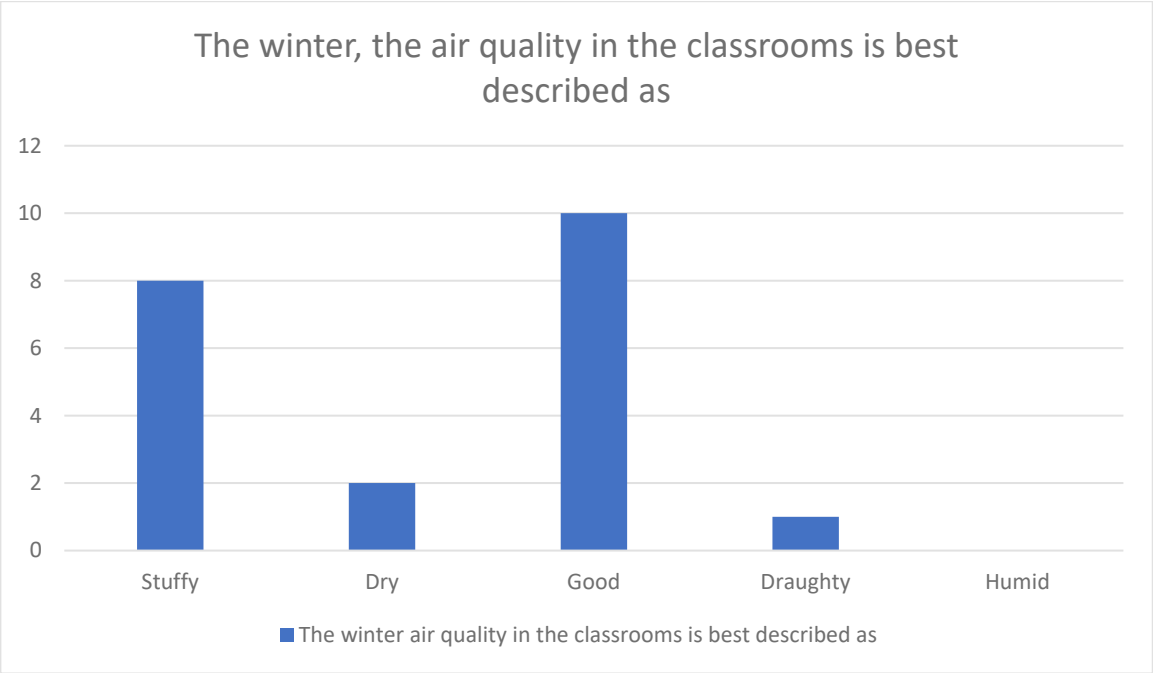


Question 2 - Winter end of the day temperature in the classroom

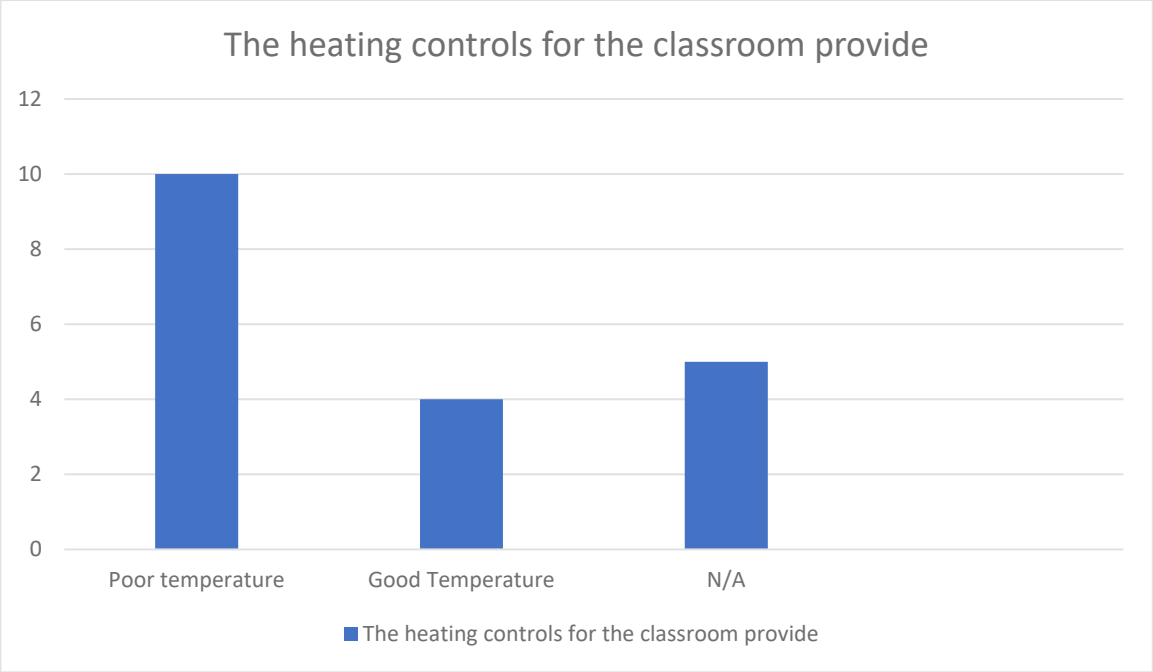


Question 3 - Winter classroom temperature suitable for different teaching scenarios

"Towards the end of the day students are drained and lack energy and motivation."
"The room is hot and stuffy."

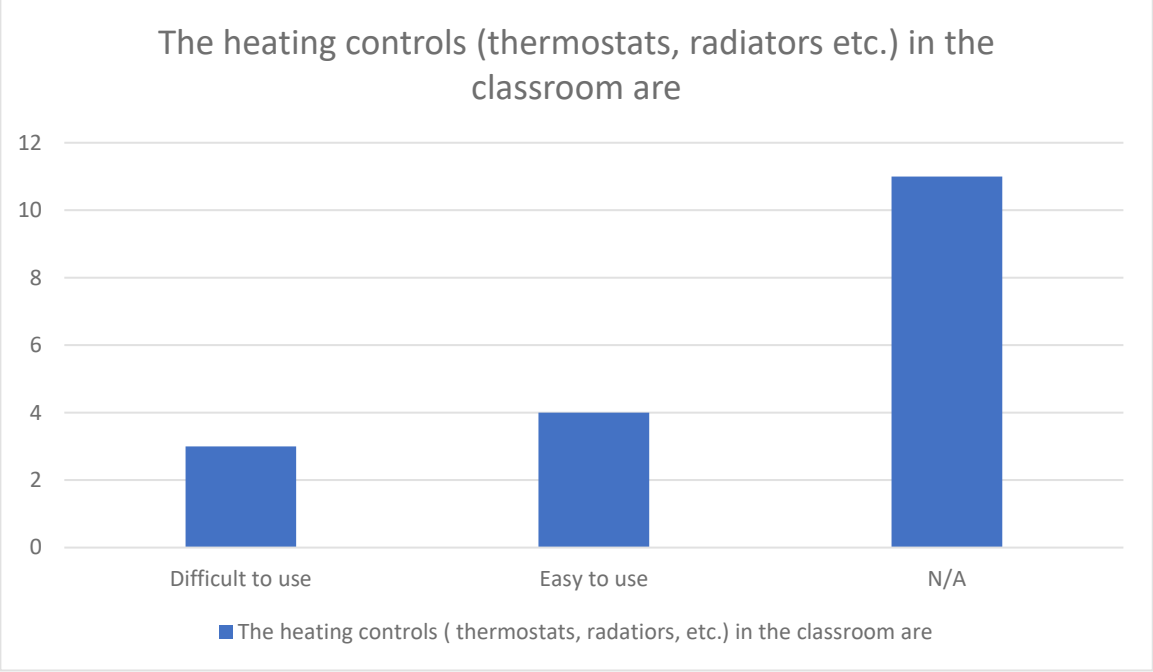


Question 4 - Winter air quality in the classroom



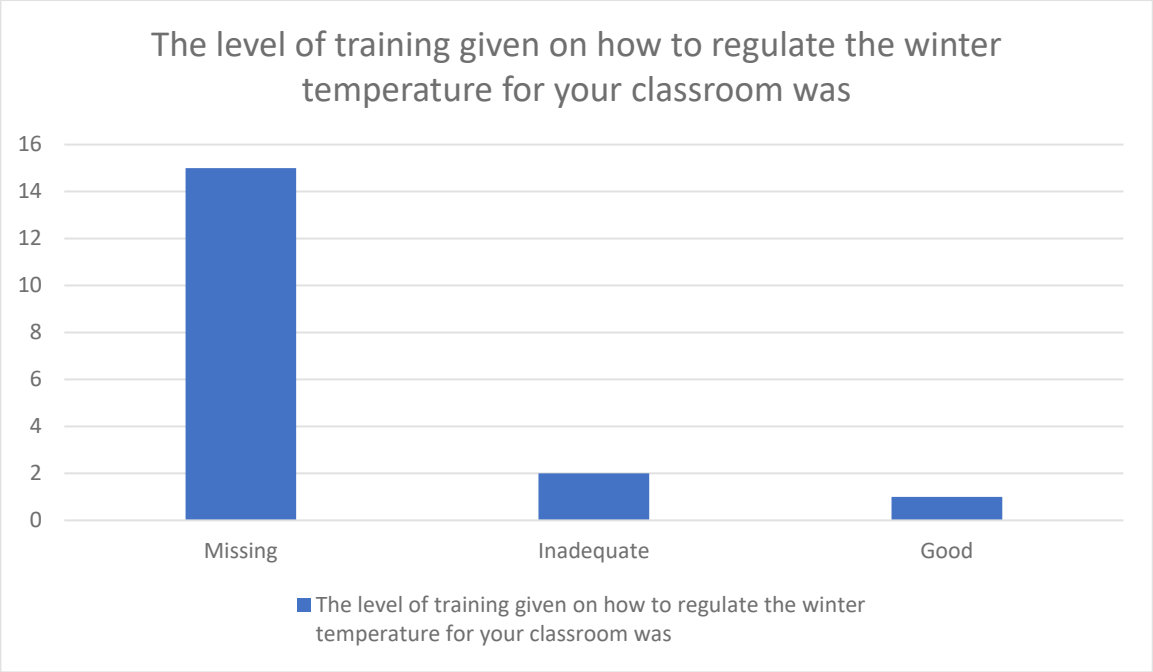
Question 5 - Heating controls for the classroom

"The temperature stays the same even if the controls are adjusted."
"The thermostat has no effect."

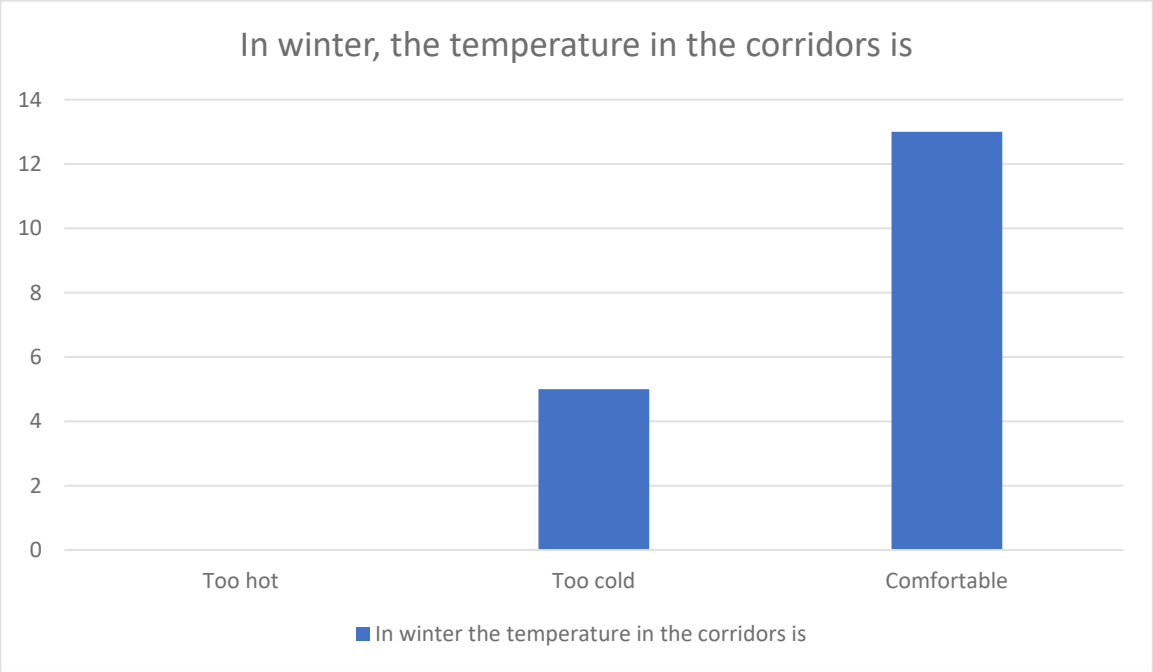


Question 6 - Heating controls in the classroom

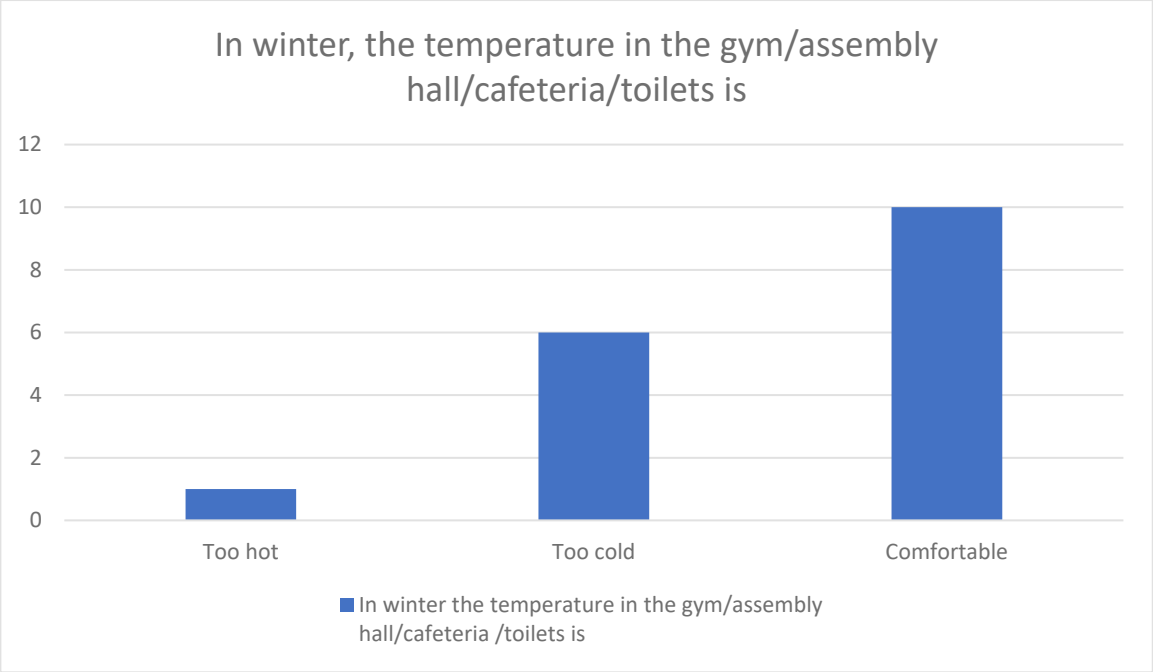
"The controls make no difference to the temperature."



Question 7 - Level of training given on how to regulate the winter temperature in the classroom

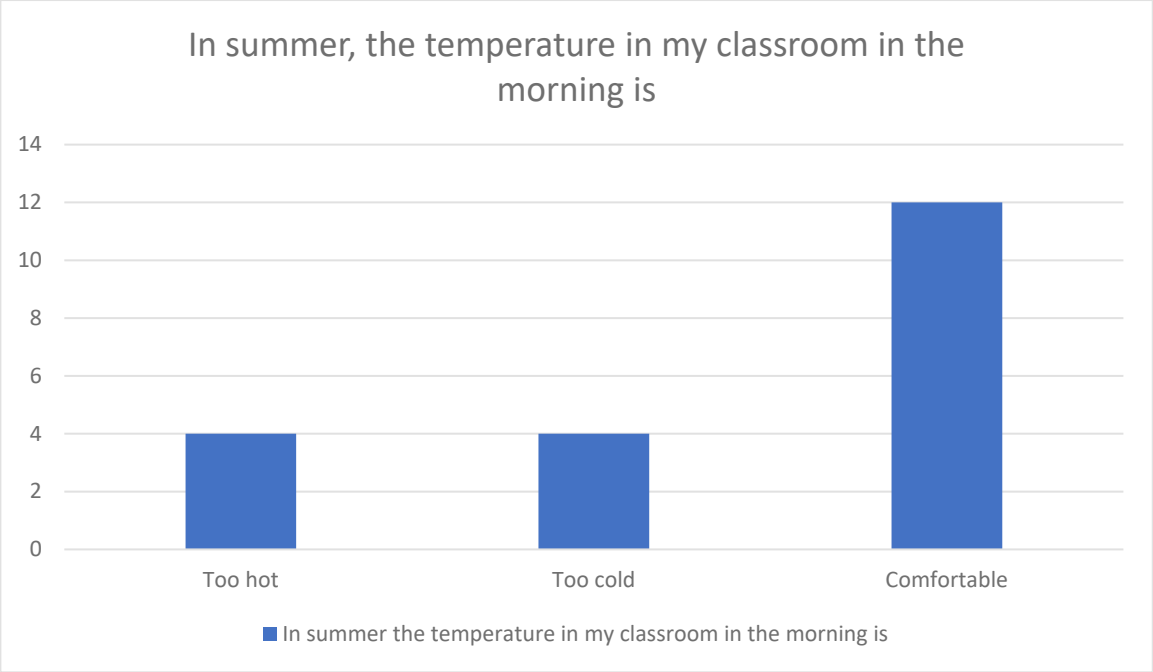


Question 8 - Winter temperature in the corridors

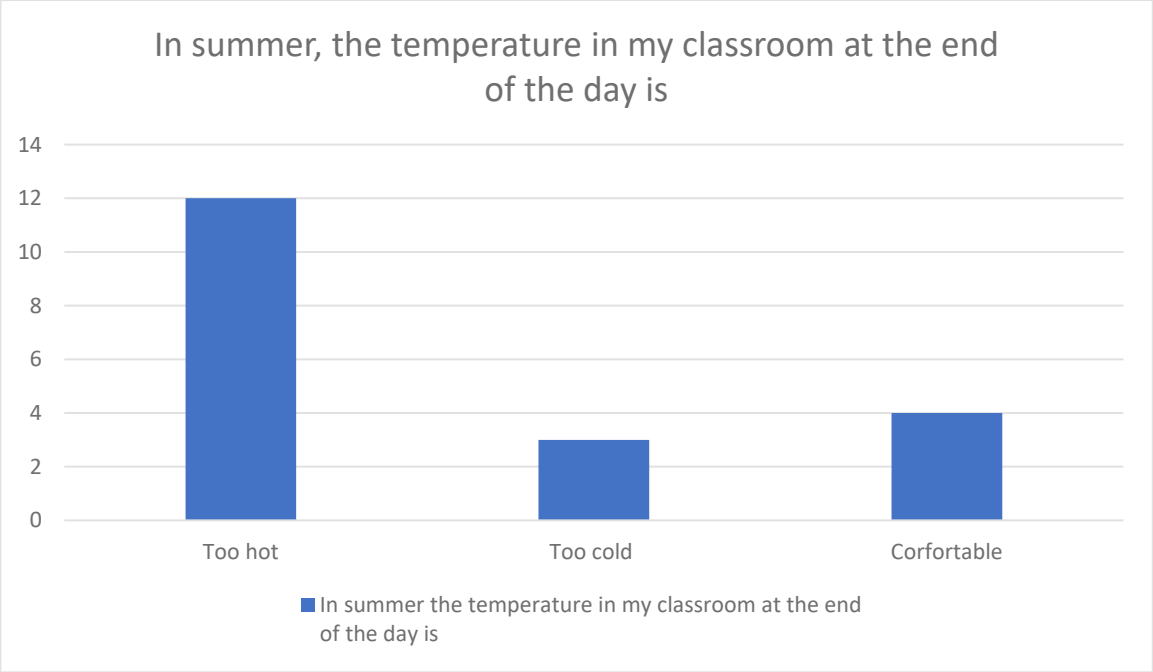


Question 9 - Winter temperature in the gym/assembly hall/cafeteria/toilets

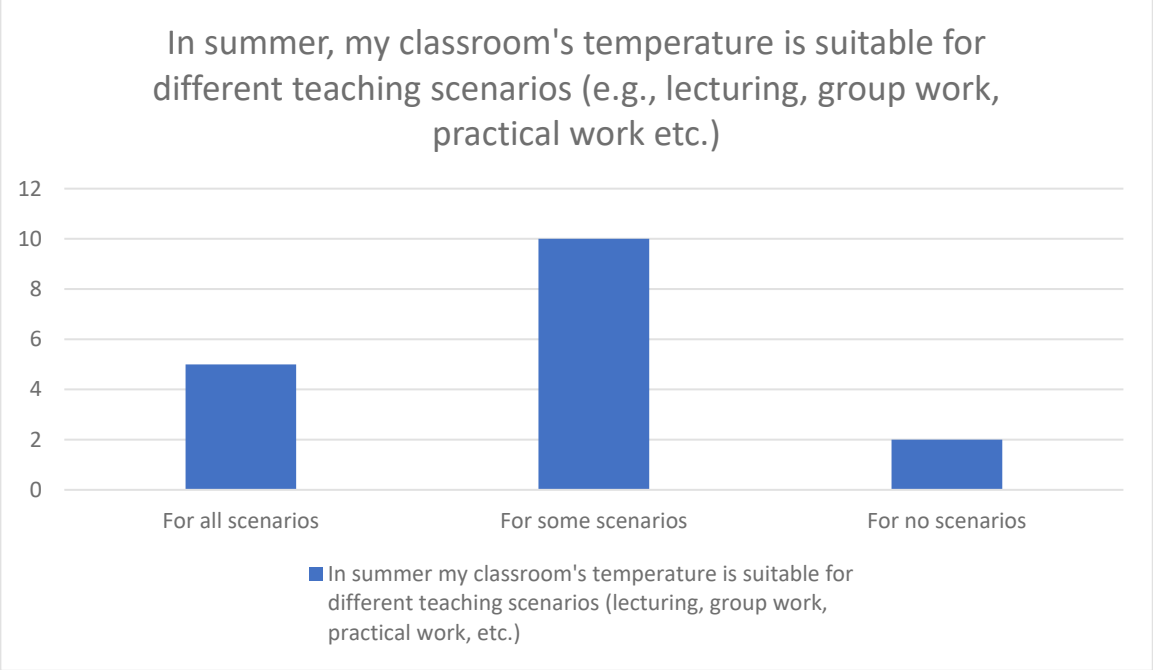
"Always very warm."
"The sports hall is very warm."



Question 10 - Summer morning temperature in the classroom

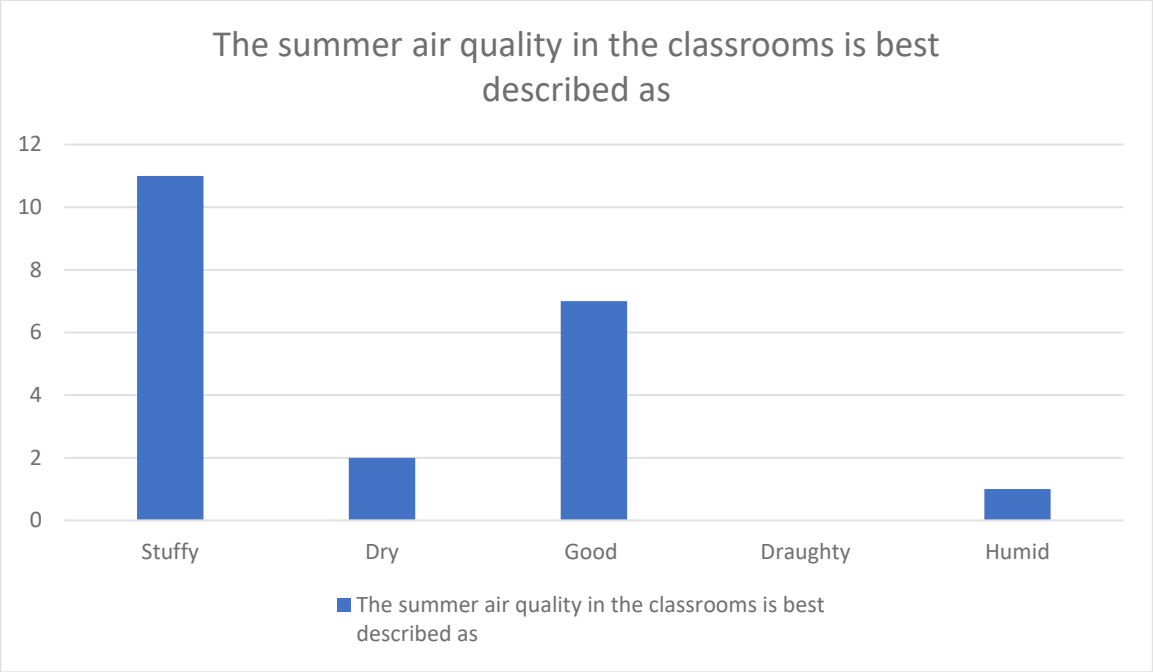


Question 11 - Summer end of the day temperature in the classroom

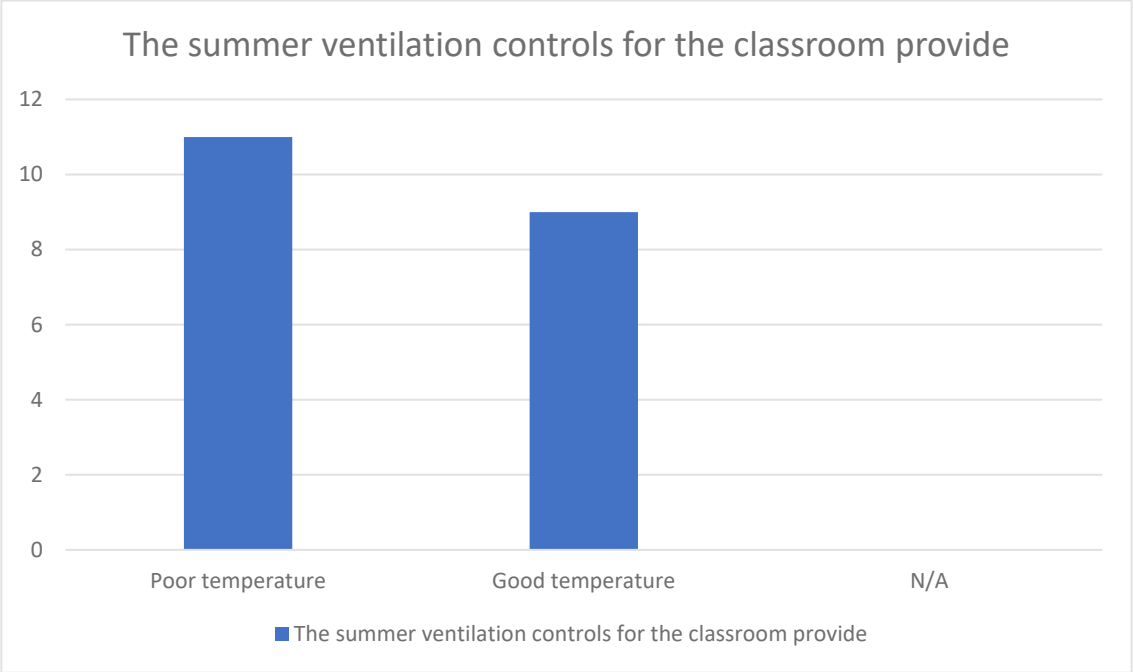


Question 12 - Summer classroom temperature suitable for different teaching scenarios

"We carry out daily duties, however temperature and environment make these difficult and exhausting."
"Leave the unit feeling tired and unwell during the summer months."
"No fresh air circulation."
"Room is very warm and stuffy."

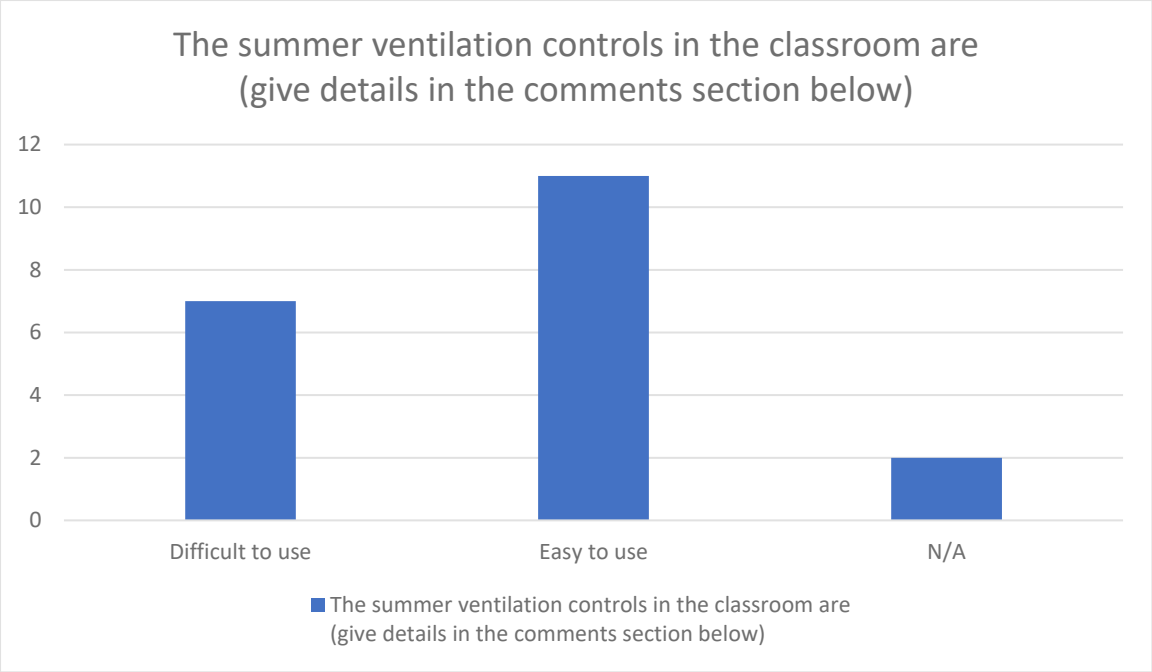


Question 13 - Summer classroom air quality



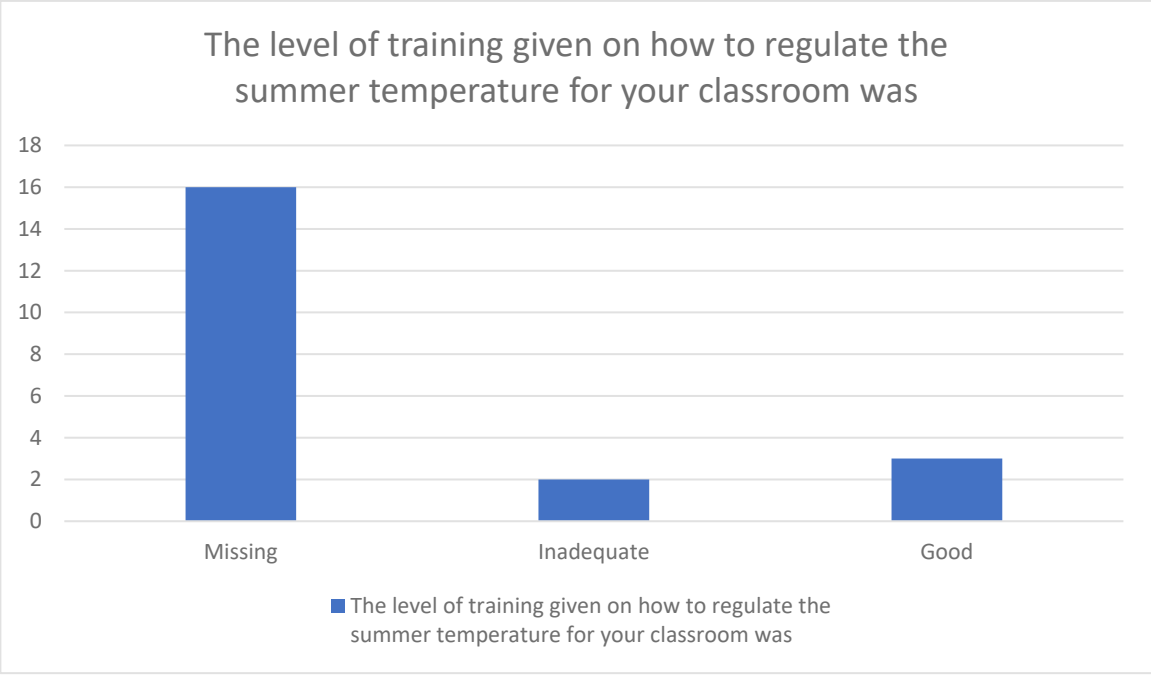
Question 14 - Summer classroom ventilation controls provide

"The air conditioning is set as low as possible."

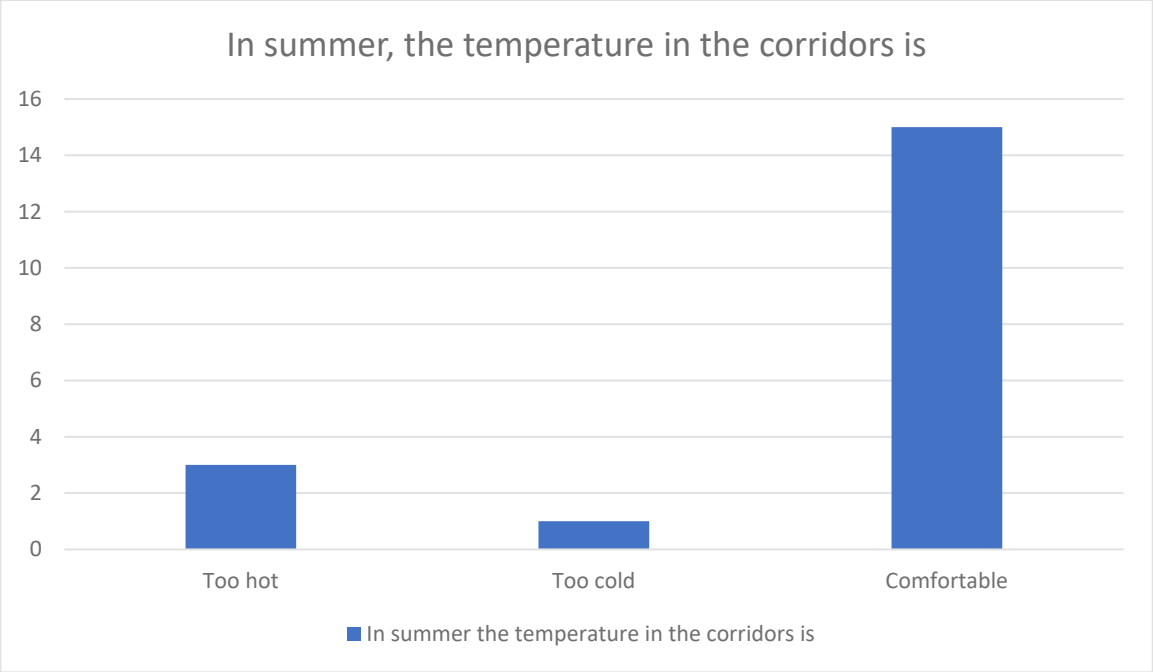


Question 15 - Summer classroom ventilation controls are

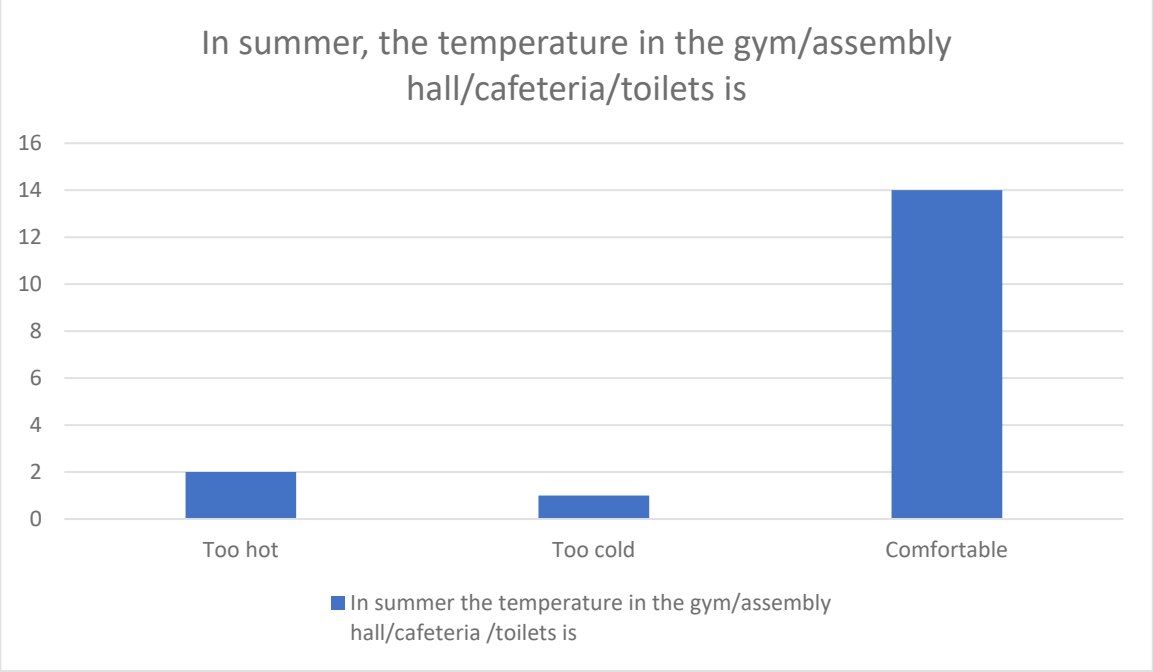
"The controls make no difference."



Question 16 - Level of training given on how to regulate the summer temperature in the classroom

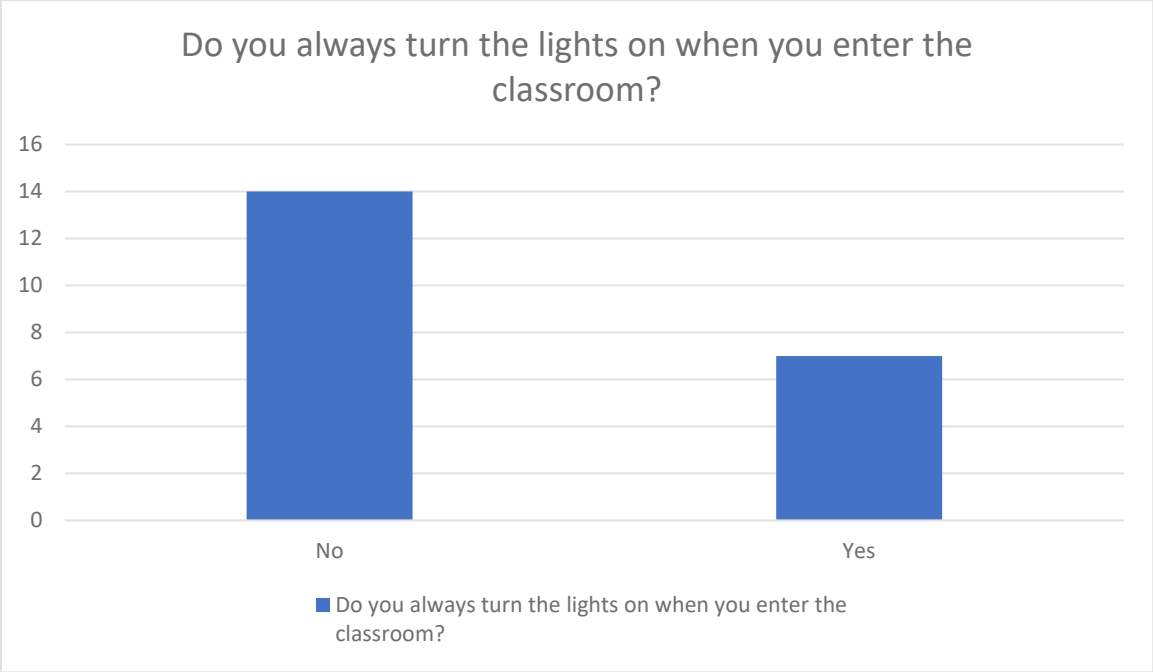


Question 17 - Summer temperature in the corridors

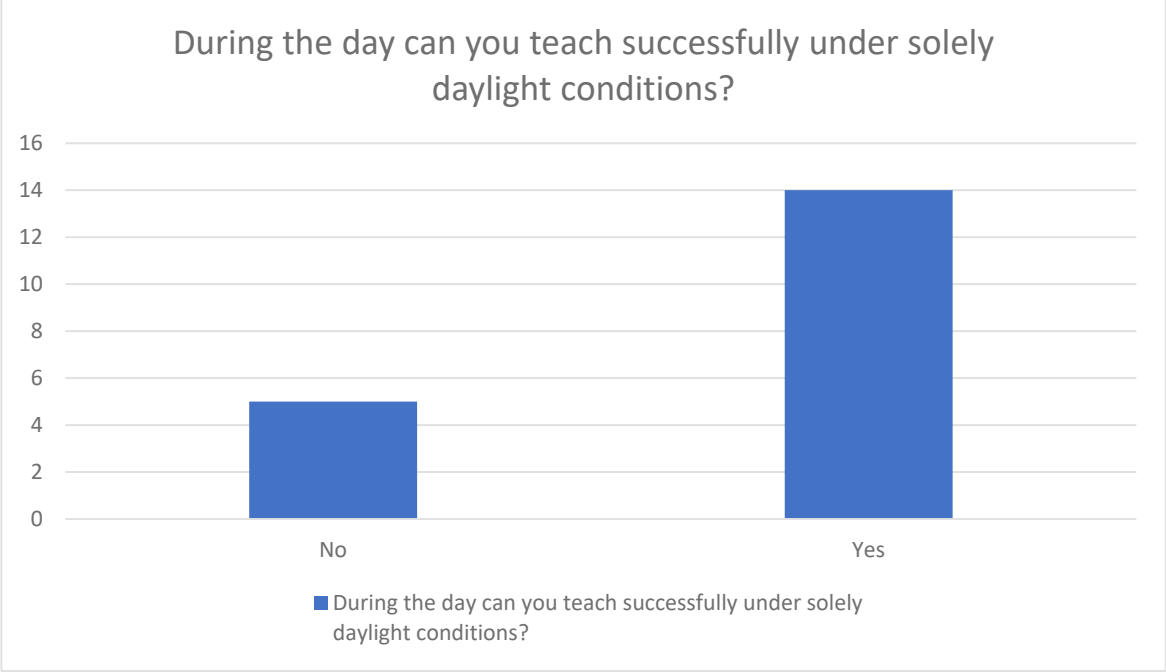


Question 18 - Summer temperature in the gym/assembly/hall/cafeteria/toilets

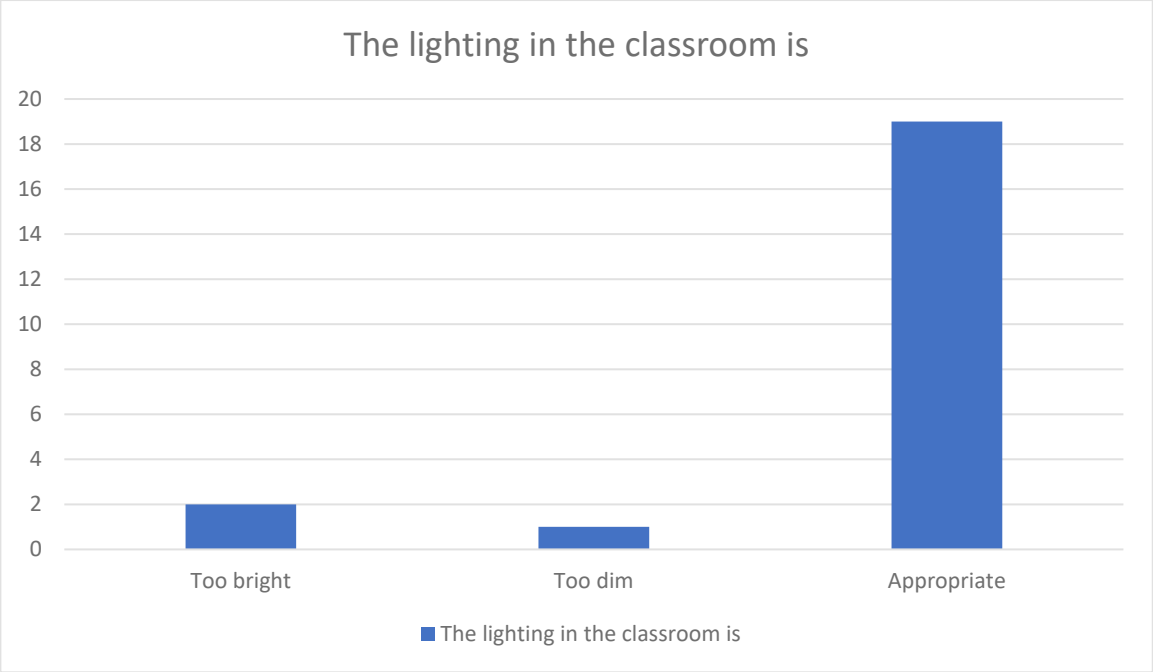
"The temperature varies from 25.4°C to 28.1°C in the summer."



Question 19 - Turning on lights when entering the classroom

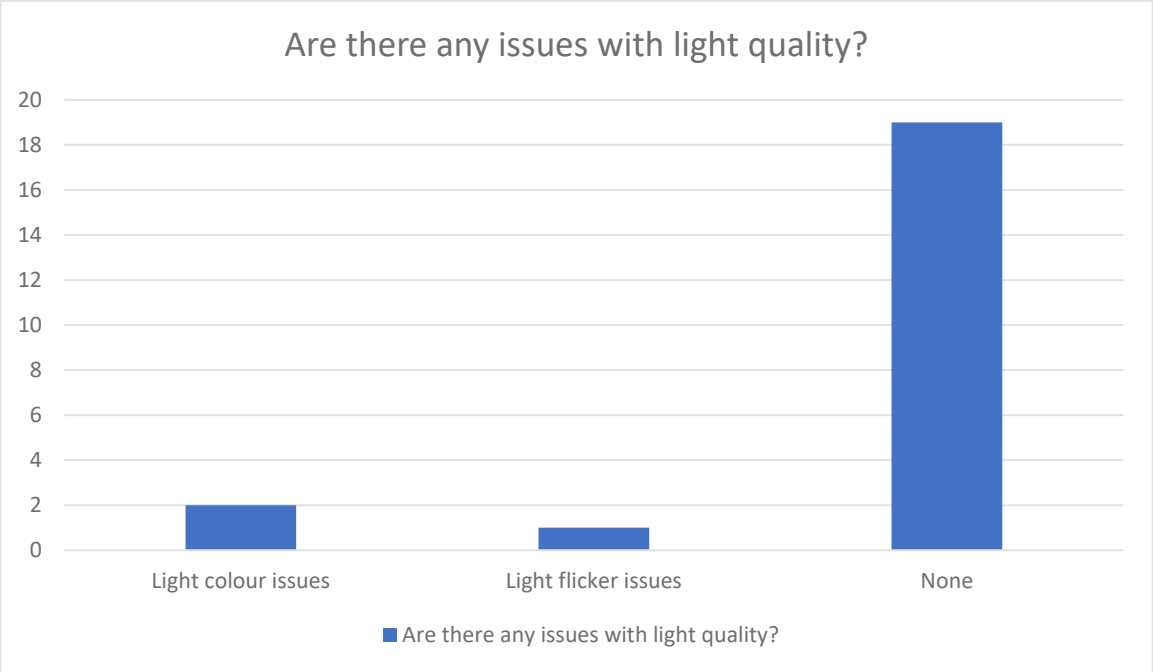


Question 20 - During the day teaching successfully under daylight conditions

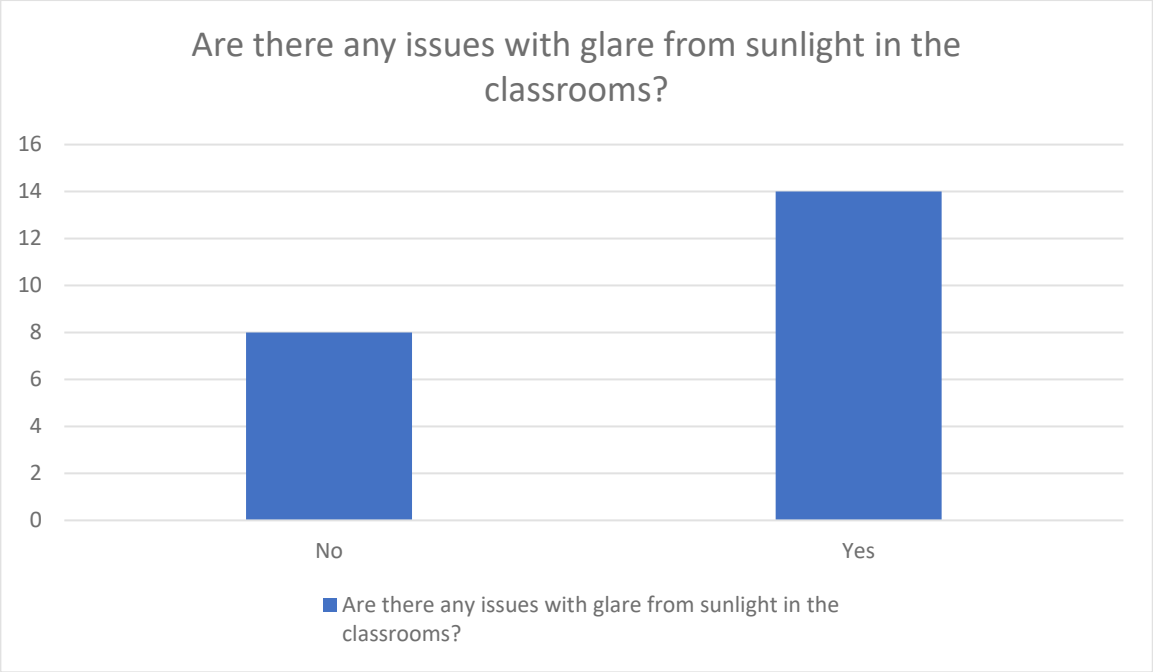


Question 21 - Classroom lighting

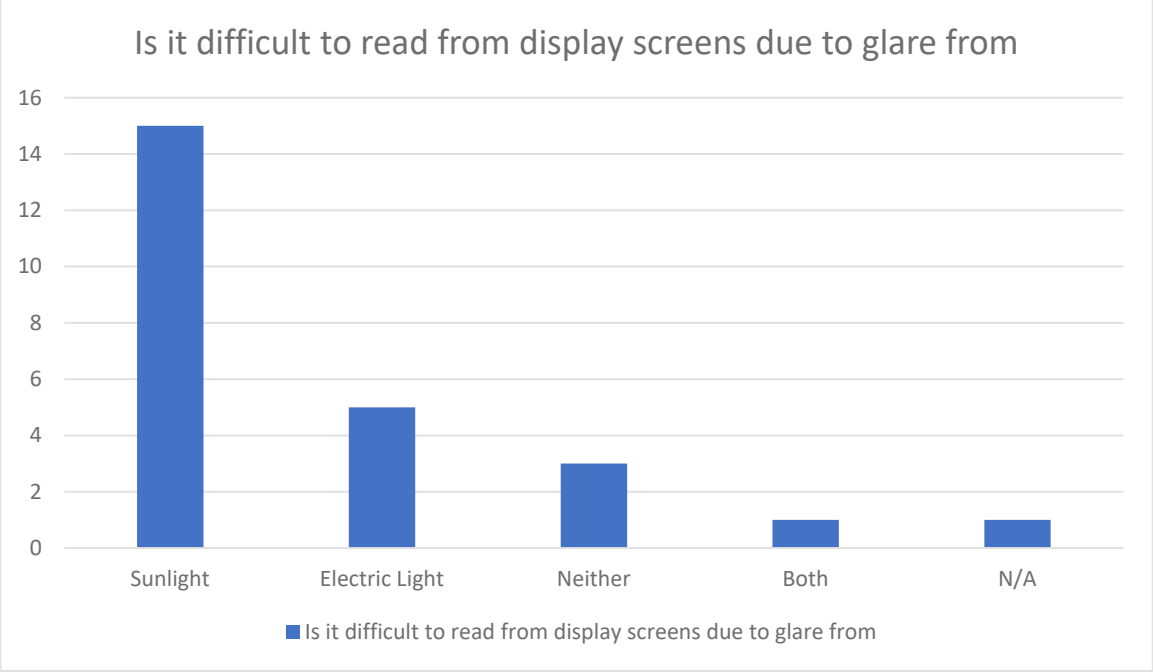
"The lights are ill placed."



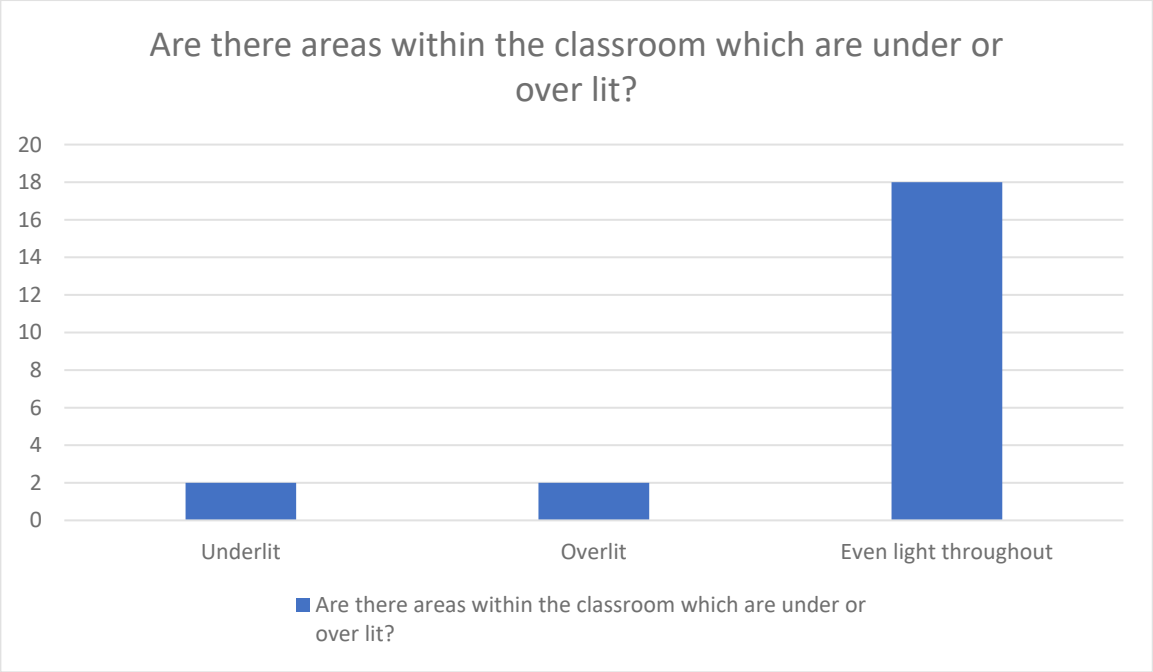
Question 22 - Light quality issues



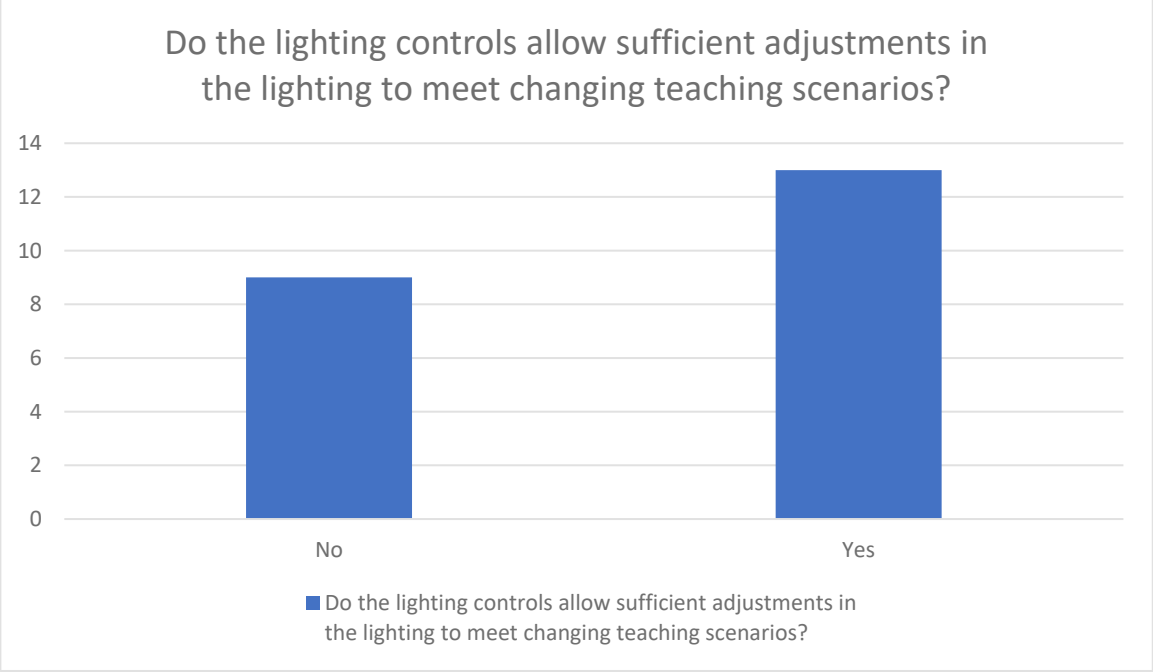
Question 23 - Glare issues from sunlight in the classroom



Question 24 - Difficulty when reading from display screens due to glare

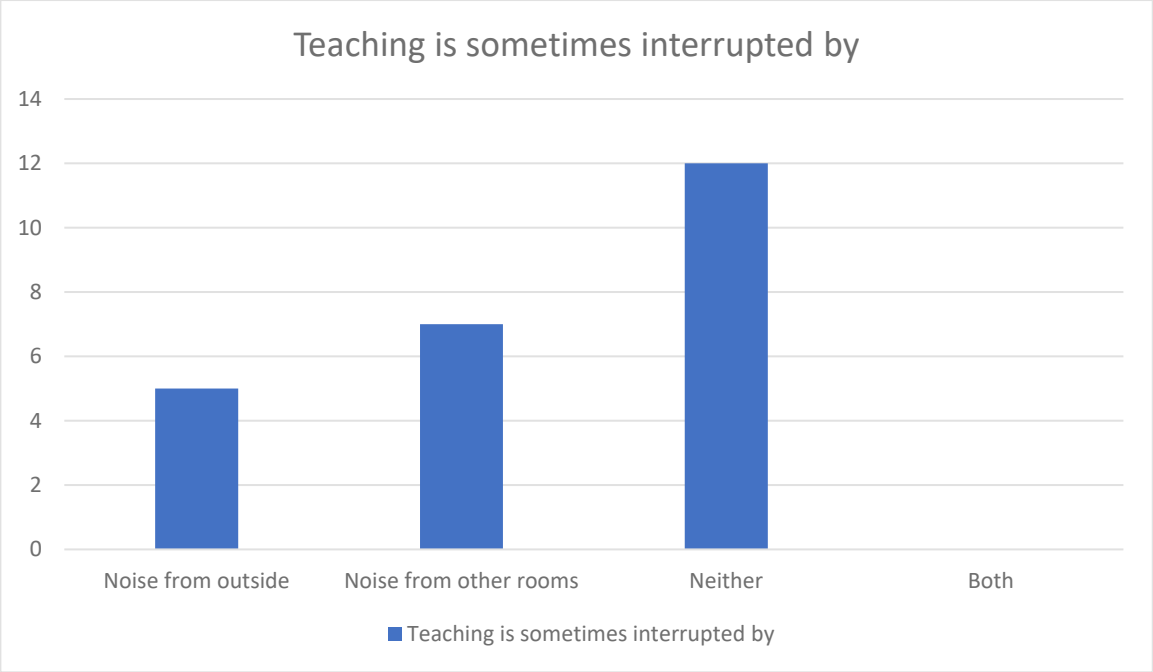


Question 25 - Areas within the classroom that are under or over lit



Question 26 - Lighting controls allowing sufficient adjustments in the lighting to meet changing teaching scenarios

"There are light and dark areas within the room."



Question 27 - Teaching interruptions

General comments:

"Gets too hot in the office and doors have to be propped open."

"The office gets hot and stuffy. When the sun shines on the side of the building it gets very hot."

"Door is always open to get air circulating. Staff room is noisy."

"Fire door needs to be open to cool the office."

"Nothing ever changes despite contractors trying."

"Room is always warm and stuffy. We only have half the lights on and need to keep the student access hatch open all day which is noisy."

1.7. Conclusion

1.7.1. The main areas of both good and bad performance for the Building are to be summarised in this section. [PM_80_10_60]

1.7.2. If there are any definite actions which need to be taken, they shall also be listed. [PM_60_30_05]

1.7.3. A simple table showing the outcome of the review ranking the issues raised in order of significance shall be provided along with proposed action plan to rectify any issues. [PM_10_20_82]

Issue No.	College or general	Issue	Explanation	Issue Owner	Lead action required by
1	general	Training	Reinforcing training on ventilation controls will assist in reducing overheating	Contractor/ College	Contractor
2	college	Teaching staff questionnaires	17 returned from college: Winter temperature – generally good, some draught issues due to main entrance doors. Noise/acoustics generally good but some reports of noise transmission from adjacent rooms and ventilation units (rooms 2027, 2026). Summer temperature – generally good but some rooms too hot (textiles room, general office). All would benefit from training on what controls are available within classrooms. Air quality – generally good,	Contractor	Contractor

			some reports of stuffy/some draughts, some Bunsen burner issues (room 2026) Lighting – generally considered satisfactory.		
3	general	Energy consumption is good	Sub-meter calibration against utility billing data and ensuring that all sub-meters are recording data would help the college in managing their energy consumption.	Contractor	Contractor
4	N/A	N/A	N/A	N/A	N/A
5 etc	N/A	N/A	N/A	N/A	N/A

Table 4 – Example Review Outcome

1.7.4. Develop the action plan from the initial BPE review showing the proposed programme for all items and implement in preparation for the final BPE review at 12 months after occupation. [PM_10_20_82]

Appendix D Final Building Performance Evaluation Report Template

1. Final Performance Review (Name of Site)

1.1. Introduction

1.1.1. This section shall be an update of the equivalent section in the Initial Performance Review document. [PM_10]

1.1.2. The introduction shall include a description of the College which covers at least the following information.

a) Brief description of the Building (location, floor area, layout, storeys, curriculum models delivered, special facilities etc.). [PM_10]
b) Date the Site was opened. [PM_10]
c) Number of Learners. [PM_10]
d) Name of Contractor. [PM_10]
e) Name of Architect. [PM_10]
f) Name of M&E designer. [PM_10]
g) Facilities management arrangements (in house or outsourced). [PM_10]
h) Date of the Initial Performance Review. [PM_10]
i) Name(s) of individual(s) who conducted the review. [PM_10]
j) Name(s) of facilities staff interviewed. [PM_10]
k) Number of teaching staff who completed the questionnaire. [PM_10]

1.2. Overview of the design

1.2.1. General

1.2.1.1. As with the “Introduction” this section can be drawn from the work done from the Initial Performance Review document, with any changes specifically highlighted. [PM_10]

1.2.1.2. This section shall include an overview of the College’s design with sufficient detail to allow the reader to understand the main operating principles of the main Building Services as well as the overall design strategy for energy management. [PM_40_20_26]

1.2.1.3. Much of this information is often located in the building logbook. [PM_70_85_60]

1.2.1.4. Each building service shall be provided with its own sub-heading. Any design targets for the systems should be stated. [PM_40_30_27]

1.3. Heating

1.3.1. Details of the heating system shall include the operating hours, temperature set points, fuel types, an overview of the local controls and distribution method for the heat i.e., via hot water or warm air. [PM_40_20_38]

1.3.2. Where there are multiple heating systems, such as a biomass boiler and supplementary gas boiler, the interaction between these systems shall be described. [PM_40_20_38]

1.3.2. Lighting

1.3.2.1. Details of the lighting shall cover the type of lamps used, whether they have automatic controls and the level of controls available to teachers in the individual classrooms. [PM_40_20_47]

1.3.2.2. Details shall also be provided regarding how the rooms have been designed to utilise daylight. [PM_40_20_21]

1.3.3. Ventilation

1.3.3.1. Details of the type of ventilation and the controls available to teachers shall be described. [PM_40_20_94]

1.3.3.2. Areas with specific ventilation needs such as kitchen, changing rooms larger curriculum spaces (for example construction activities) and sports halls shall be noted. [PM_40_20_94]

1.3.3.3. The design maximum CO_2 levels shall also be stated. [PM_40_20_94]

1.3.4. Cooling

1.3.4.1. If cooling is provided, the reason for its use shall be explained. [PM_40_20_38]

1.3.4.2. The details of the controls shall include information on whether it is possible for the heating and cooling systems to be operating at the same time. [PM_40_20_38]

1.3.5. BMS Controls

1.3.5.1. A list of all the systems that are connected to the BMS shall be provided, along with the level of control provided over them. [PM_40_30_52]

1.3.5.2. For example, the BMS may only provide information on whether plant is running or not for some systems, whereas for others it may provide full control including changing of set-points. [PM_40_30_52]

1.3.6. Other major systems (including renewables)

1.3.6.1. Any system which has a significant impact on the building's performance shall be noted. [PM_40_20_26]

2. Issues with the Building

2.1. Issues with the Building

2.1.1. General

2.1.1.1. This section focuses on the issues with the building performance that affect energy consumption, facilities management and building user comfort. [PM_10]

2.1.1.2. It shall be supported by the photographs taken on the site visit. [PM_10_20_82]

2.1.1.3. Wherever possible the root cause of the issues shall be described. [PM_10_20_82]

2.1.1.4. As the Building will have been occupied for some months, a greater number of issues may have emerged. [PM_10]

2.1.1.5. Issues with the ease of maintaining and cleaning the Building shall be noted. [PM_10_20_82]

2.2. Energy and Utility consumption

2.2.1. Description of the energy monitoring systems

2.2.1.1. A brief overview shall be provided of the energy monitoring systems in place and the process required to extract the data from them. [PM_40_20_26]

2.2.1.2. The ease of investigating energy consumption trends over time shall be stated. For example, is there a computer interface that displays energy consumption in a graphical format; do the College utilise the iSERV energy reports in managing the Building? [PM_10_20_82]

2.2.2. Overview of energy consumption

2.2.2.1. The first year annual energy and utility data should be recorded here. As a minimum the following information should be presented.

a) Utility being monitored (e.g., gas, electricity etc). [PM_10_20]
b) Meter ID. [PM_10_20]
c) Consumption since the start of building occupation until the present time. [PM_10_20]

d) Average consumption per day. [PM_10_20]

e) Average out of hours consumption per day. [PM_10_20]

2.2.2.2. A brief description of the energy monitoring process used by the College should be provided including details on who has overall responsibility for monitoring and managing the energy consumption. [PM_10_20_82]

2.2.3. Breakdown of consumption

2.2.3.1. The electricity consumption should be grouped into use type and presented to demonstrate how the energy is consumed as shown in the following chart. [PM_10_20_82]

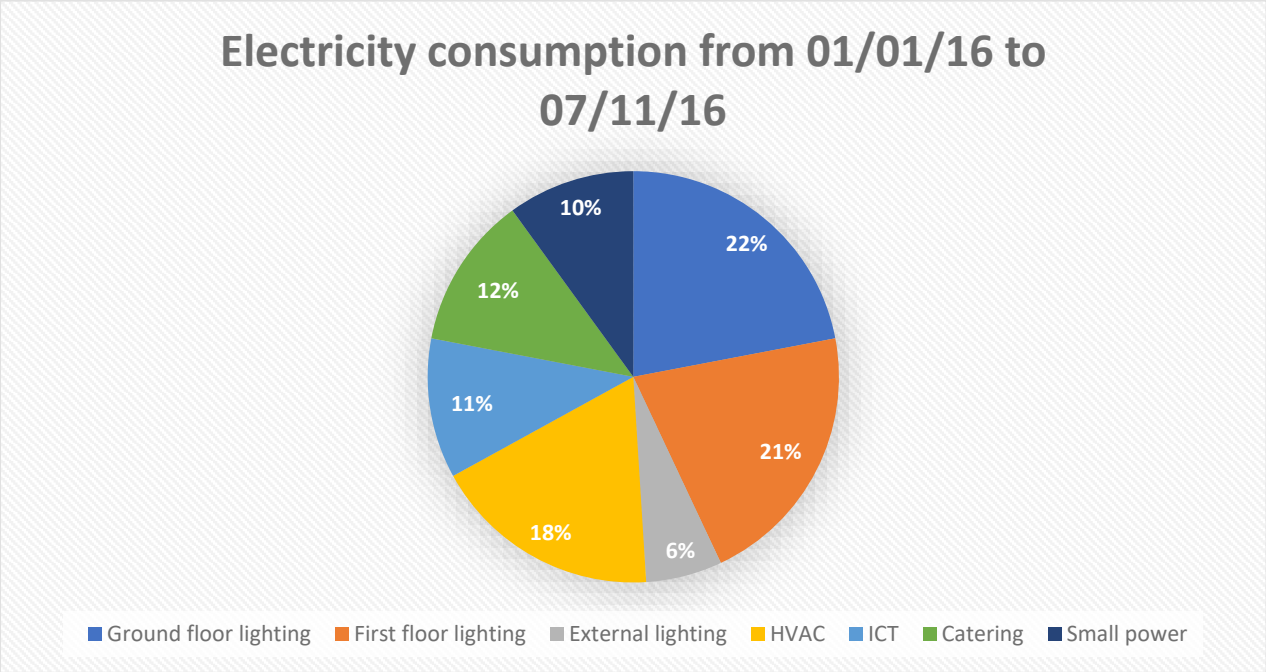


Figure 2 – Electricity consumption from 01/01/2016 to 07/11/2016

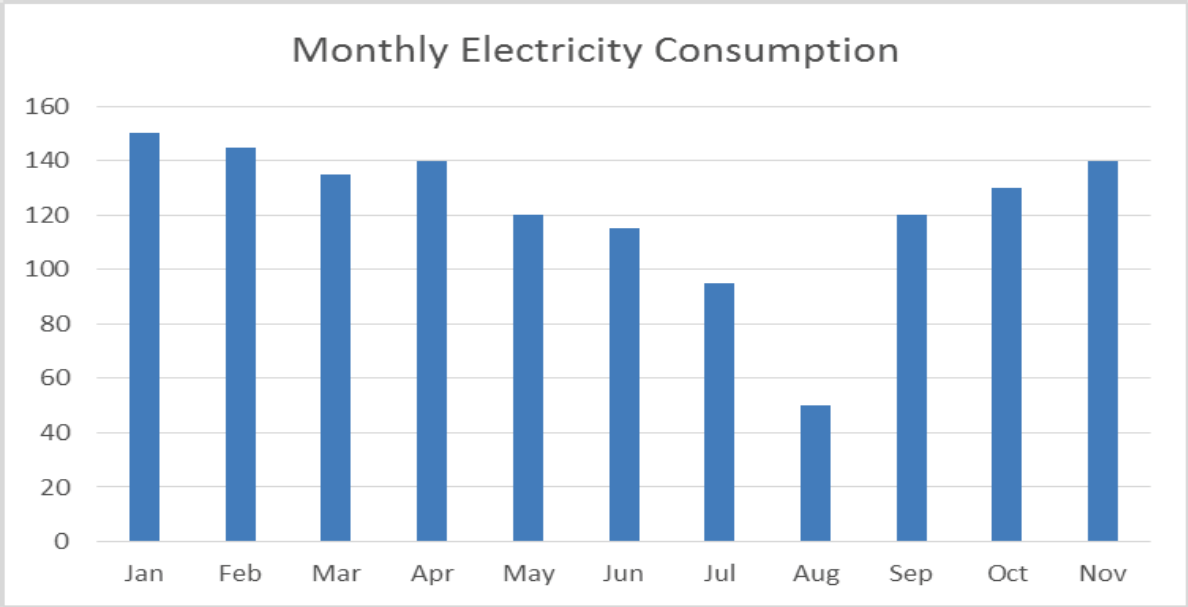


Figure 3 – Monthly Electricity Consumption

2.2.3.2. The monthly totals for the various sub-meters and main meters shall also be shown. Where there are trends observed in the energy consumption, a commentary should be provided describing the likely drivers behind them. [PM_10_20_82]

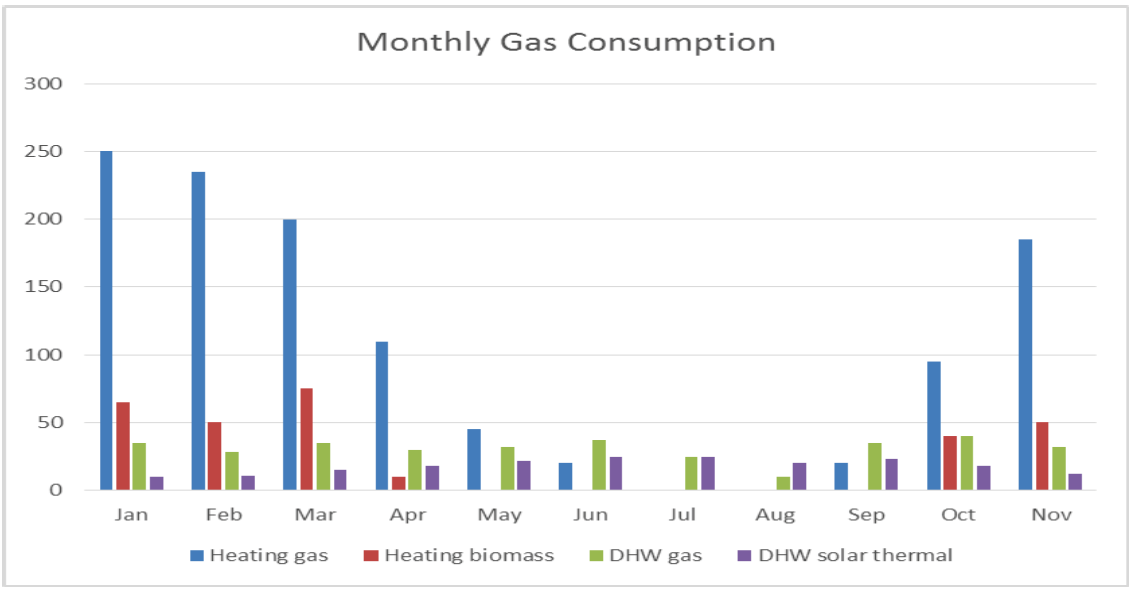


Figure 4 – Monthly Gas Consumption

2.2.3.3. The gas shall be presented in a similar manner as the electricity. If possible, the hot water shall be shown separately from the heating use. Also, if renewable heat is used alongside the gas, this shall also be presented. As with the electricity consumption a commentary shall be provided to explain the driving factors behind the patterns in consumption. [PM_10_20_82]

2.2.3.4. The water consumption shall also be shown with any contribution from rainwater harvesting or greywater recovery shown separately. [PM_10_20_82]

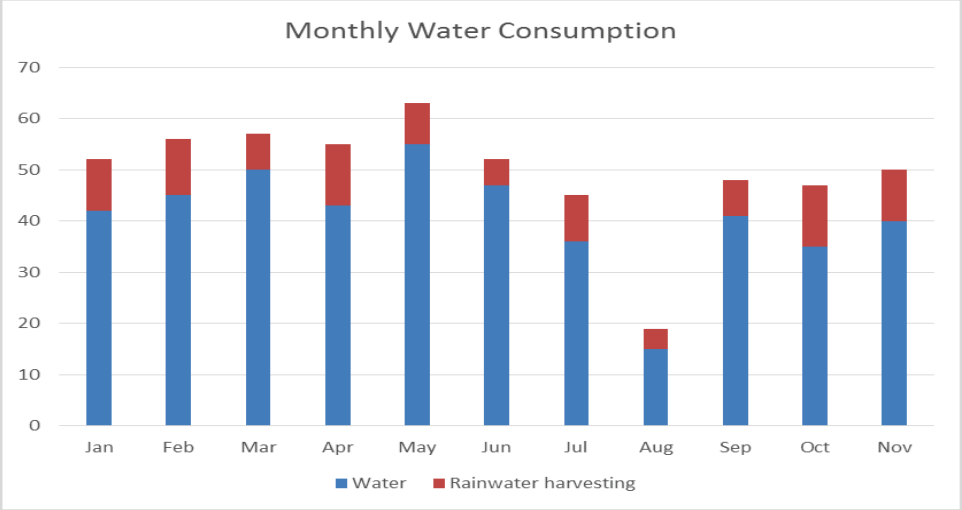


Figure 5 – Monthly Water Consumption

2.2.4. iSERV Analysis and reporting

2.2.4.1. The energy data that is uploaded to the iSERV or similar monitoring system shall be analysed to highlight areas of good and bad energy performance. The iSERV system will produce a report showing different areas of the building's energy performance measured against industry benchmarks. The main findings from this report shall be summarised here, paying particular attention to any areas that significantly exceed the benchmark consumption figures. [Ac_05_50_54]

2.2.5. Daily profiles

2.2.5.1. The energy consumptions for a summer day and a winter day shall be presented as shown in the following chart. [PM_10_20_82]

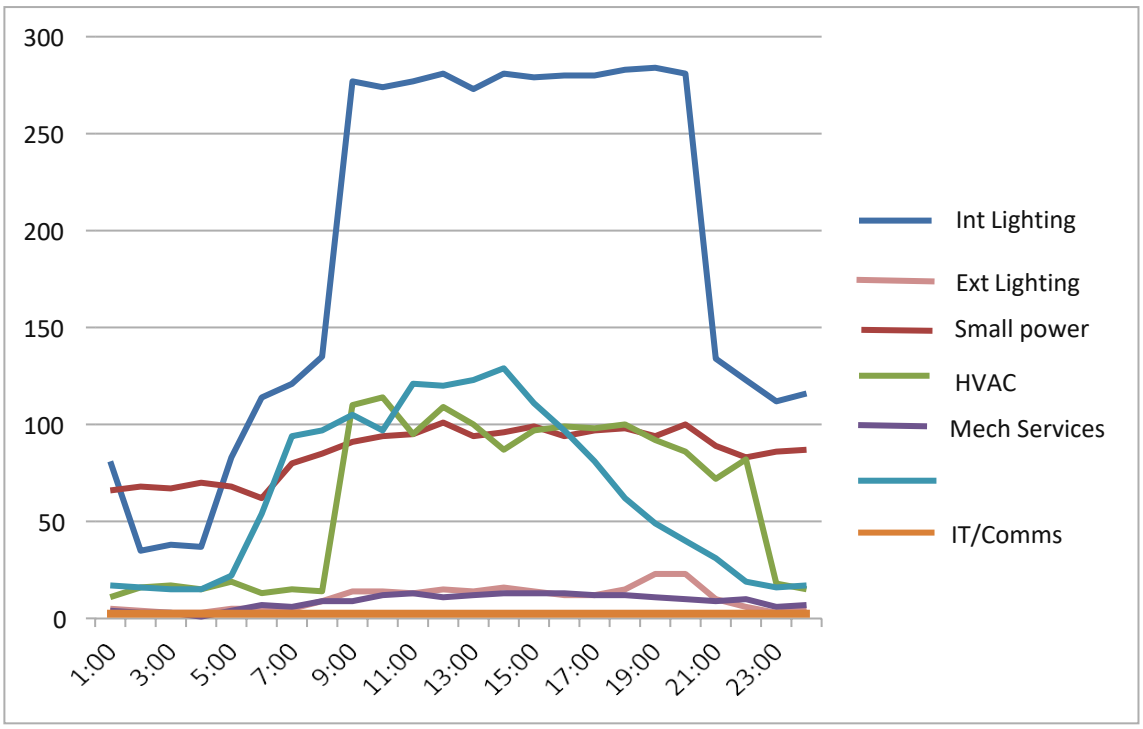


Figure 6 – Example of a daily energy profile for a school building (as reference)

2.2.5.2. A commentary shall be provided which shows how the activities taking place within the College are mirrored by the energy consumption. For example, the energy usage of illumination is projected to peak on the basis of daytime and College Hours of service. This shall be reflected by annotation of a separate graph of the internal lighting metered data. [PM_10_20_82]

2.2.5.3. A table showing the comparison of the actual annual energy and water consumptions against the Contractors' design proposals and also the DfE energy benchmarks shall be included. [PM_10_20_82]

2.2.5.4. A commentary explaining what actions have been taken through items such as seasonal commissioning adjustments shall be provided. [PM_10_20_82]

2.2.5.5. Fine tuning and training to reduce energy consumptions and achieve design performance shall be included. [PM_10_20_82]

2.2.5.6. Where it is not clear what is driving any aspect of the energy consumption, this shall be clearly noted as an area for further investigation. [PM_10_20]

2.2.5.7. If the temperature and CO_2 levels are being monitored within the rooms then these too shall be recorded on separate daily profiles. If either the CO_2 or the temperature levels are found to be outside the design limits this shall be highlighted along with details of the potential causes. [PM_10_20_82]

2.2.5.8. Internal temperature is linked to the heating and ventilation systems and it can be useful to produce daily profiles showing the gas consumption and internal

temperature in the winter, and the ventilation consumption and internal temperature in the summer. [PM_10]

3. Facilities staff interview results

3.1. The facilities staff interview is structured based on a multiple-choice format and as such the responses can be presented in the following table. [PM_10]

3.2. In addition to the table any specific details and issues raised during the interview shall be described in this section of the report. [PM_10_20_82]

Question Number	Question	Multiple Choice answer 1	Multiple Choice answer 2	Multiple Choice answer 3
1	Do you have any responsibility for the operation and/or maintenance of the Building's heating systems?	Yes	No	N/A
2	The training provided on the operation and/or maintenance of the heating system was	Good	Inadequate	Too complex
3	The heating controls are	Simple to use	Moderately simple to use	Complex to use
4	The level of feedback on the heating system provided by the control system is	Good	Inadequate	Too detailed
5	Issues with the heating systems are	Easy to identify	Slightly difficult to identify	Difficult to identify
6	Maintenance of the heating system is	Easy	Moderately difficult	Difficult
7	Do you have any responsibility for the operation and/or	Yes	No	N/A

Question Number	Question	Multiple Choice answer 1	Multiple Choice answer 2	Multiple Choice answer 3
	maintenance of the Building's cooling and ventilation systems?			
8	The training provided on the operation and/or maintenance of the cooling and ventilation systems was	Good	Inadequate	Too complex
9	The cooling and ventilation controls are	Simple to use	Moderately simple to use	Complex to use
10	The level of feedback on the cooling and ventilation systems provided by the control system is	Good	Inadequate	Too detailed
11	Issues with the cooling and ventilation systems are	Easy to identify	Slightly difficult to identify	Difficult to identify
12	Maintenance of the cooling and ventilation systems is	Easy	Moderately difficult	Difficult
13	Do you have any responsibility for the operation and/or maintenance of the Building's lighting?	Yes	No	N/A
14	The training provided on the operation and/or maintenance of the lighting/shading/blinds systems was	Good	Inadequate	Too complex

Question Number	Question	Multiple Choice answer 1	Multiple Choice answer 2	Multiple Choice answer 3
15	The lighting/shading/blind controls are	Simple to use	Moderately simple to use	Complex to use
16	Access to the light fittings for cleaning, replacement and maintenance is	Easy	Moderately difficult	Difficult
17	Using the metering system to compare energy consumption over the weekend with the weekday consumption is	Easy	Difficult	Not possible
18	Using the metering system to compare the energy consumption of this week with last week is	Easy	Difficult	Not possible
19	The training provided for monitoring and reporting the college's water and energy use was	Good	Inadequate	Too complex
20	In terms of helping to understand, operate and manage the college, the Contractor's Aftercare Service was	Full and complete	Partly complete	Inadequate
21	Cleaning the college building is	Completely straight forward	Partly straight forward	Difficult

Table 5 – Example Format

4. Teaching staff survey results

4.1. General

4.1.1. A summary of the main findings in all areas shall be provided and any trends in poor building performance should be highlighted. [PM_10_20_82]

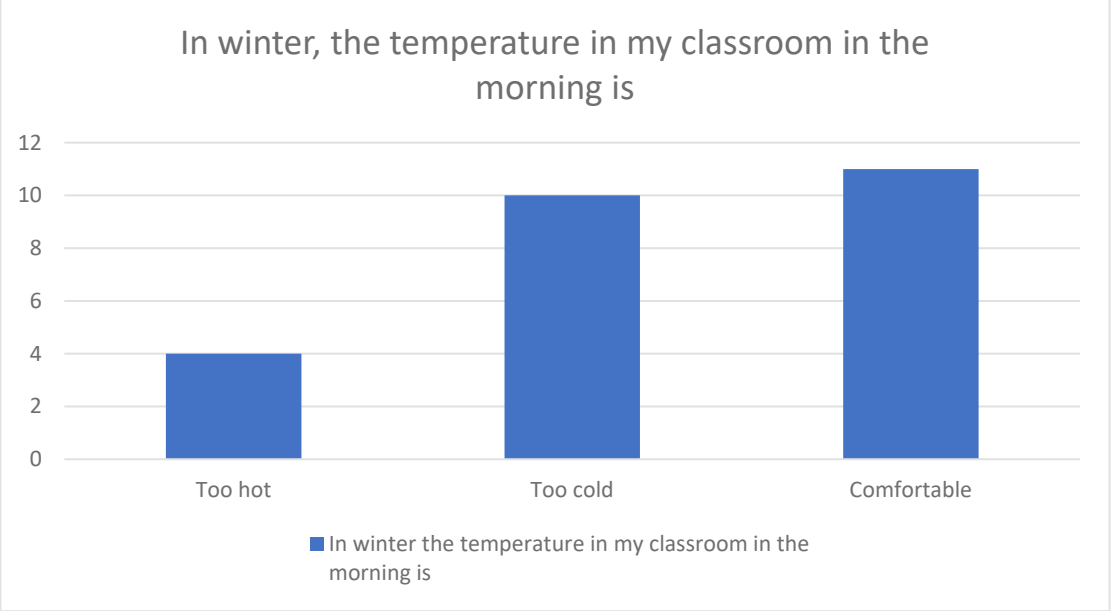
4.1.2. It is important when interpreting the staff survey results to look at the broad trends in the opinions rather than focusing on single points from individuals. [PM_10_20_82]

4.1.3. In addition to the summary, the responses to the individual questions shall be presented in a graphical format. [PM_10_20_82]

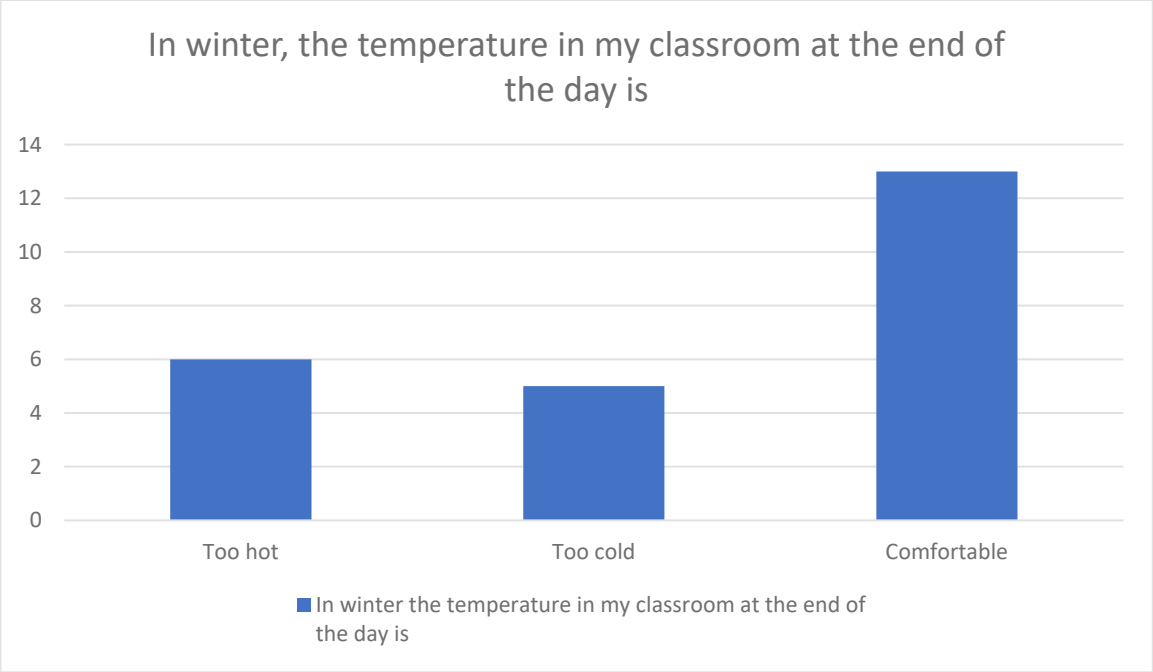
4.1.4. A spreadsheet answer template is available to assist with this process. [PM_10]

4.1.5. Although the questions are multiple choice there are spaces on the answer sheet for the respondents to provide further details if required. [PM_10]

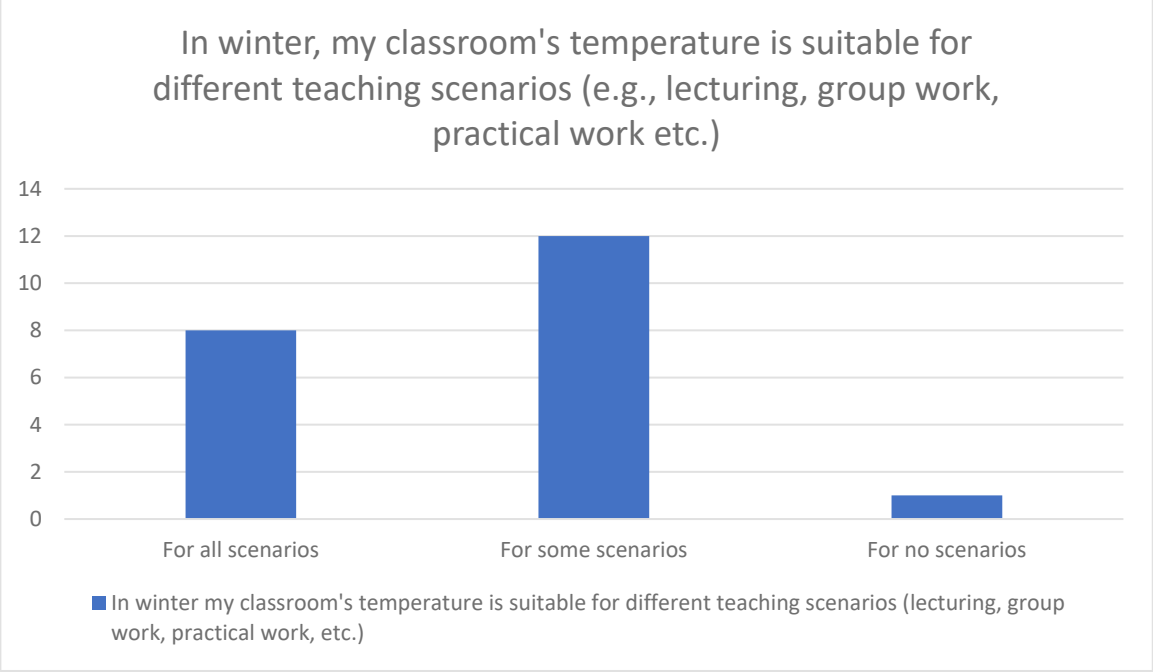
4.1.6. These additional responses shall be reported below the graphs. As shown in the following examples. [PM_10_20_82]



Question 1 - Winter morning temperature in the classroom

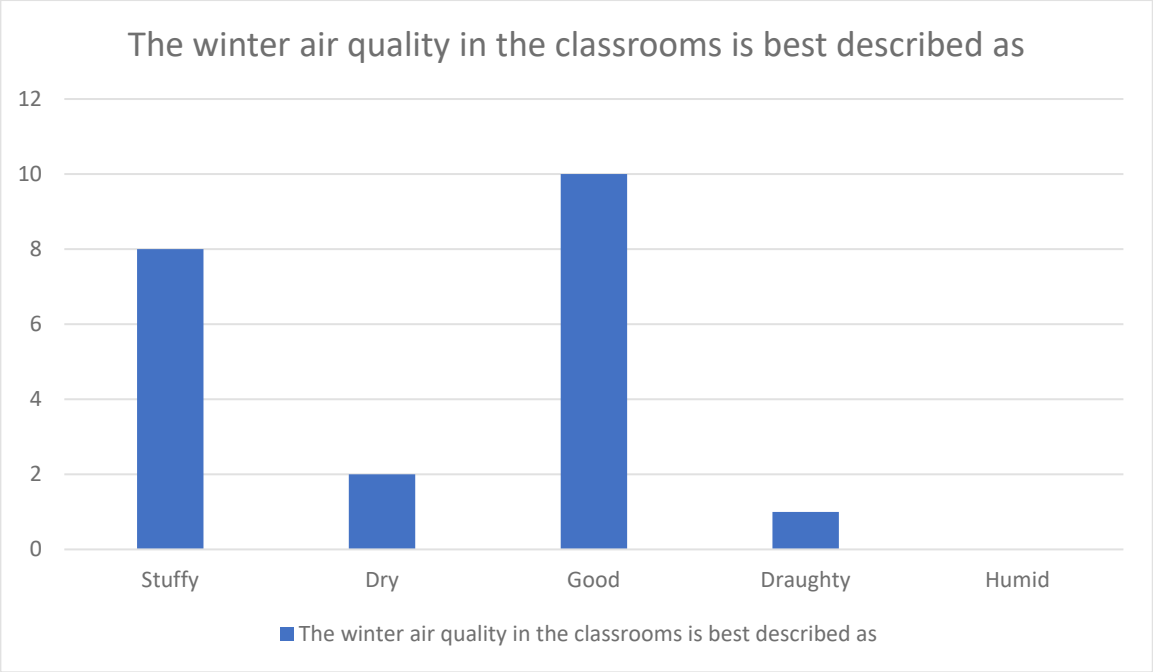


Question 2 - Winter end of the day temperature in the classroom

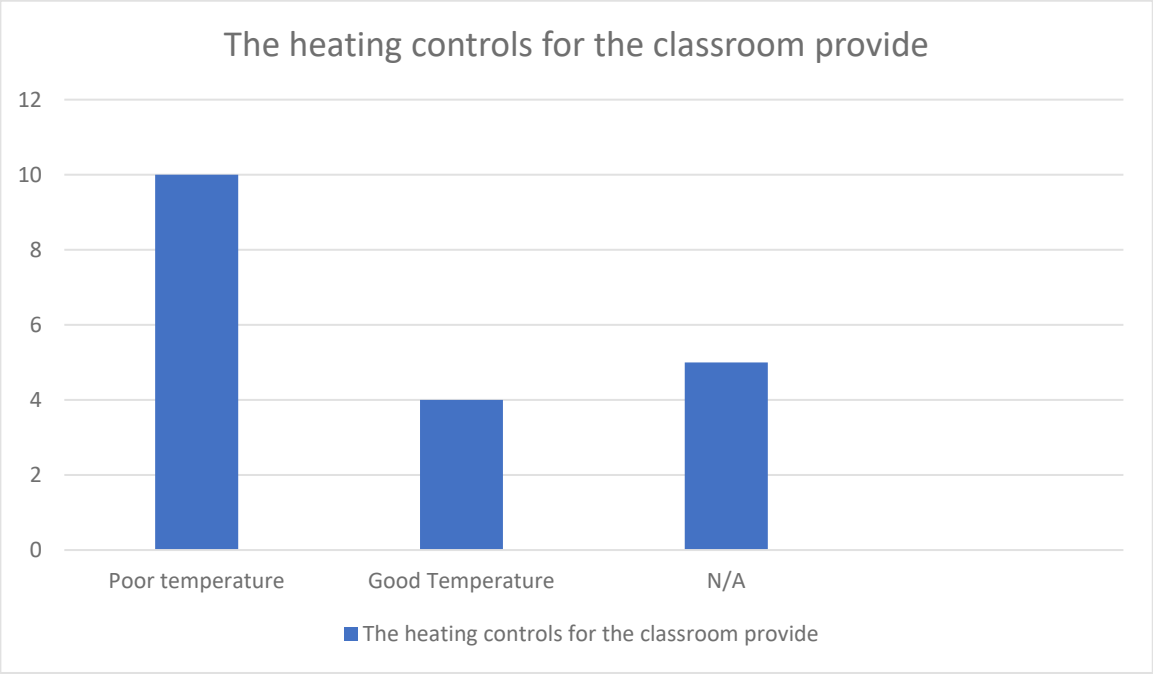


Question 3 - Winter classroom temperature suitable for different teaching scenarios

"Towards the end of the day students are drained and lack energy and motivation."
"The room is hot and stuffy."

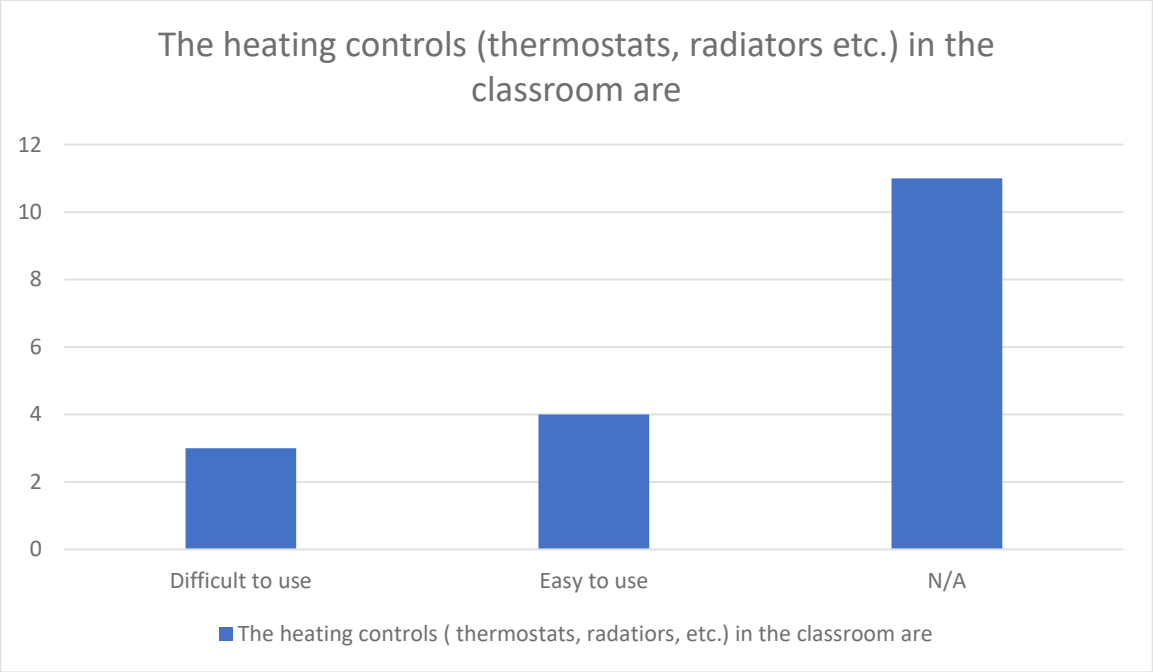


Question 4 - Winter air quality in the classroom



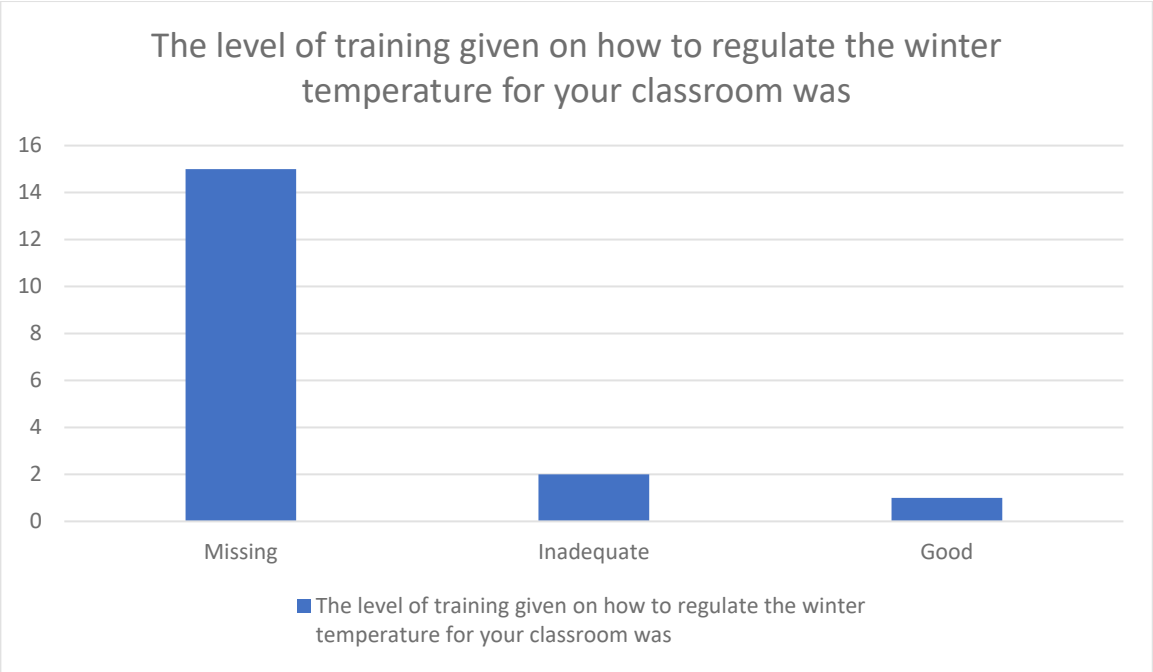
Question 5 - Heating controls for the classroom

"The temperature stays the same even if the controls are adjusted."
"The thermostat has no effect."

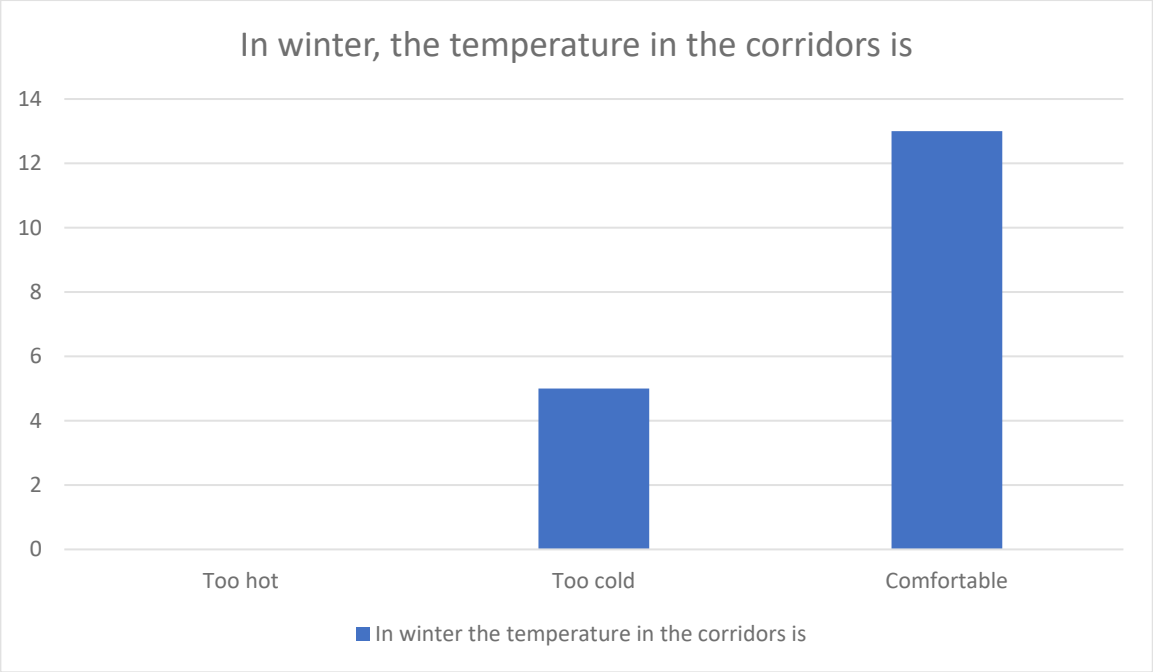


Question 6 - Heating controls in the classroom

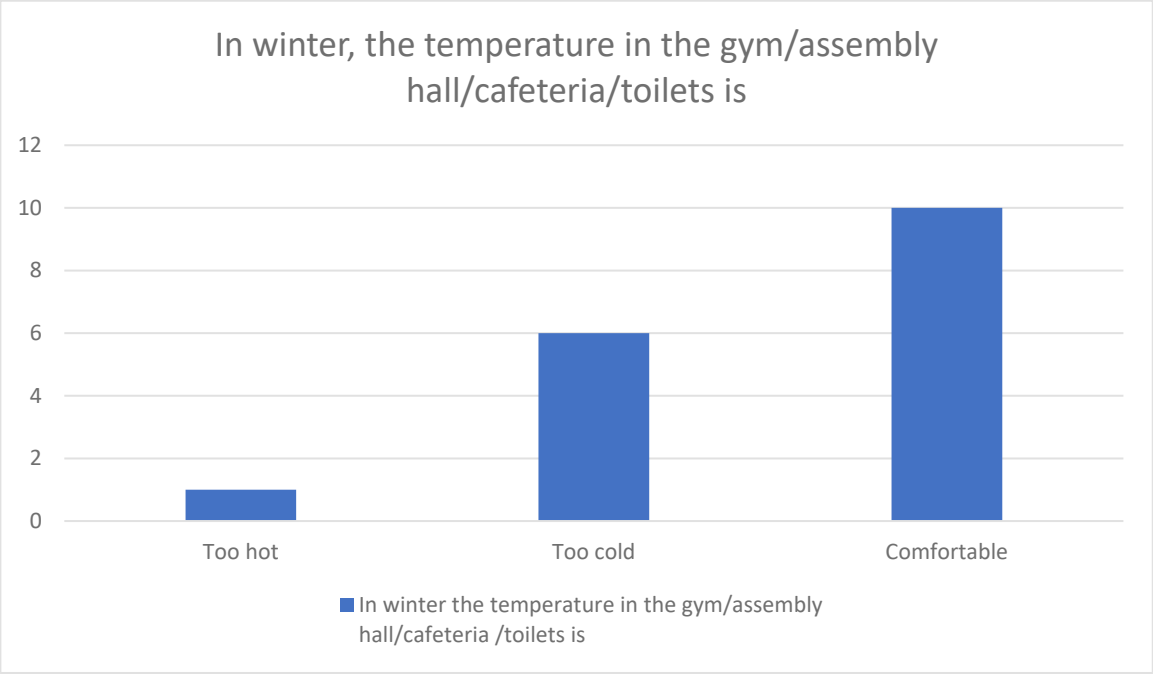
"The controls make no difference to the temperature."



Question 7 - Level of training given on how to regulate the winter temperature in the classroom

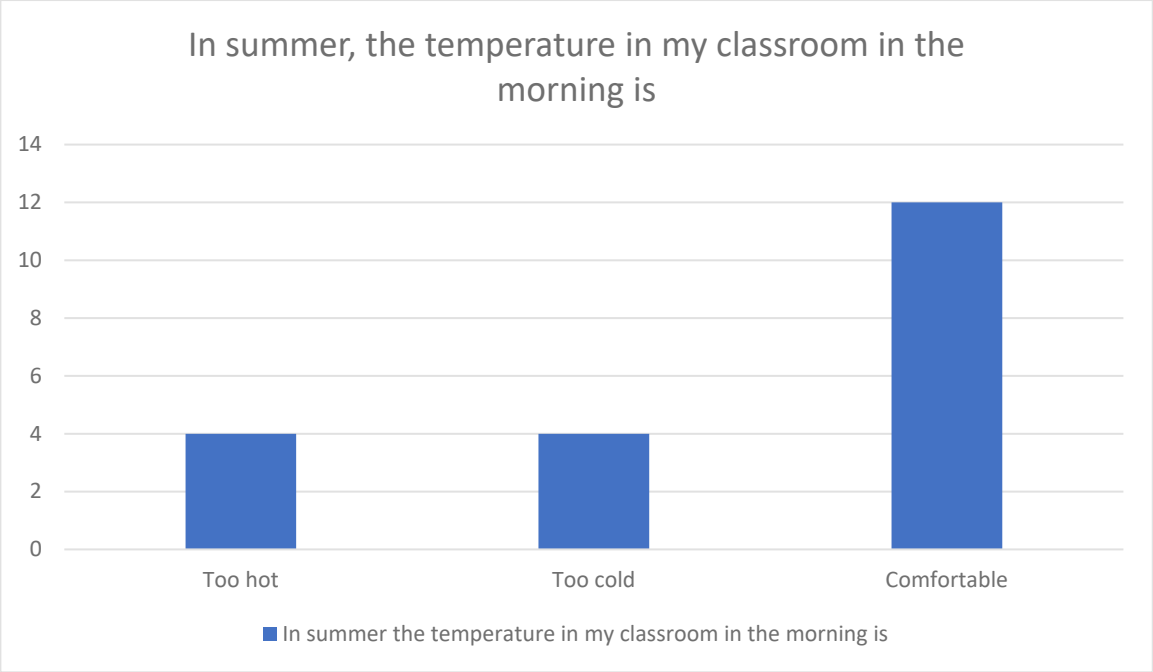


Question 8 - Winter temperature in the corridors

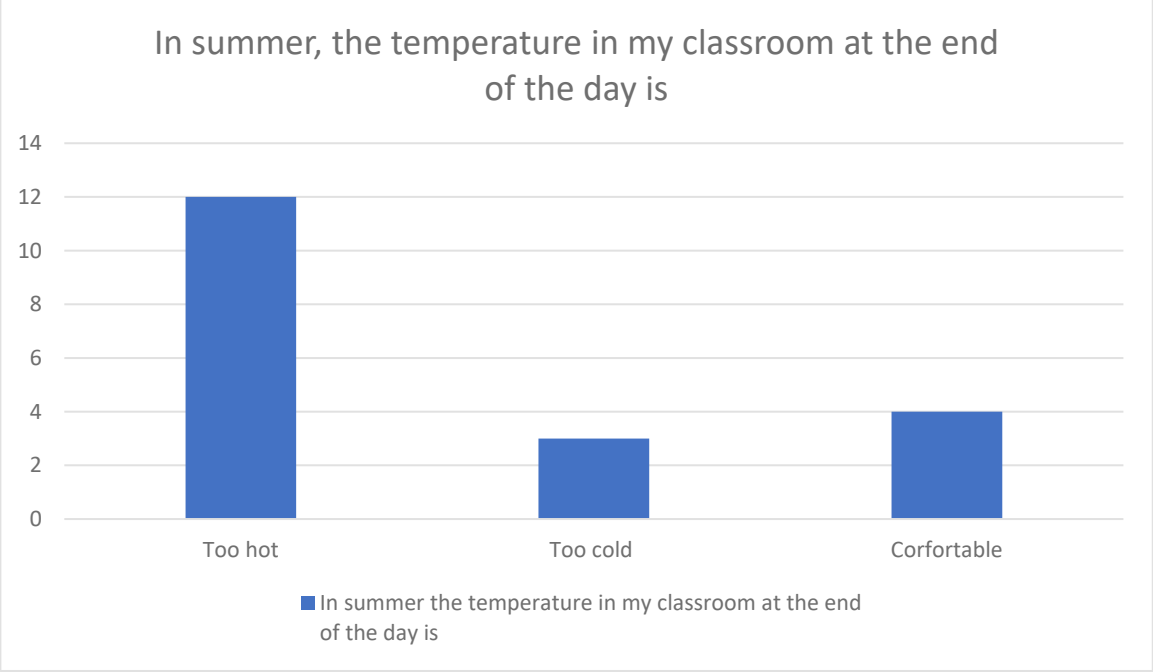


Question 9 - Winter temperature in the gym/assembly hall/cafeteria/toilets

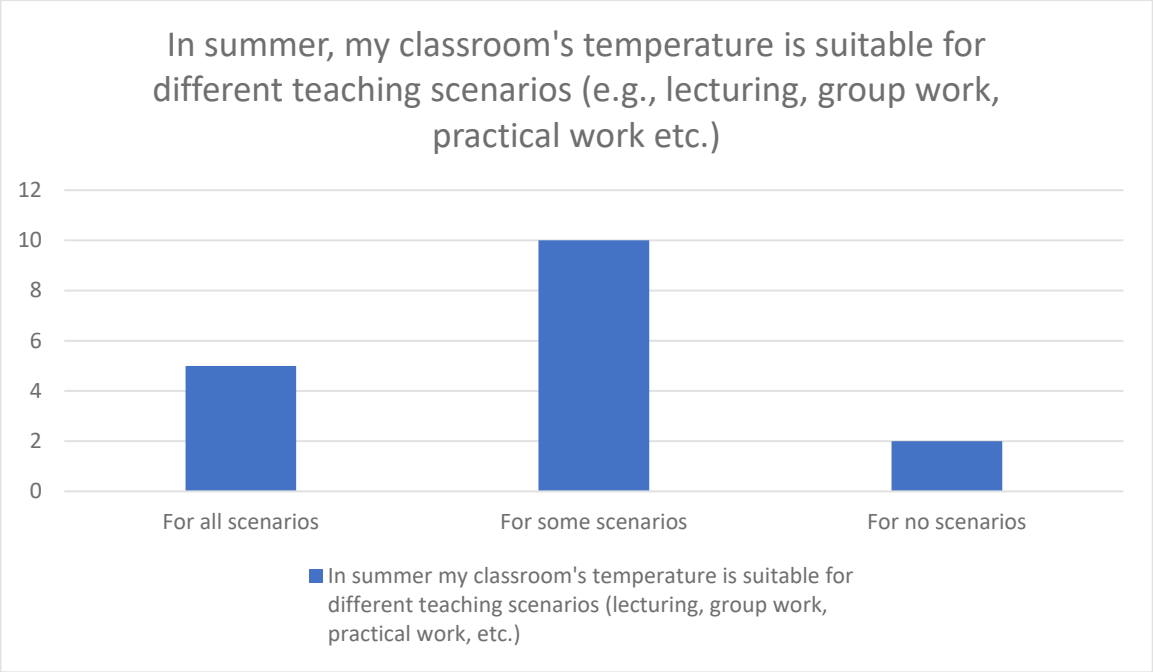
"Always very warm."
"The sports hall is very warm."



Question 10 - Summer morning temperature in the classroom

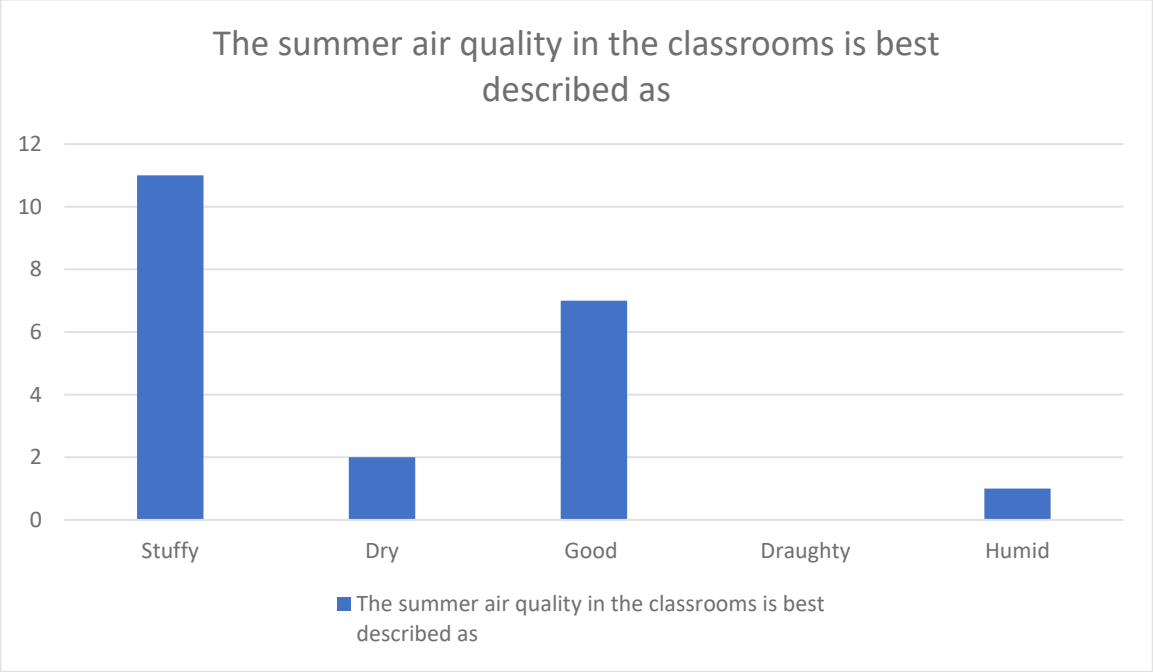


Question 11 - Summer end of the day temperature in the classroom

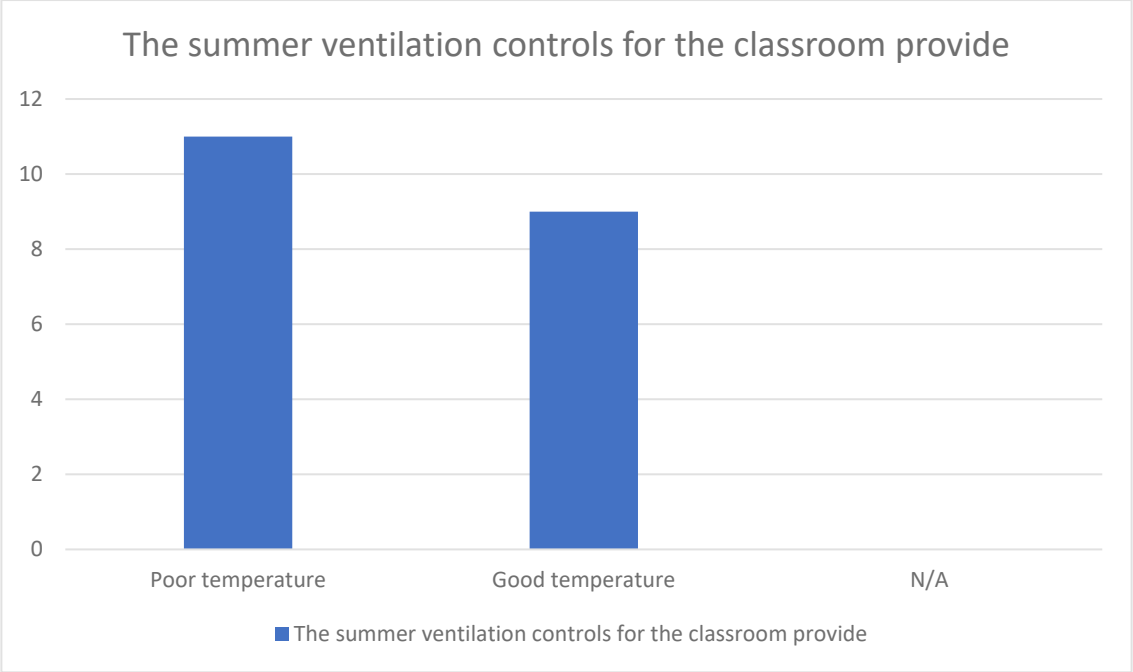


Question 12 - Summer classroom temperature suitable for different teaching scenarios

"We carry out daily duties, however temperature and environment make these difficult and exhausting."
"Leave the unit feeling tired and unwell during the summer months."
"No fresh air circulation."
"Room is very warm and stuffy."

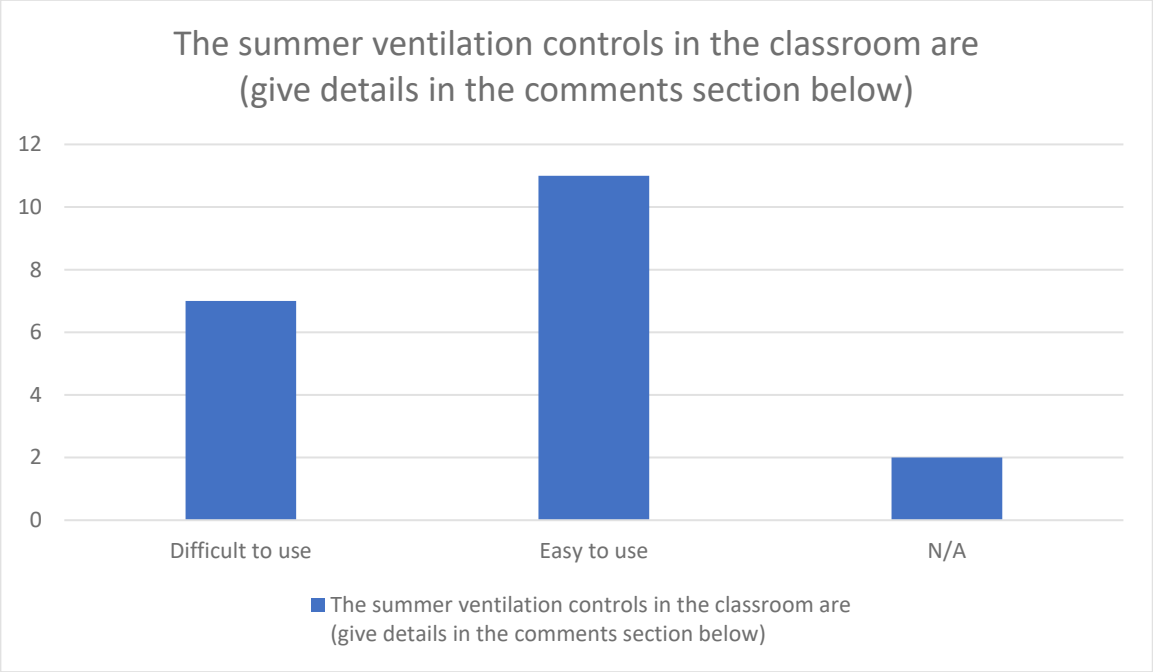


Question 13 - Summer classroom air quality



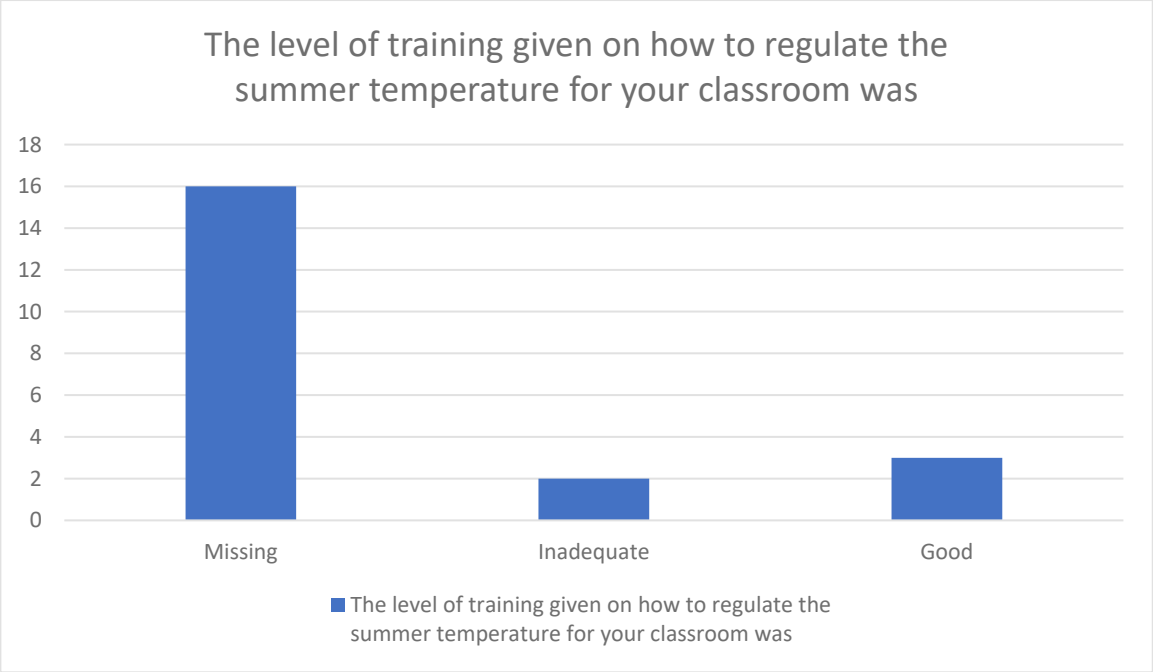
Question 14 - Summer classroom ventilation controls provide

"The air conditioning is set as low as possible."

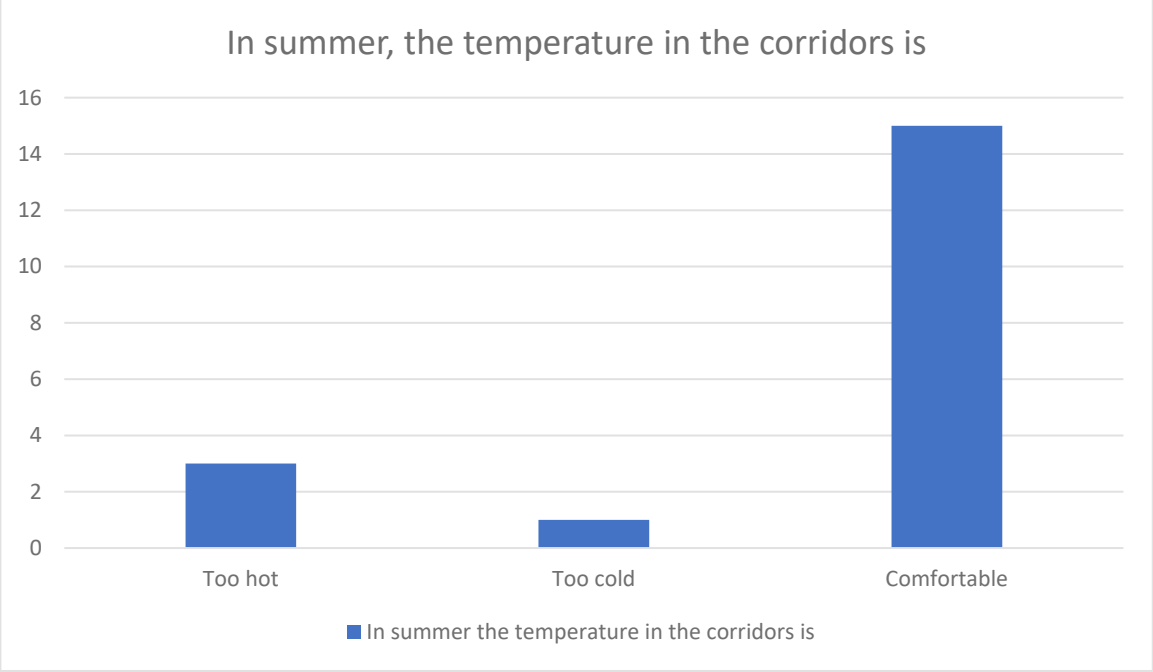


Question 15 - Summer classroom ventilation controls are

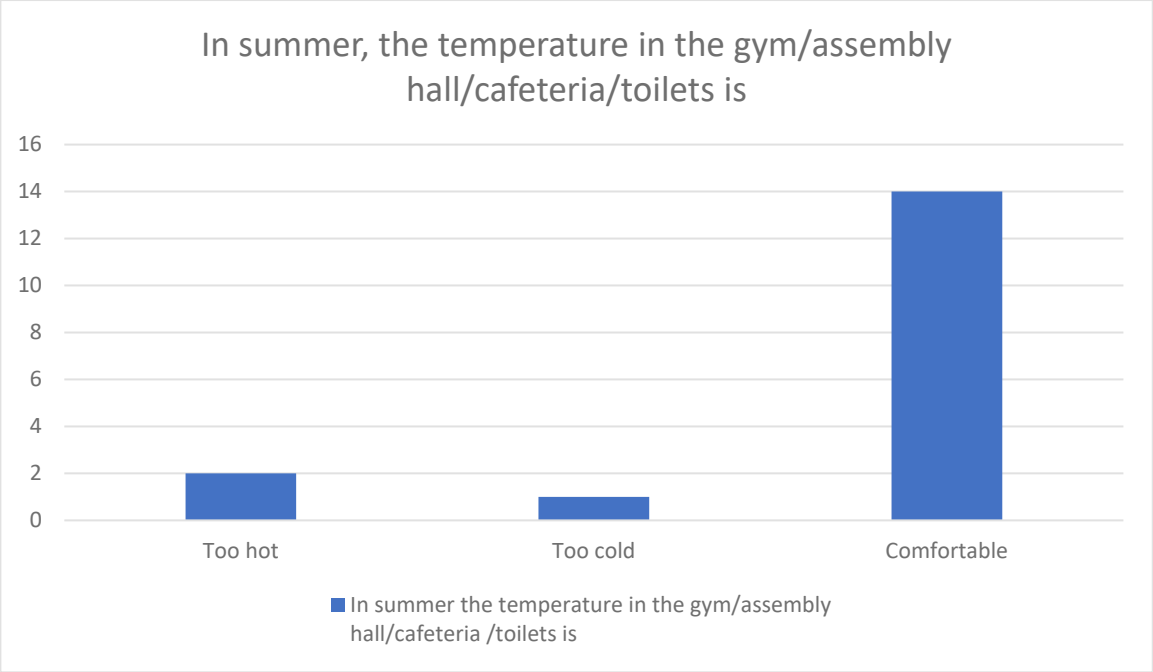
"The controls make no difference."



Question 16 - Level of training given on how to regulate the summer temperature in the classroom

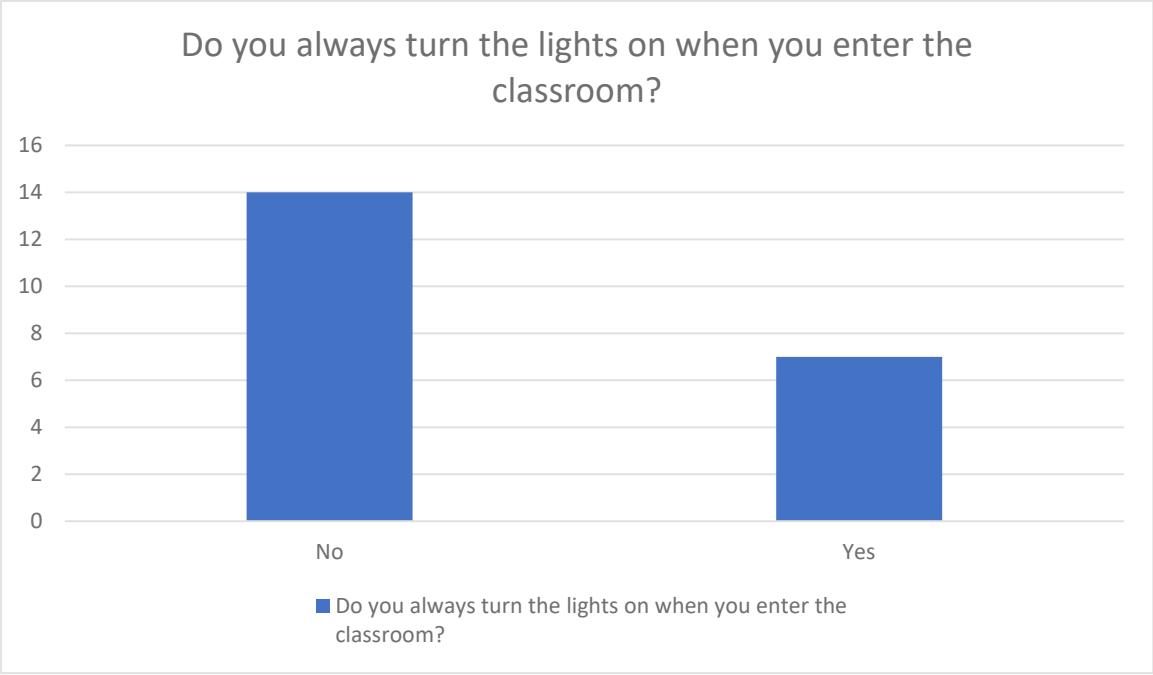


Question 17 - Summer temperature in the corridors

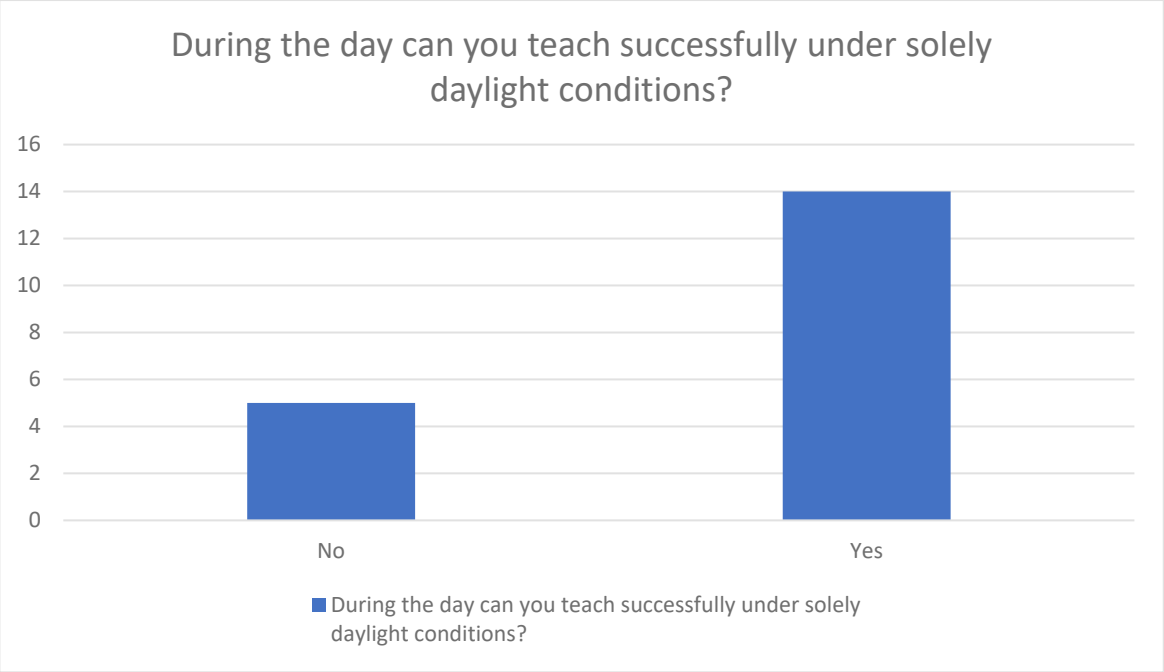


Question 18 - Summer temperature in the gym/assembly/hall/cafeteria/toilets

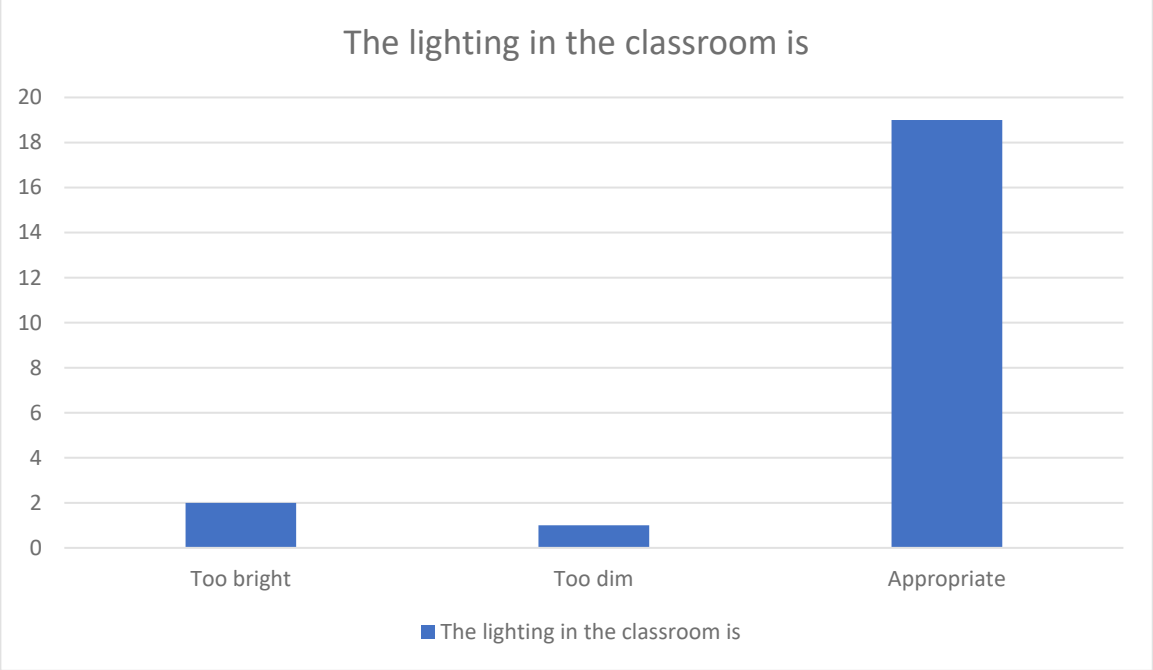
"The temperature varies from 25.4°C to 28.1°C in the summer."



Question 19 - Turning on lights when entering the classroom

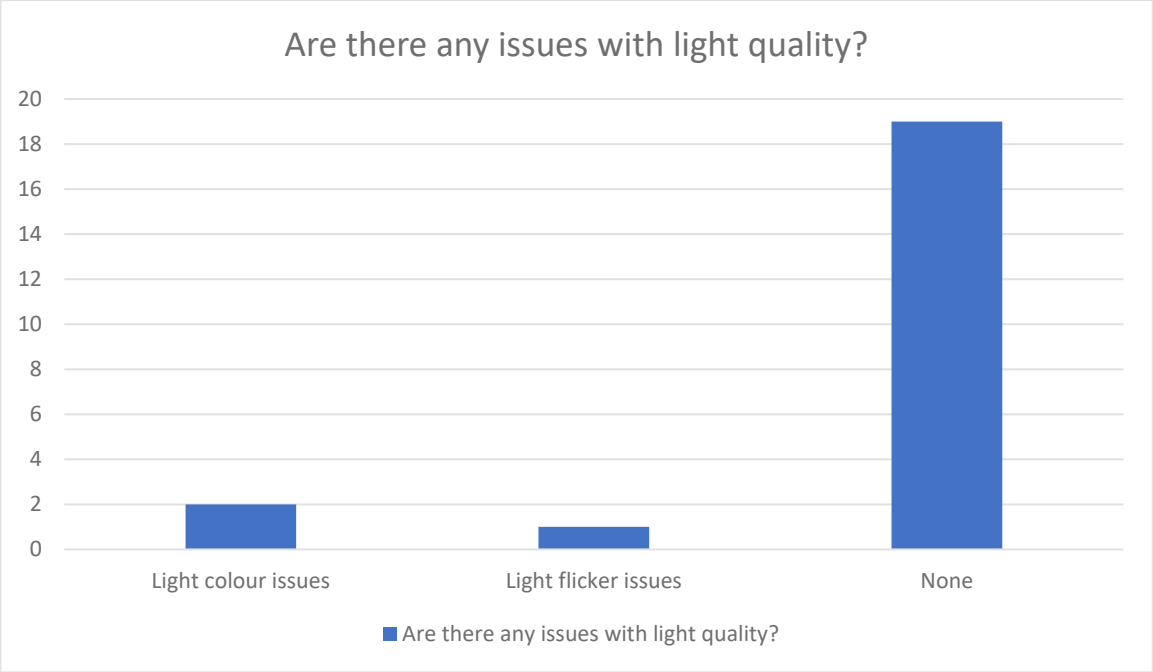


Question 20 - During the day teaching successfully under daylight conditions

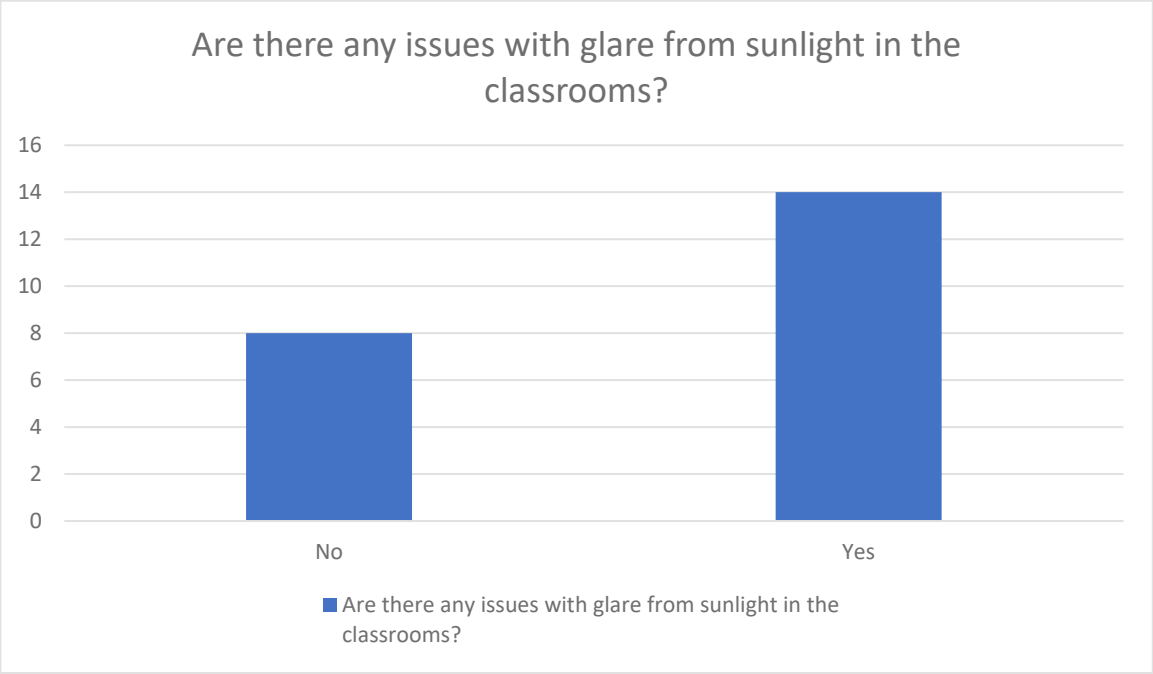


Question 21 - Classroom lighting

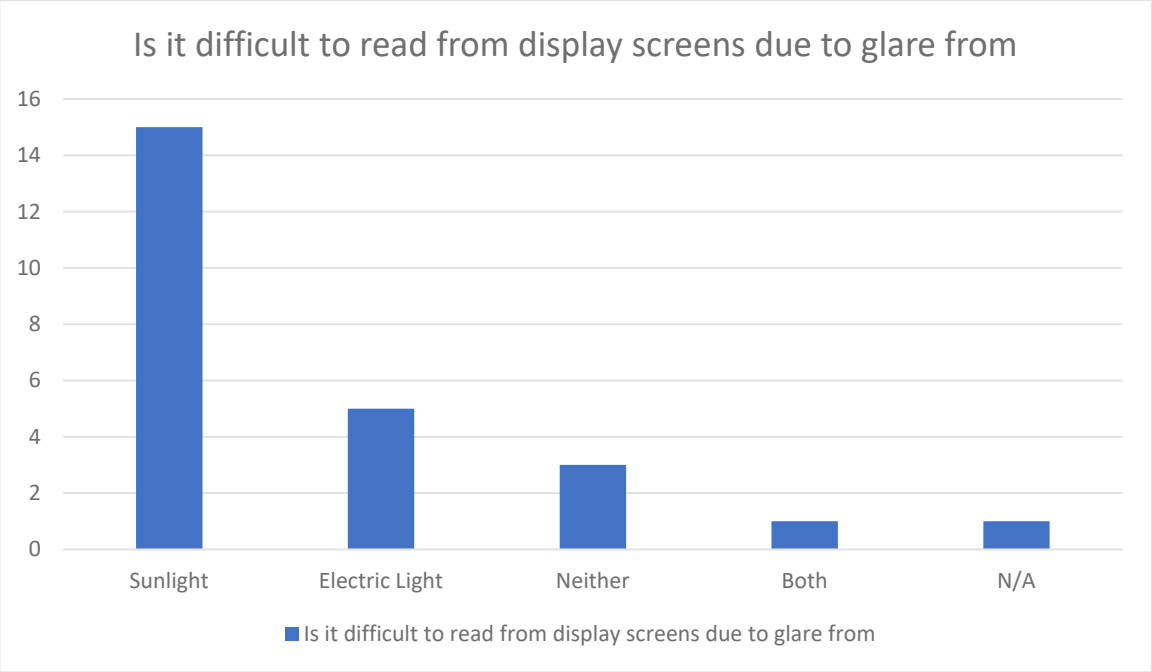
"The lights are ill placed."



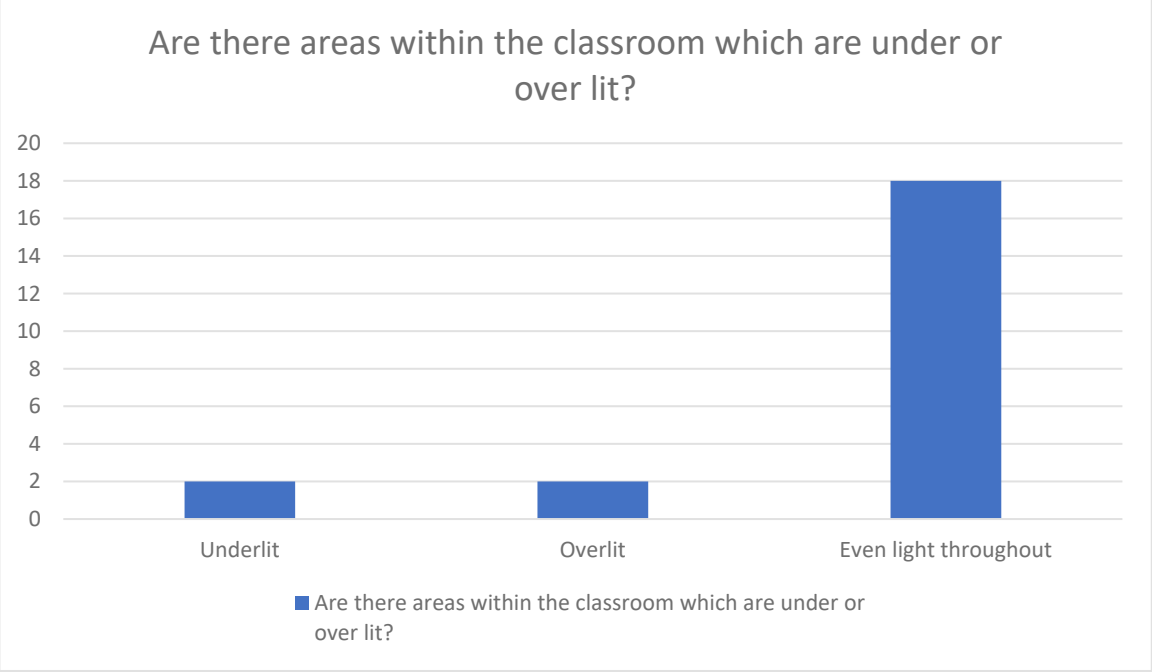
Question 22 - Light quality issues



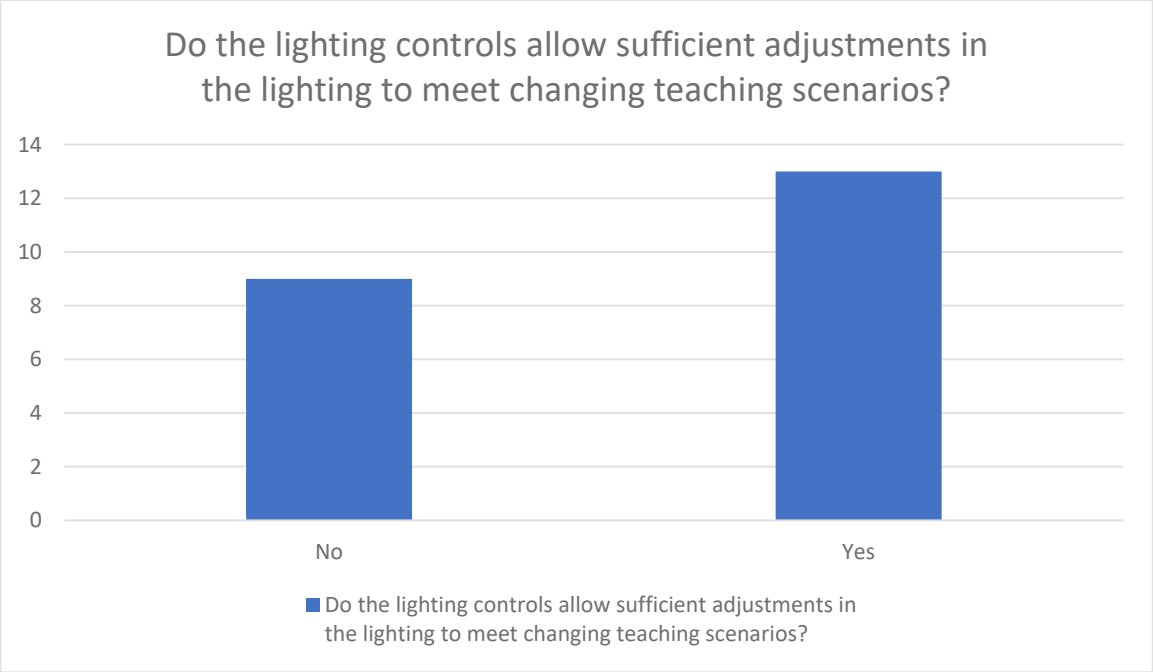
Question 23 - Glare issues from sunlight in the classroom



Question 24 - Difficulty when reading from display screens due to glare

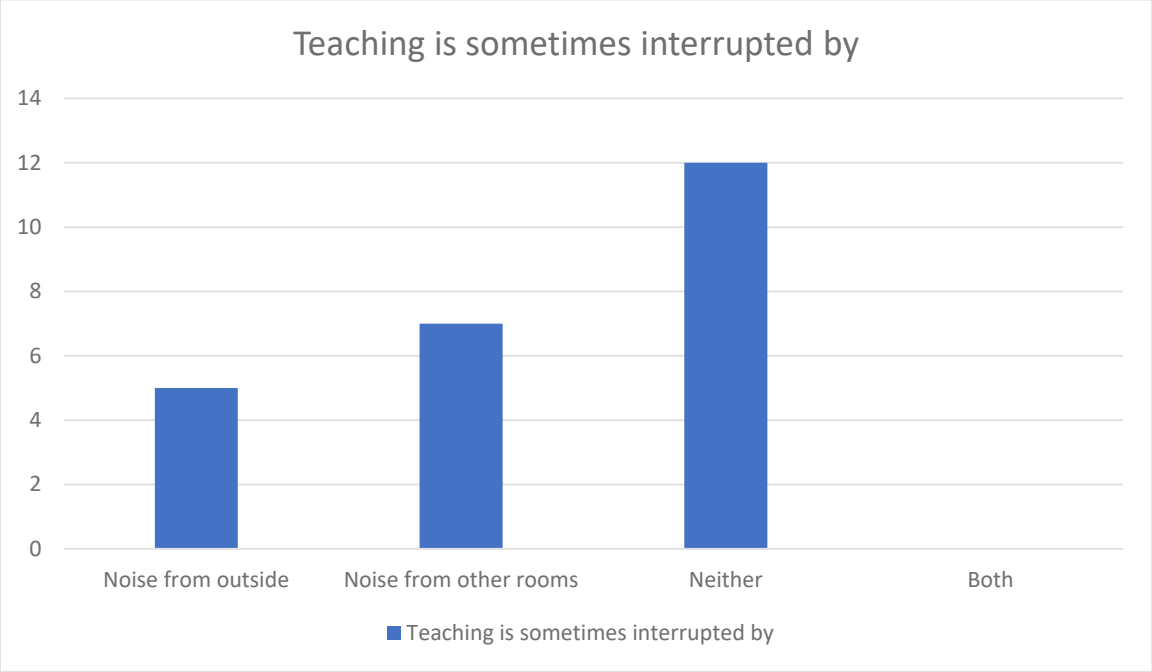


Question 25 - Areas within the classroom that are under or over lit



Question 26 - Lighting controls allowing sufficient adjustments in the lighting to meet changing teaching scenarios

"There are light and dark areas within the room."



Question 27 – Teaching interruptions

General comments:

"Gets too hot in the office and doors have to be propped open."

"The office gets hot and stuffy. When the sun shines on the side of the building it gets very hot."

“Door is always open to get air circulating. Staff room is noisy.”

“Fire door needs to be open to cool the office.”

“Nothing ever changes despite contractors trying.”

“Room is always warm and stuffy. We only have half the lights on and need to keep the student access hatch open all day which is noisy.”

5. Conclusion

5.1. The conclusion shall bring together all the information from the energy data analysis alongside the responses from the facilities staff interviews and staff questionnaire. [PM_10_20_82]

5.2. It is important to look at all the information together to draw any links between the monitored energy consumption data and the experiences of the building users. [PM_10_20_82]

5.3. Any notable trends or patterns in the findings shall be highlighted. [PM_10_20_82]

5.4. An action plan of issues to resolve any areas for further investigation shall be put together along with a recommendation for the priority they shall be given. [PM_60_30_05]

5.5. Once completed, the report shall be issued to the College for them to consider any further action. [PM_10_20_82]

Department for Education

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