IAPT has formed a Committee to celebrate ***Professor D. P. Khandelwal Birth Centenary***. As a part of the celebration a ***National-level Survey*** work has been conducted to understand the exact status of laboratory based Physics education ***at the 10+2 and the UG levels*** throughout the country. This Survey is especially dedicated to Professor D. P. Khandelwal to commemorate his commendable contributions to Physics / Science education in India.

To this aim, four questionnaires (in Google Form) for 10+2 students, 10+2 teachers, UG students, and UG teachers are framed by Dr K. S. Mann and Prof. Rekha Ghorpade with the inputs from a large group of science teachers and circulated all over India. Primarily, the question-to-question analysis report of the four categories is prepared by Dr Vivek Wagh. The diagrammatic presentation of the Survey report is prepared by Dr K S Mann, and Dr P. Panchadhyayee. Finally, on considering the total feedback from students and teachers at both the 10+2 and UG levels Dr K S Mann, Prof. R. Ghorpade, Dr V. Wagh, and Dr S. C. Samanta are going to collaboratively publish an article entitled as '***DPK survey for understanding the status of lab based physics education: summary of the survey outcome and the actions that IAPT can initiate***' in the forthcoming issue (October, 2022) of IAPT Bulletin.

DPK Survey Report – Vivek Wagh

Introduction:

Sincerity or seriousness in performance of experiments: Physics teacher's perspective

The following question was asked to teachers teaching at +2 and UG levels. Four options were presented and only one option could be chosen.

Q 1: What percentage of your students, perform experiments sincerely?

(a) Up to 25%
(b) 26% to 50%
(c) 51% to 75%
(d) 76% to 100%

440 teachers teaching Physics at the higher secondary level answered the question. Option (a) was chosen by 14.8%, option (b) by 24.8% option (c) by 34.5%, and option (d) by 25.9% of the respondents.

357 teachers teaching Physics at the under-graduate level answered the question option (a) was chosen by 24.6%, option (b) by 25.2% option (c) by 36.1% and (d) by 14.1% respondents.

About 15% of the teachers at the +2 level think that less than 25% of their students perform experiments seriously. While about 25% teachers at the UG level think similarly.

Nearly 26% of the teachers at the +2 level think that more than 75% of their students perform experiments seriously. In contrast only about 14% teachers at UG level think that way.

Nearly 40% of teachers at the +2 level think that less than 50% of their students are serious about experiments. In contrast nearly 50% of the UG teachers think that less than 50% of their students are serious about experiments.

Observation: A large percentage of teachers (nearly 40% at the +2 level and almost 50% at the UG level) find that majority of their students are not serious towards experiments. It is also observed that student's attitude towards lab work appears to be more casual at the UG level than at the +2 level, as indicated by the perspective of teachers.

Q 2: What is the usual percentage of experiments completed by the students against prescribed in the syllabus?

(a) 0 to 25
(b) 26 to 50
(c) 51 to 75

(d) 76 to 100

440 teachers at the +2 level answered the question. Option (a) was selected by 8.6%, option (b) by 13%, option (c) by 27.5% and option (d) by 50.9% of the respondents.

357 teachers at the UG level answered the question. Option (a) was selected by 11.2%, option (b) by 13.4%, option (c) by 30.8% and option (d) by 44.5% of the respondents.

Nearly 22% teachers at the +2 level reported that less than 50% of the prescribed experiments are completed by the students. In contrast nearly 25% of the UG teachers reported the same.

Nearly 51% teachers at the +2 level reported that more than 75% of the prescribed experiments are completed by the students. In contrast only 44.5% teachers at the UG level reported so.

Observation: The percentage of experiments completed by students against prescribed in the syllabus is poorer at the UG level than at the +2 level.

Inference: Various steps need to be taken to improve interest of students in lab activity, particularly so at the UG level.

Teacher's perspective regarding prescribed syllabus for the lab work

Q 1: What do you feel about the prescribed syllabus for lab work? This question was asked to the +2 level teachers. We received 440 responses for the question. The following six options were presented to the teachers. Selecting more than one option was allowed.

(a) Not much useful as it does not encourage innovation
(b) Hands on training on making equipment is not encouraged
(c) Some experiments cannot be set up as they incur higher expenses
(d) Some experiments should be mandatory
(e) Demonstration experiments based on theory syllabus must be included and reported
(f) Lab course is in consonance with the theory syllabus

88 out of the 440 (20%) respondents chose option (a). 124 out of 440 (28.2%) respondents chose option (b) Option (c) was chosen by 94 respondents (21.4%). Option (d) received 160 ticks (36.4%). Option (e) was chosen by 263 (59.8%) respondents while optio0n (d) was chosen by 183 (41.6%) respondents.

We can infer that in the opinion of 58.6% respondents the lab course is not in consonance with the theory syllabus. This feeling is also supported by the choice of statement (e) by 59.8% respondents. The options chosen indicate the need to tune the laboratory work to be in consonance with the theory syllabus to a greater extent. Around a fifth of the respondents felt that the present lab work does not encourage innovation and hands on training on making equipment. A similar number felt that some experiments cannot be set up as they incur higher expenses. Slightly more than a third of the respondents felt that some experiments should be mandatory.

Same question with the same options was asked to the UG teachers. We received 357 responses in total. Option (a) was chosen by 86 respondents (24.1%). Option (b) was selected by 133 respondents

(37.3%). Option (c) received 120 (36.1%) ticks. Option (d) was selected by 108 (30.3%) respondents. Option (e) was chosen by 208 (58.3%) respondents while option (f) found 141 (39.5%) takers.

We can infer that 60.5% of the surveyed teachers at the UG level find that the lab work is not in consonance with the theory syllabus and 58.3% feel that demonstration experiments based on theory syllabus must be included and reported. This indicates the need to bring the lab work in suitable harmony with the theory syllabus at the UG level too. Nearly one-fourth of the respondents felt that the present lab work at UG level does not encourage innovation. This is almost 4% more than their peers at +2 levels. That the lab work at UG level does not encourage hands on training on making equipment was felt by 37.8% teachers indicating a jump of nearly 17% compared to their peers at the +2 level. Nearly 36% UG teachers felt that some experiments could not be set up as this involved higher expenses. This was nearly 15% more than their peers at the +2 level. Slightly less than one-third respondents felt that some experiments should be made mandatory which was nearly 6% less than those teaching at the +2 level.

Inference: This calls for bringing lab work in consonance with the theory syllabus and exploring means to encourage, at the UG lab work level, hands on training on making equipment.

Q 2: What percentage of experimental methods in the syllabus is outdated or new techniques need to be introduced?

(a) Less than 10%
(b) 10% to 20%
(c) More than 20%

Only one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was selected by 22.5%, option (b) by 45% and option (c) by 32.5% of the respondents.

357 teachers also answered the question. Option (a) was selected by 19.9%, option (b) by 41.5% while option (c) by 38.7% of the respondents.

Observation: Nearly 75% of the teachers surveyed at the +2 level feel that more than 10% of the experimental methods in the syllabus are outdated or new techniques need to be introduced. In contrast nearly 80% of the UG teachers feel the same.

Inference: There is a need to update the lab syllabus to introduce new techniques in more than 10% of the experimental methods.

Q 3: A physics graduate is trained to handle the modern instrumentation with currently available instrumentation in UG lab?

(a) Fully disagree they remain unemployable to a large extent
(b) Partly agree a good student can manage on his own
(c) Fully agree the instrumentation in UG lab teaches basic techniques to handle all modern instrumentation

This question was asked exclusively to UG teachers. Only one option could be chosen. Option (a) was chosen by 15.1%, option (b) by 53.5% and option (c) by 31.4% of the respondents.

Observation: Nearly 53% of the surveyed UG teachers feel that a good student can manage to handle modern instrumentation on her own with the currently available instrumentation in UG lab. Nearly 31% of the surveyed teachers felt that UG lab teaches basic techniques to handle all modern instrumentation. 15% of surveyed teachers felt otherwise.

Inference: Further probing needs to be done in view of the response to the last two questions.

Practices in laboratory work teacher's perspective

To understand the practices in laboratory work a few questions were drafted. Some were in the form of statements to be chosen by the teachers. The questions and the options provided for each question are listed below. The number of respondents for each question and the percentage of respondents selecting each option have also been listed after each question.

Q 1: Do you allow your students to….

(a) Handle the lab related equipment independently?
(b) Do the experiment after learning the relevant theory?
(c) Use alternate/different method to do the experiment?

More than one option could be chosen.

We received 440 responses from the +2 level teachers. Options (a) and (b) both received 59.8% ticks while option (c) received 25% ticks.

357 UG teachers answered the question. Option (a) was chosen by 60.5% teachers. Option (b) was chosen by 57.7% teachers. Option (c) received 24.9% ticks.

Observation: Only about 25% surveyed teachers at both the levels allow students to use alternate/different methods to perform experiments. Nearly 40% of the surveyed teachers at both levels do not allow students to handle lab related equipment independently. Nearly 60% of the respondents at +2 level and 58% respondents at UG level allow students to perform experiments after learning relevant theory.

Inference: Nearly 75% of the surveyed teachers at both levels do not allow students to use alternate or different method to perform experiment. The reasons for this low percentage need to be explored.

Q 2: If you do not allow students to handle the lab equipment independently then specify the reasons

(a) No I always allow
(b) Safety purpose
(c) Shortage of equipment
(d) Mishandling

More than one option could be chosen.

The question was responded to by 330 teachers from the +2 level. Option (a) was chosen by 62.1% teachers. Option (b) was the choice of 24.2% teachers. Option (c) was chosen by 16.4% teachers and option (d) received 16.4% of the response.

In the context of UG teachers 229 respondents answered the question. 52.7% of the respondents chose option (a). Option (b) was chosen by 28.2% of the respondents. Option (c) received 22.1% ticks while option (d) was chosen by 23.8% respondents.

Observations: Although the question was drafted to find reasons for not allowing students to handle equipment independently. Nearly 62% at the +2 level and 53% at the UG level respondents chose the option (a). The option (a) should have received nil selection. Out of the three other options safety appears to be primary concern followed by concern regarding mishandling. Shortage of equipment is also a significant choice.

Inference: An approach to handle issues related to safety and mishandling needs to be outlined. Ways need to be thought of to address the issue of shortage of equipment.

Q 3: Do you give Lab-Orientation (introduction to lab and general skills required) to students before starting the lab work?

(a) Never
(b) Sometimes
(c) Most of the time
(d) Always

440 responses were received from the +2 level teachers. Option (a) was chosen by 0.9% option (b) by 11.4%, option (c) by 27.7% and option (d) by 60% of the respondents.

At the UG teachers level 357 responses were recorded. Option (a) was chosen by 1.7%, option (b) by 12%, option (c) by 26.9% and option (d) by 59.4% of the respondents.

Observations: Nearly 60% of the responding teachers at +2 and UG level said lab-orientation is always given. Nearly 27% indicated that it is given most of the time. About 12% of the surveyed teachers indicated that Lab-orientation is given sometimes. More teachers at UG level as compared to those at +2 levels indicated that Lab-orientation is never given.

Inference: Lab-orientation is a common practice. There is a need to find out the reasons for the deviation from the common practice through further research.

Q 4: Do majority of your students keep record of data?

(a) As observed, in the tables given in practical books
(b) As observed, in the tables prepared by themselves from theory.
(c) In the tables in practical books, after manipulation to suit the textual results
(d) Without following any norm.

We received 440 responses from the +2 level teachers. Option (a) was chosen by 59.1%, option (b) by 23%, option (c) by 15.2% and option (d) by 2.7% of the respondents.

357 teachers at the UG level answered the question. Option (a) was chosen by 63.9%, option (b) by 20.4%, option (c) by 12.9% and option (d) by 2.8% of the respondents.

Observations: Nearly 60% (59.1% at +2 levels and 63.9% at UG level) teachers reported that majority of their students record data as observed, in the tables given in practical books. About 20% respondents (23% at +2 and 20.4% at UG levels) stated that majority of their students kept record of data as observed in the tables prepared by them from theory. Significant percentage of surveyed teachers (15.2% at +2 and 12.9% at UG levels) reported practice of manipulation of data by their students to suit textual results.

Inference: Majority of the students of more than 80% of the surveyed teachers record data as observed. So practice of recording data as observed seems to be followed by majority of the students. Further probing needs to be done to see if quality of the data is looked at or not.

Q 5: When is the experimental work of the student assessed?

(a) Immediately after the completion of experiment
(b) Weekly
(c) Randomly
(d) Just before the examination

Only one option could be selected.

440 teachers at the +2 level answered the question. Option (a) was selected by 50.9%, option (b) by 32.7%, option (c) by 12% and option (d) by 4.3% of the respondents.

357 teachers at the UG level answered the question. Option (a) was chosen by 52.7%, option (b) by 33.1%, option (c) by 9.5% and option (d) by 4.8% of the responding teachers.

Observations: Around half of the surveyed teachers at +2 and UG levels reported that experimental work is checked immediately after completion of experiment. Around 33% of surveyed teachers check the experimental work on a weekly basis. About 10% teachers follow practice of random checking of experimental work. Less than 5% teachers reported that experimental work is checked just before examinations.

Inference: Immediate assessment of experimental work of the student is still practiced by half of the surveyed teachers. Weekly assessment of the student's experimental work is also common.

Q 6: Do your students estimate errors /perform uncertainty analysis of measurements after every experiment?

(a) Never
(b) Sometimes
(c) Most of the time
(d) Always

Only one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was chosen by 8.6%, option (b) by 52.5%, option (c) by 26.8% and option (d) by 12% of the responding teachers.

357 UG teachers answered the question. Option (a) was selected by 8.4%, option (b) by 46.5%, option (c) by 29.7% and option (d) by 15.4% of the respondents.

Observations: Large number (52.5% at +2 and 46.5% at UG levels) of teachers reported that their students estimate errors or perform uncertainty analysis sometimes only. Around 8% teachers (8.6% at +2 and 8.4% at UG levels) reported that their students never estimate errors. More number of UG teachers (15.4%) reported as compared to their +2 peers (12%) that their students always estimate errors or perform uncertainty analysis.

Inference: Special efforts need to be focused to cultivate the habit (among students) of estimating errors or performing uncertainty analysis.

Q 7: Do you insist your students to write results with proper significant figures?

(a) Never
(b) Sometimes
(c) Most of the times
(d) Always

Only one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was chosen by 3.6%, option (b) by 18.6%, option (c) by 30.9% and option (d) by 46.8% of the responding teachers.

357 UG teachers answered the question. Option (a) was selected by 2.8%, option (b) by 13.2%, option (c) by 26.3% and option (d) by 57.7% of the respondents.

Observations: Large majority of the surveyed teachers (77.5% at +2 and 84% at UG levels) reported that they insist their students to write results with proper significant figures.

Inference: Although majority of teachers insist that results should be written with proper significant figures in view of the earlier question majority of the students do not perform error estimate or uncertainty analysis. This substantiates the need to take special efforts to build the culture of error estimation or uncertainty analysis among students.

Q 8: Do you allow students to think alternative methods for performing the prescribed experiment?

(a) Never
(b) Sometimes
(c) Most of the times
(d) Always

This question was asked only to teachers teaching at the +2 level. Only one option could be chosen.

440 teachers answered the question. Option (a) was chosen by 6.6%, option (b) by 46.4%, option (c) by 31.6% and option (d) by 15.5% of the respondents.

Observations: About 47% of the surveyed teachers frequently allow the students to think of alternative methods to perform prescribed experiment. Almost similar numbers allow the students to think of alternative methods sometimes.

Inference: A large number of surveyed teachers are inclined to allow students to think of alternative methods to perform prescribed experiments.

Q 9: Evaluation of experimental work includes the following:

(a) Emphasis is given on collection of data accurately (at least few readings are certified).
(b) Graph plotting with analysis is an essential component.
(c) Error analysis or estimation of uncertainties is emphasized.
(d) Emphasis is given on writing the result with correct significant figures.
(e) Continuous MCQ type internal evaluation (online/offline) is carried out and marks are considered for final grades.
(f) The question paper allocated to an examinee has at least one surprise element to test his/her basic understanding
(g) Viva is an integral part of the examination
(h) Evaluation is done by the external examiner

More than one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was chosen by 67%, option (b) by 78.6%, option (c) by 46.1%, option (d) by 54.8%, option (e) by 25.5%, option (f) by 26.4%, option (g) by 70.2% while option (h) by 51.8% of the respondents.

357 teachers at the UG level answered the question. Option (a) was chosen by 69.2%, option (b) by 77%, option (c) by 45.7%, option (d) by 50.4%, option (e) by 26.1%, option (f) by 21%, option (g) by 69.7% while option (h) by 57.7% of the respondents.

Observations: Graph plotting with analysis is the most emphasized component (about 77% at UG and 78.6% at +2 levels). Next emphasized was viva (69.7% UG and 70.2% +2 levels). This is followed by emphasis on collection of data accurately (69.2% at UG and 67% at +2 levels). Next emphasized is writing the result with correct significant figures (50.4% at UG and 54.8% at +2 levels. Less than 50% of the surveyed teachers (45.7% UG and 46.1% +2 levels) gave importance to error analysis or estimation of uncertainties.

Inference: While evaluating experimental work error analysis comes low in priority for majority of the teachers. This partly explains the observations related to one of the previous questions (Q7) of this section.

Q 10: Do you give weightage to the project in the final marks?

(a) Yes
(b) No

440 teachers at the +2 level answered the question. Option (a) was selected by 82.7% and option (b) by 17.3%

357 teachers at UG level answered the question. Option (a) was selected by 74.2% and option (b) by the remaining 25.8% of the respondents.

Observation: Weightage is given to project in final marks by vast majority of the surveyed teachers.

Q 11: Are your students performing experiments with available items at home to sharpen their analytical and experimental skills?

(a) Always
(b) Most of the time
(c) Sometimes
(d) Never

Only one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was selected by 8%, option (b) by 13.4%, option (c) by 57.5% and option (d) by 21.1% of the respondents.

357 UG teachers answered the question. Option (a) was selected by 5.6%, option (b) by 19%, option (c) by 45.7% and option (d) by 29.7% of the respondents.

Observations: Most the surveyed teachers (57.5% at +2 and 45.7% at UG levels) reported that their students sometimes perform experiments with available items at home to sharpen their analytical and experimental skills. Nearly 30% of the surveyed teachers at UG level reported that their students never performed experiments at home. 21.1% of surveyed +2 level teachers reported the same.

Inference: Students do exhibit occasional interest in performing experiments at home with available items. There is probably a need for developing more experiments that can be performed at home and making these available to teachers and students.

Situation in laboratory: Teacher's perspective

To understand the situation in laboratory particularly in the context of teacher student ratio, number of students sharing an experiment set up and funding some questions were posed. These along with the responses are presented below.

Q 1: Number of students normally sharing the same experimental setup for performing a practical

(a) 2
(b) 3
(c) 4
(d) More than 4

Only one option could be chosen

440 teachers at the +2 level answered the question. Option (a) was chosen by 35.7%, option (b) by 27.7%, option (c) by 24.1% and option (d) by 12.5% of the respondents.

357 teachers at UG level answered the question. Option (a) was chosen by 27.2%, option (b) by 26.6%, option (c) by 21.8% and option (d) by 24.4% of the respondents.

Observations: At +2 level two students sharing the same experimental set up for performing a practical was most common (35.7%). The more than 4 students sharing the same experimental set up for performing a practical was reported to be far less (12.5%). 3 students and 4 students sharing the same set up was around the same (3-student 27.7%, 4-students 24.1%).

At UG level all the four set ups are quite frequent. Moreover the more than 4 students sharing the same experimental set up for performing experiment is in nearly 25% cases. 2 students, 3students sharing the same set up for performing experiment is also similar (2-students 27.2%, 3-students 26.6%). 4-student set up is slightly lower at 21.8%.

Q 2: What is the teacher-student ratio in your institution?

(a) 1:20
(b) 1:30
(c) 1:40
(d) More than 1:40

Only one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was chosen by 32.7%, option (b) by 24.8%, option (c) by 22.3% and option (d) by 20.2% of the respondents.

357 teachers at UG level answered the question. Option (a) was chosen by 39.2%, option (b) by 28%, option (c) by 12.3% and option (d) by 20.4% of the respondents.

Observations: 1:20 teacher-student ratio seems to be more common at both UG and +2 levels (39.2% and 32.7%). The other teacher-student ratios seem to be around 22% level at the +2 level with 2-3% variation. At UG level 1:40 ratio seems to be in significantly smaller percentage 12.3%. 1:30 ratio (28%) is significantly higher as compared to more than 1:40 (20.2%).

Q 3: Is sufficient annual funding available to upgrade your lab?

(a) Always
(b) Most of the times
(c) Sometimes
(d) Never

Only one option could be chosen.

440 teachers at the +2 level answered the question. Option (a) was chosen by 27.5%, option (b) by 26.8%, option (c) by 35.9% and option (d) by 9.8% of the respondents.

357 teachers at UG level answered the question. Option (a) was chosen by 11.2%, option (b) by 23.5%, option (c) by 48.7% and option (d) by 16.5% of the respondents.

Observations: Nearly 66% UG teachers reported that sufficient annual funding is available at best sometimes. At +2 levels this percentage was around 46%. Sufficient annual funding is always available to 27.5% of surveyed +2 teachers while among UG teachers this was true for only 11.2%. In general UG teachers reported a poorer state of funding.

Q 4: Do you get grants from the following?

(a) UGC
(b) MHRD
(c) College Development Scheme
(d) Others

Multiple options could be chosen. This question was asked to UG teachers only. 357 UG teachers answered the question. Option (a) was selected by 39.2%, (b) by 8.4%, (c) by 40.9% while (d) by 40.1% of the respondents.

Observations: Grants to surveyed UG teachers were received primarily from UGC, College Development Scheme and other sources in almost similar proportion to around 40% of the respondents. MHRD funds were received by only 8.4% of the respondents.

Q 5: If a grant is available, how do you like to spend it?

(a) Infrastructure
(b) Equipment
(c) Components
(d) Workshops

Multiple options could be chosen. The question was asked to UG teachers only. 357 responses were received. Option (a) was selected by 40.3%, option (b) by 87.4%, option (c) by 51.5% and option (d) by 45.7%

Observations: Funds received are generally spent on equipment (87.4%) followed by components (51.5%) then workshops (45.7%) and then on infrastructure.(40.3%)

Inference: The situation in laboratory in surveyed population is far more challenging at UG level than at the +2 level. We need to take a look at the PG level to understand how things are at that level. A detailed strategy needs to be prepared to address the scenario over a period of next few decades.

Response on Suggestions that would help students to learn physics through experiments

The following question was presented to the teachers of UG level.

Q 1: Which of the following suggestions could help students to learn physics through experiments?

(a) Introducing open ended experiments
(b) Encourage them to participate in science exhibitions
(c) Employing experts for trouble shooting during lab sessions
(d) Organizing workshops for teachers for new experiments introduced in the syllabus
(e) Encouraging students to participate in experiment related activities of IAPT e.g. NGPE, NCIEP, NANI etc.

(f) Organizing lab facilities like Atal Tinkering Lab, Anveshika, Innovation Hub, Centre for Scientific Culture
(g) Encouraging the students to organize science colloquial, seminar, seminar, workshops, stage science shows, etc.

357 UG teachers responded to the question. Multiple options could be chosen while answering the question.

Option (a) was chosen by 58.3%, option (b) by 65.8% (c) by 34.2%, (d) by 67.8%, (e) by 63.9%, (f) by 50.7% and (g) by 63.9%

The following question was presented to the teachers of the +2 level.

Q 2: Which of the following suggestions could help students to learn physics through experiments?

(a) Introducing open ended experiments
(b) Introducing surprise element sin experimental question paper
(c) Employing experts for trouble shooting during lab sessions
(d) Organizing workshops for teachers for new experiments introduced in the syllabus
(e) Encouraging students to participate in experiment related activities of IAPT e.g. NGPE, NCIEP, NANI etc.
(f) Organizing lab facilities like Atal Tinkering Lab, Anveshika, Innovation Hub, Centre for Scientific Culture
(g) Encouraging the students to organize science colloquial, seminar, seminar, workshops, stage science shows , etc
(h) Encouraging the students to organize science colloquial, seminar, seminar, workshops, stage science shows, etc.

440 teachers at the +2 level responded to the question. Multiple options could be chosen while answering the question.

Option (a) was chosen by 56.1%, option (b) by 32% (c) by 25.5%, (d) by 68.6%, (e) by 65.9%, (f) by 61.8% and (g) by 69.3%

Observations: In both the teacher categories the top voted suggestion was to organize workshops for teachers for new experiments introduced in the syllabus. Encouraging students to organize science colloquial, seminar etc. was also chosen by many as capable of developing student interest in experimental work. Employing experts for trouble shooting during lab sessions, introducing surprise element in experimental question paper and organizing facilities like ATL etc. were the least chosen options.

Inference:

Q 3: Do you encourage your students to participate in science exhibitions?

(a) Always
(b) Most of the time

(c) Sometimes
(d) Never

This question was asked exclusively to the +2 level teachers. Only one option could be chosen. Option (a) was chosen by 60.9%, option (b) by 26.6%, option (c) by 11.8% and option (d) by 0.7% of the respondents.

Students perspective about Physics lab activity

Responding to the question, "How does your lab experience at +2 level help to undertake your current (UG) lab activity?" more than half the students (54.9%) did not feel that it really helps. 45.1% respondents out of 1176 UG students chose the option "It really helps". 41% respondents reported that "Sometime it helps" while 13.9% chose the option "It does not help much".

"How does your lab experience at UG level help to undertake your current (PG) lab activity?" This question was posed to 463 respondents studying Physics at the PG level. Three options similar to those given to UG students were given for this group also. 49.2% students chose to report that "it really helps". "Sometimes it helps" was chosen by 34.6% respondents. The remaining 16.2% respondents chose the option "It does not help much".

We can conclude that in the opinion of majority of students the Physics lab experience at lower stage "does not really help" while doing Physics lab activity at their current stage.

DPK 10+2-Students Survey for the Status of Physics Laboratory

1,176 responses

Pictorial Report prepared by Dr K S Mann & Dr P Panchadhyayee

Students of 10+2

1.How does your lab experience at Higher secondary school (+2) level help to undertake your current(UG) lab activity?

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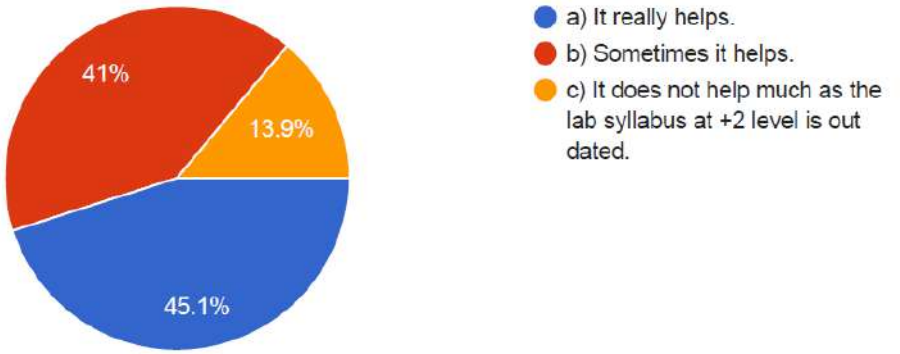
1,176 responses



2. What is the usual percentage of experiments completed against the allotted in the syllabus?

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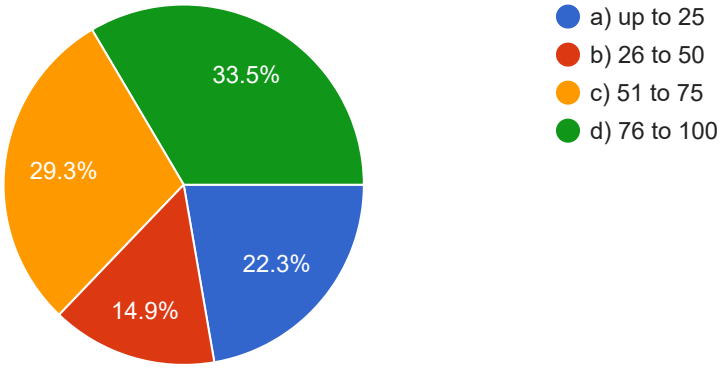
1,176 responses



3. Plus 2 lab syllabus helps to handle UG experiments based on modern instrumentation.

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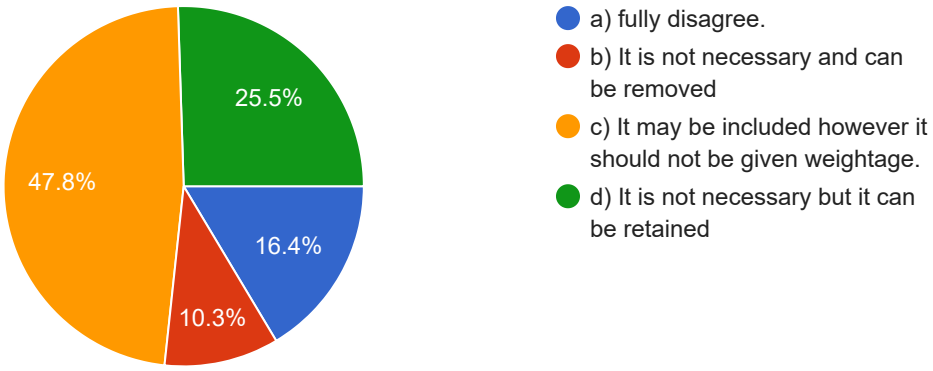
1,176 responses



4.Are you allowed to handle the lab equipment independently?

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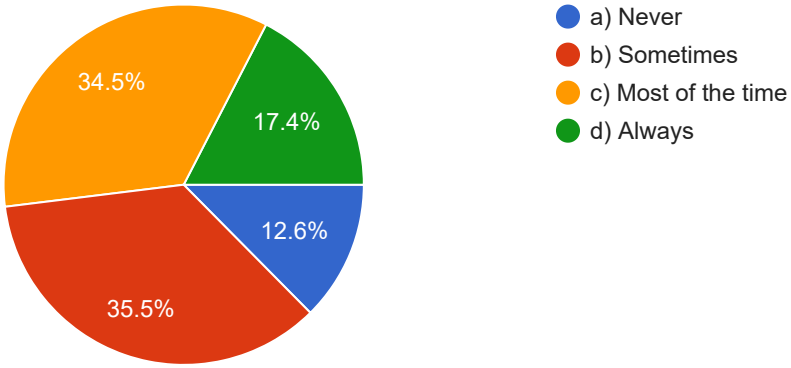
1,176 responses



5. If you are not allowed to handle the lab equipment independently then please specify the reason

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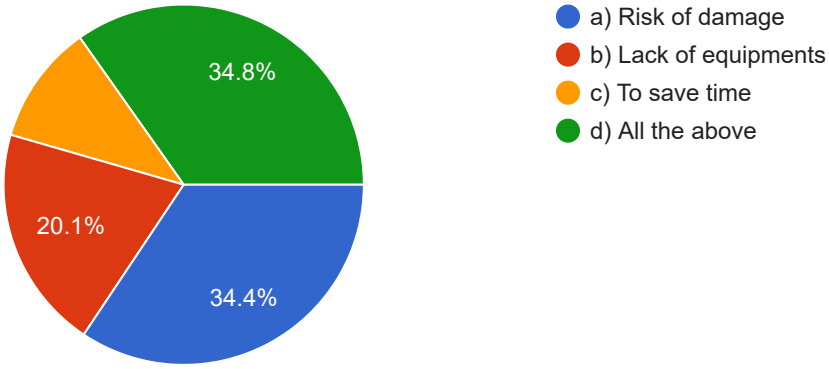
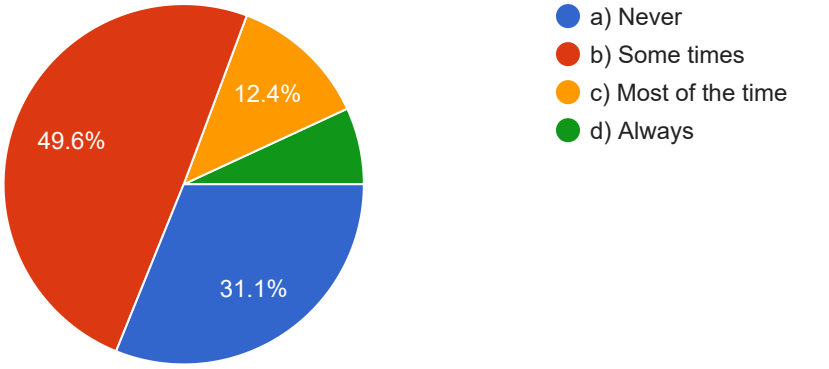
940 responses



6. Are you allowed to use different/alternate methods for performing the prescribed experiment?

Copy

1,176 responses



7. Do you get Lab-Orientation(introduction to lab and general instructions) before starting the lab work.

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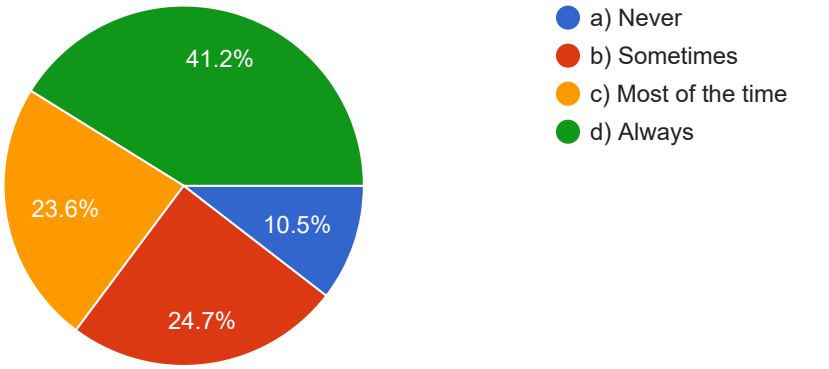
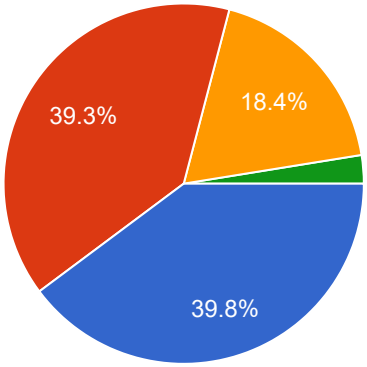
1,176 responses



8. Do you keep records of experimental work,

Copy

1,176 responses



- a) as observed, in the tables given in the practical book.
- b)as observed, in the tables prepared by yourself.
- c) in the tables in practical book, after manipulation to suit the textual results.
- d) without following any norms.

9. How the experimental work was assessed usually?

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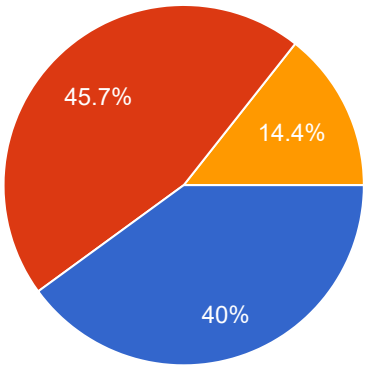
1,176 responses

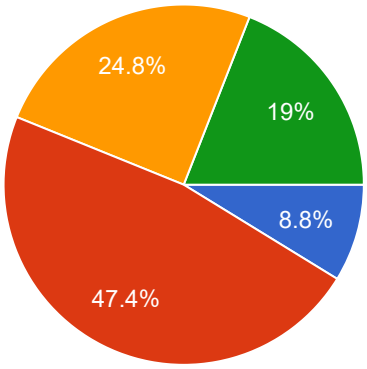


- a) Immediately after the completion of the experiment
- b) Periodically
- c) Just before the examination

10. Do you estimate errors/ do uncertainty analysis of measurements after every experiment?

Copy

1,176 responses

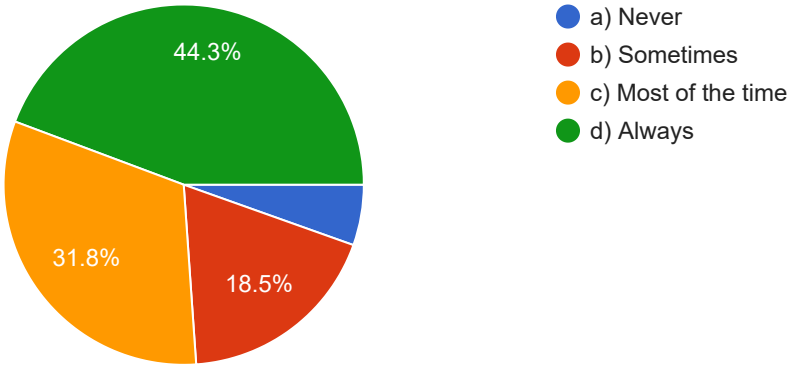


- a) Never
- b) Sometimes
- c) Most of the time
- d) Always

11. Do you write your result with proper significant figures?

Copy

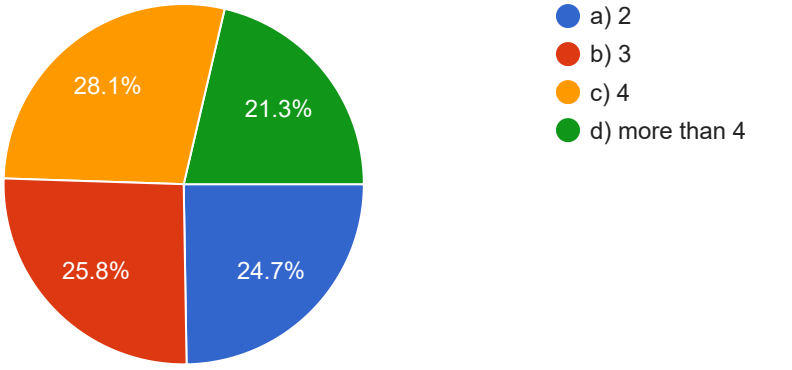
1,176 responses



12. Number of students normally sharing the same experimental setup for performing a practical

Copy

1,176 responses



13. On an average the extent of interaction between teachers and students during the practicals.

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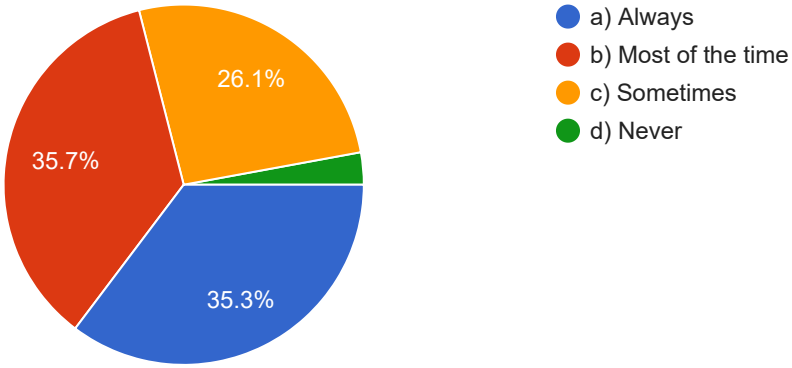
1,176 responses



14. Are the students encouraged to do the Project work?

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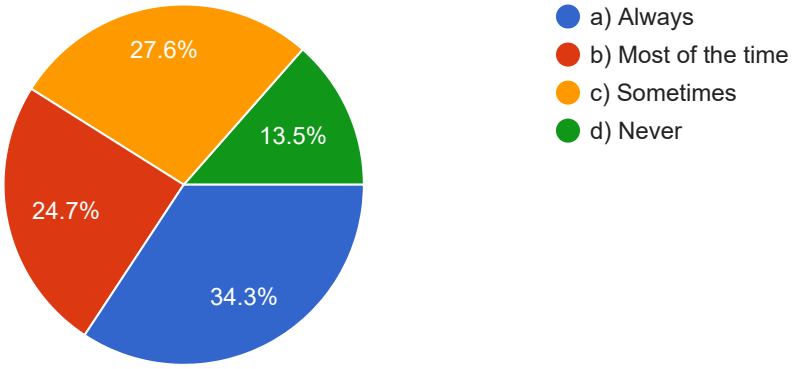
1,176 responses



15. Is Fun involved in Physics Practicals?

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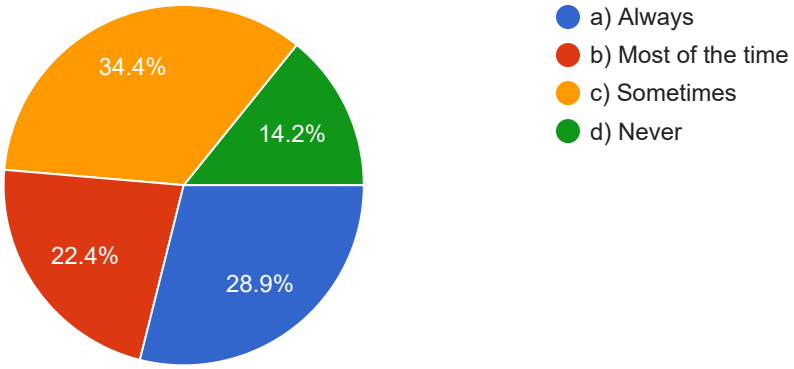
1,176 responses



16. Demonstrations of experiments are normally given by?

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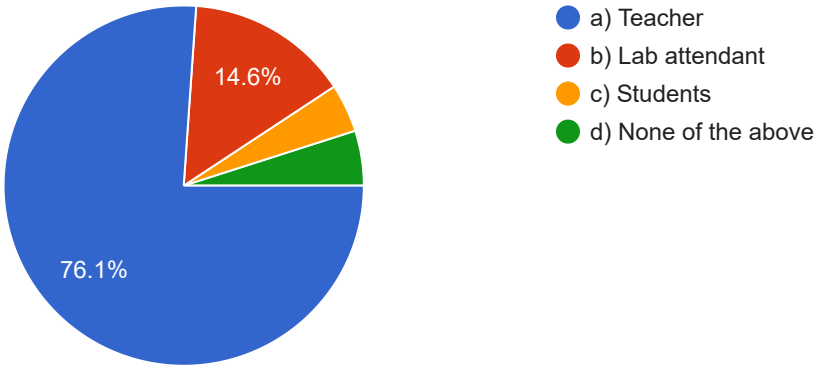
1,176 responses



17. I have used the following equipment in Physics Lab?

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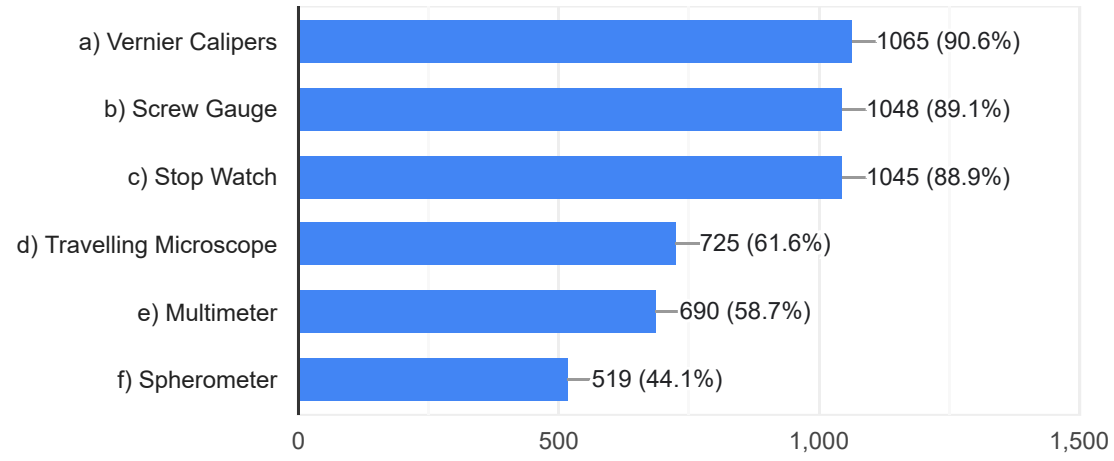
1,176 responses



18. Reason for liking/loving experiments

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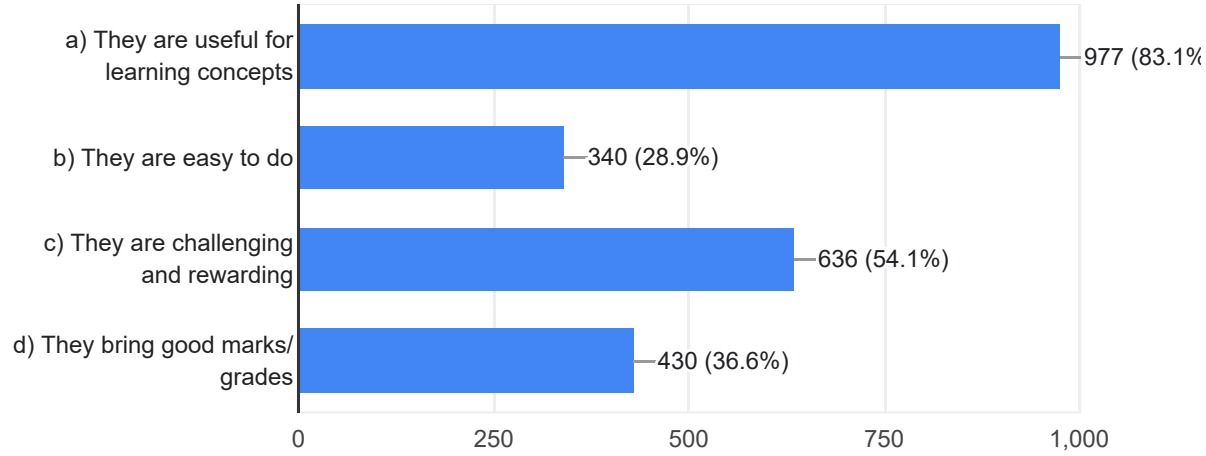
1,176 responses



19. Reason for not loving experiments

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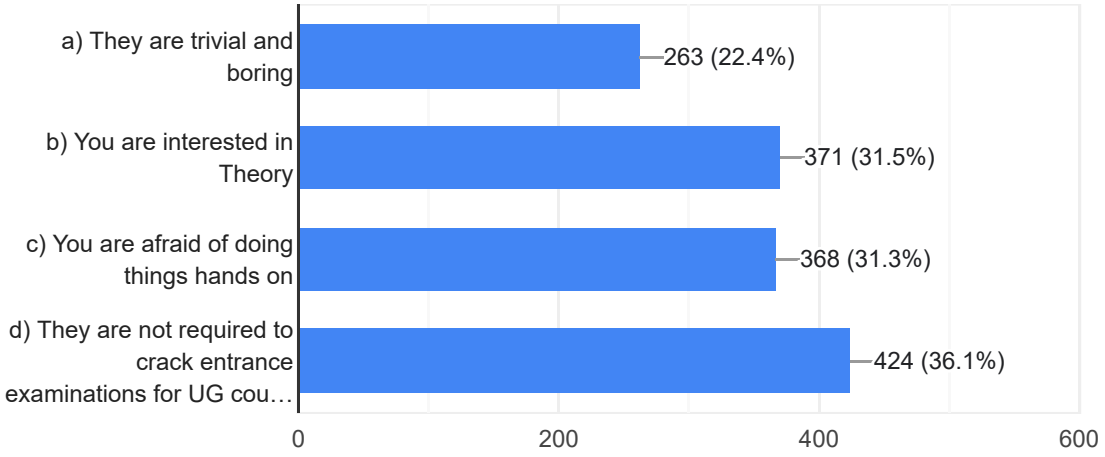
1,176 responses



20. How to grow interest in Physics Laboratory course?

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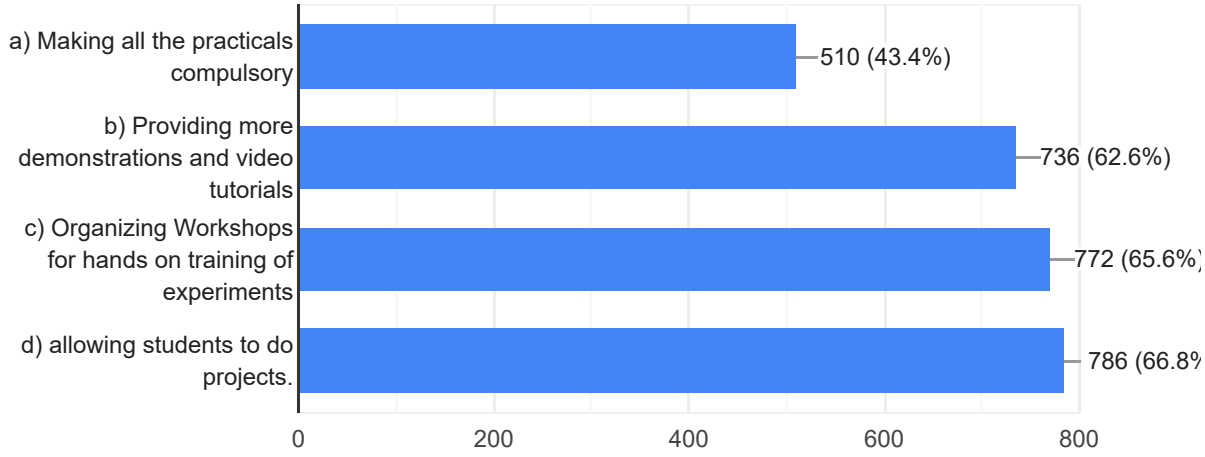
1,176 responses



DPK 10+2-Teachers Survey for the Status of Physics Laboratory

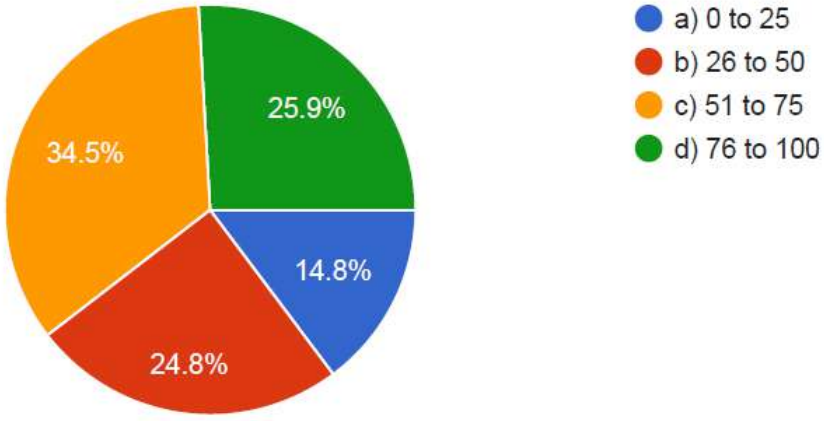
440 responses

Pictorial Report prepared by Dr K S Mann & Dr P Panchadhyayee

1. What percentage of your students perform experiments sincerely?

Copy

440 responses



2. What is the usual percentage of experiments completed by students against prescribed in the syllabus?

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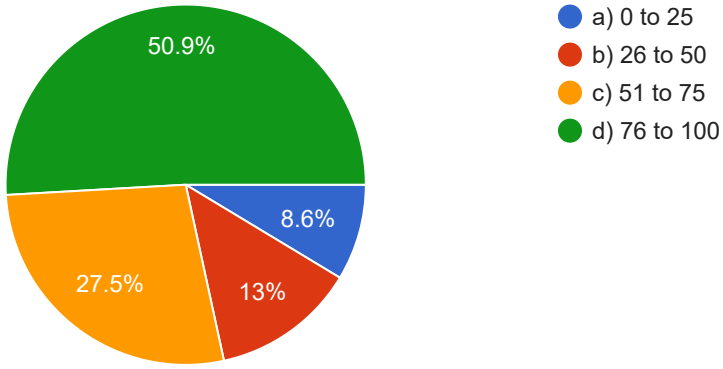
440 responses



3. What do you feel about the prescribed syllabus for the Lab work?

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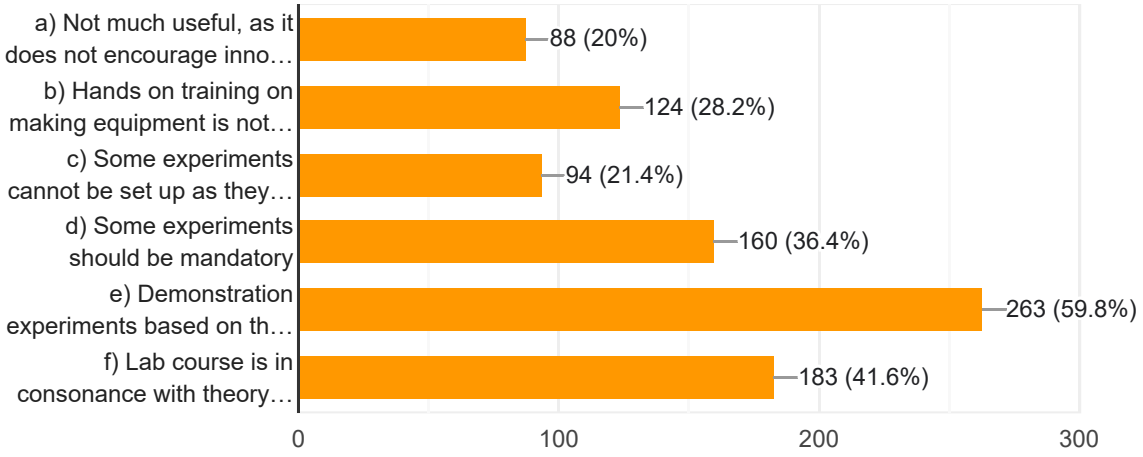
440 responses



4. Do you allow your students to ...

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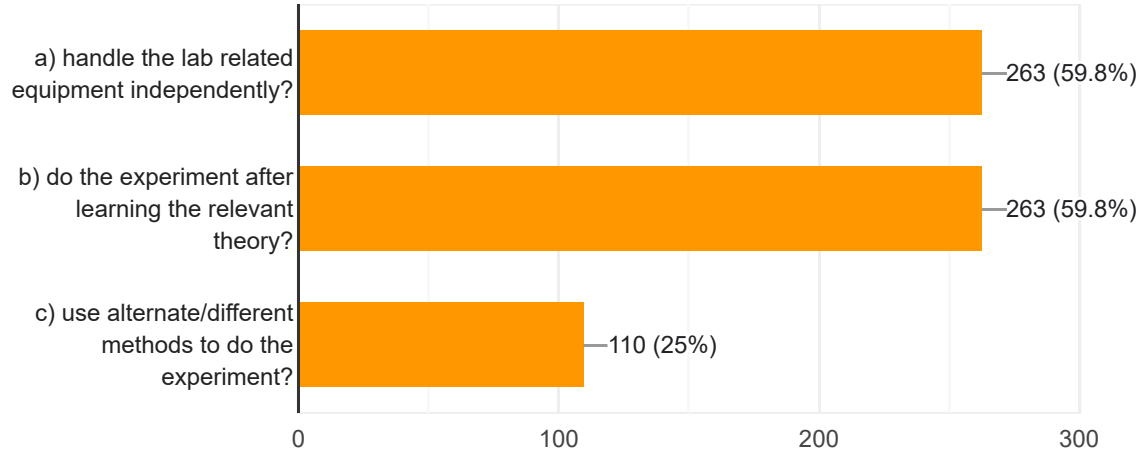
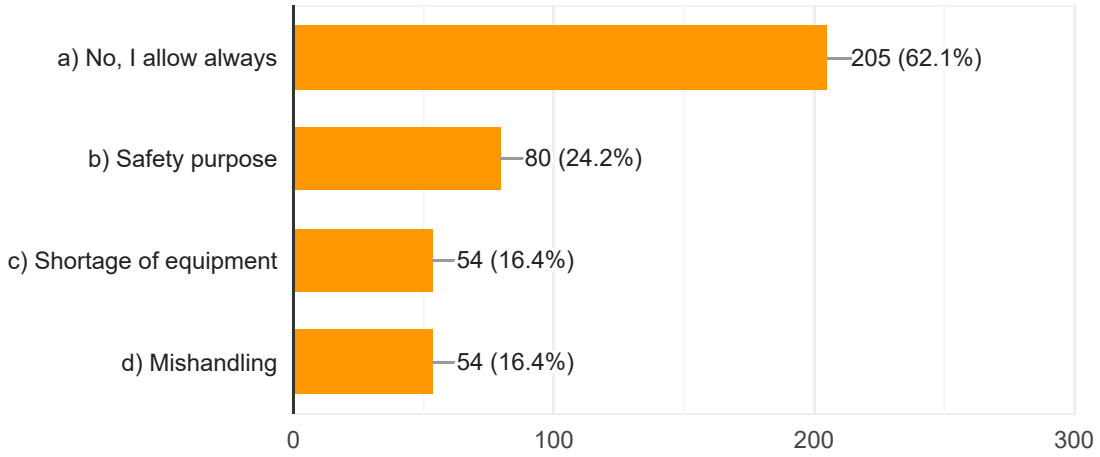
440 responses



5. If you do not allow students to handle the lab equipment independently then please specify the reason/s

Copy

330 responses



6. Do you give Lab-Orientation (introduction to lab and general skills required) to students before starting the lab work?

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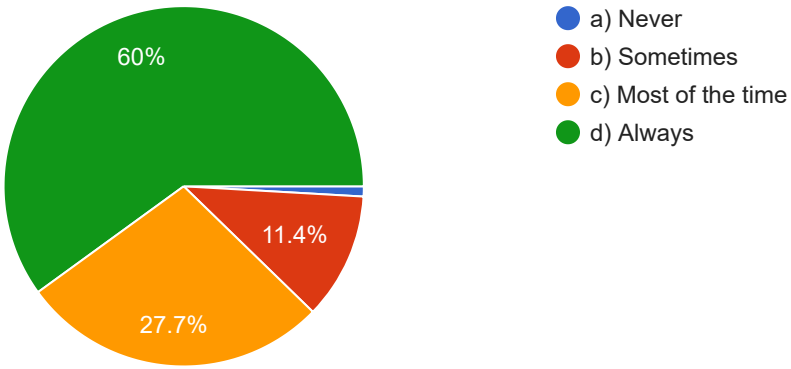
440 responses



6. Do you allow students to think alternative methods for performing the prescribed experiment?

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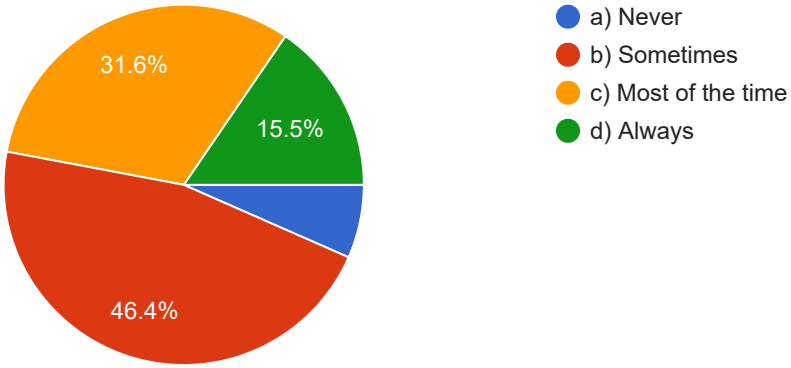
440 responses



7. Do majority of your students keep record of data

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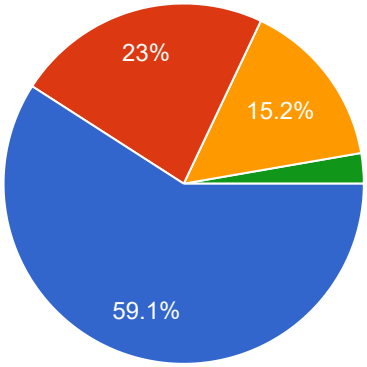
440 responses



- a) as observed, in the tables given in practical books.
- b) as observed, in the tables prepared by themselves from theory.
- c) in the tables in practical books, after manipulation to suit the textual results.
- d) without following any norm.

8. When students collect data, you emphasize on ----

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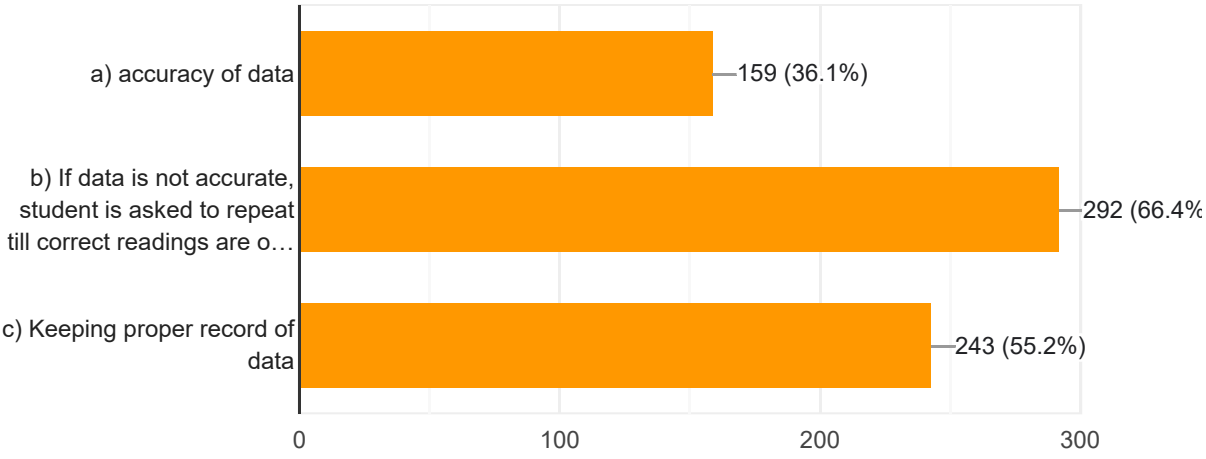
440 responses



9. When is the experimental work of the students assessed?

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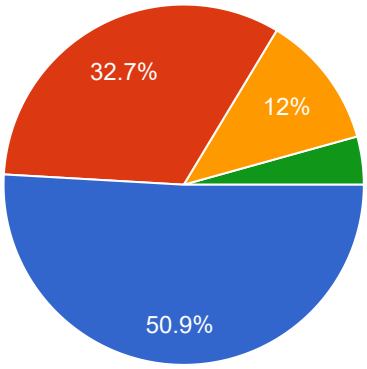
440 responses



- a) Immediately after the completion of the experiment
- b) Weekly
- c) Randomly
- d) Just before the examination

10. Do your students estimate errors/ perform uncertainty analysis of measurements after every experiment?

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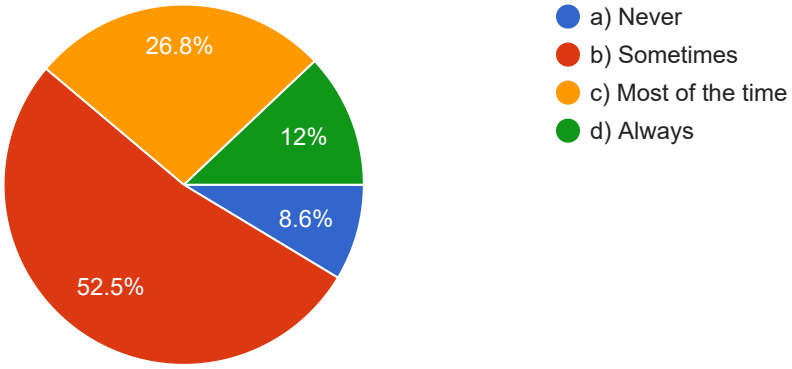
440 responses



11. Do you insist your students to write results with proper significant figures?

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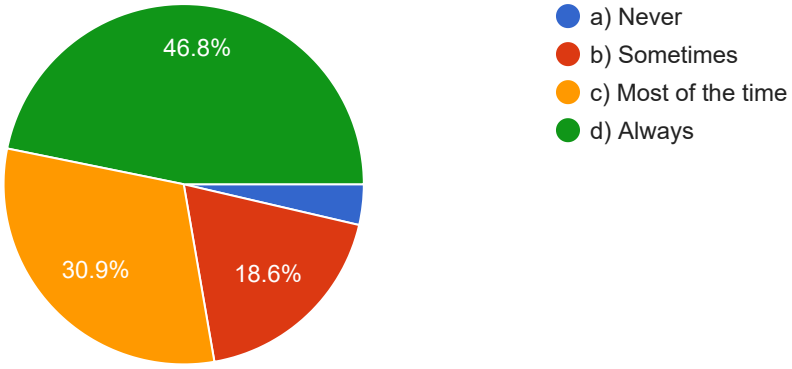
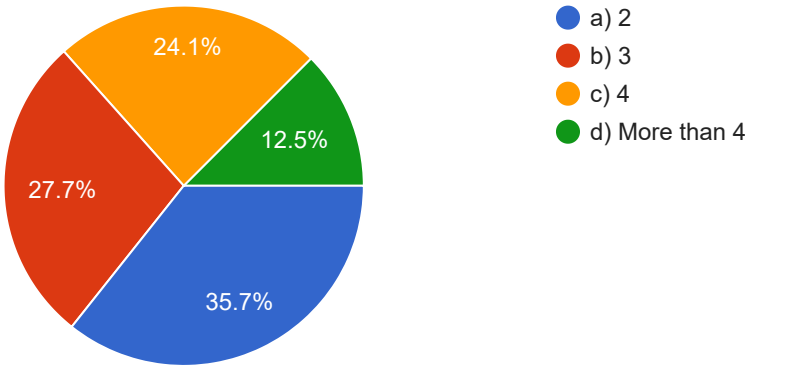
440 responses



12. Number of students normally sharing the same experimental setup for performing a practical

Copy

440 responses



13. What is the Teacher-Student ratio, in your institution?

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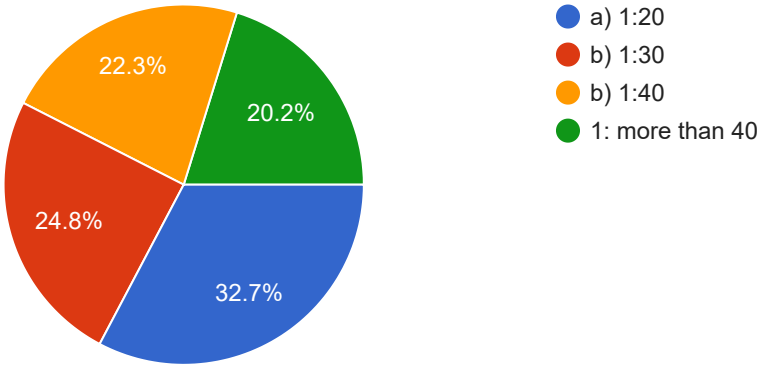
440 responses



14. Do you give weightage to the project in the final marks?

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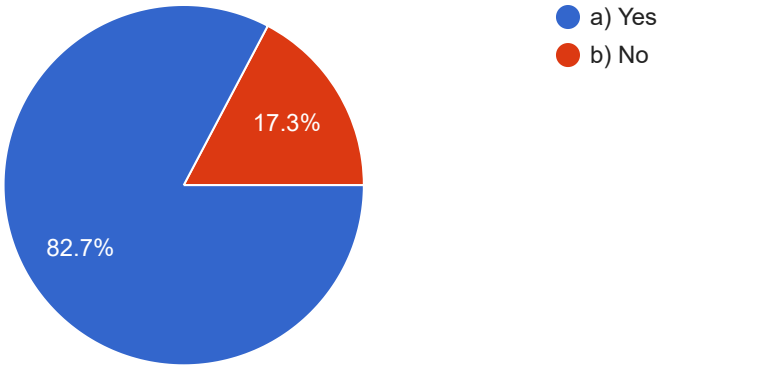
440 responses



15. What percentage of experimental methods in the syllabus are outdated OR new techniques need to be introduced?

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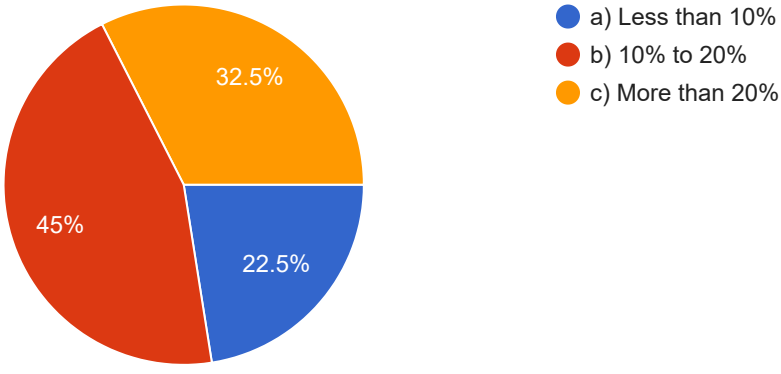
440 responses



16. Evaluation of experimental work includes the following:

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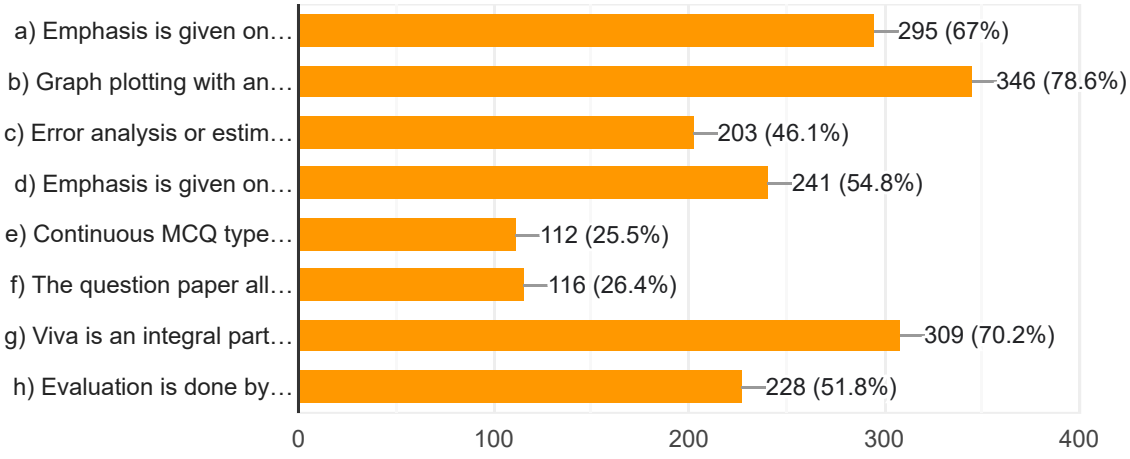
440 responses



17. Is sufficient annual funding available to upgrade your lab?

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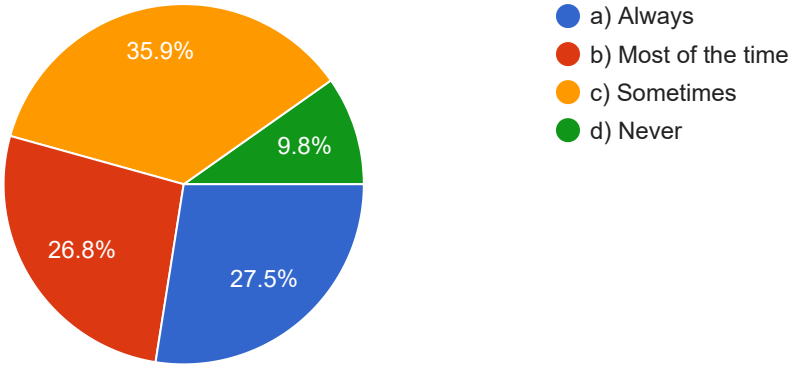
440 responses



18. Are your students performing experiments with available items at home to sharpen their analytical and experimental skills?

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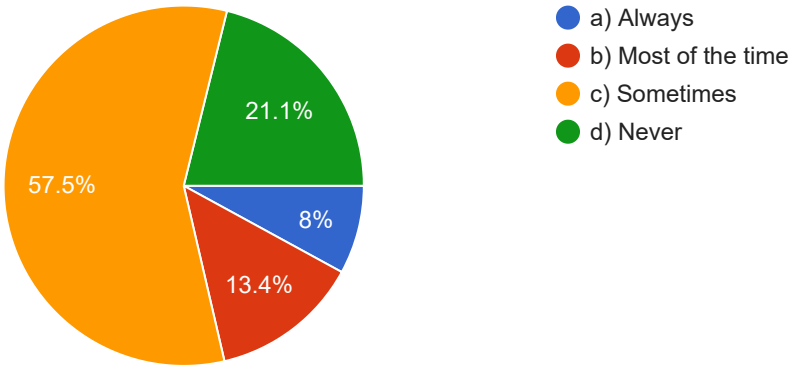
440 responses



19. Do you encourage your students to participate in science exhibitions?

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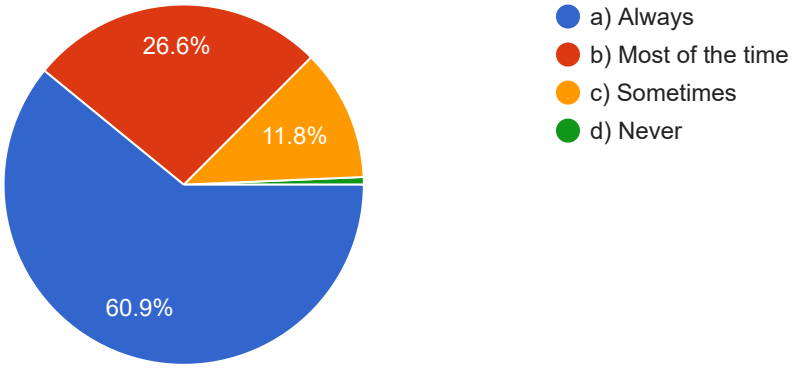
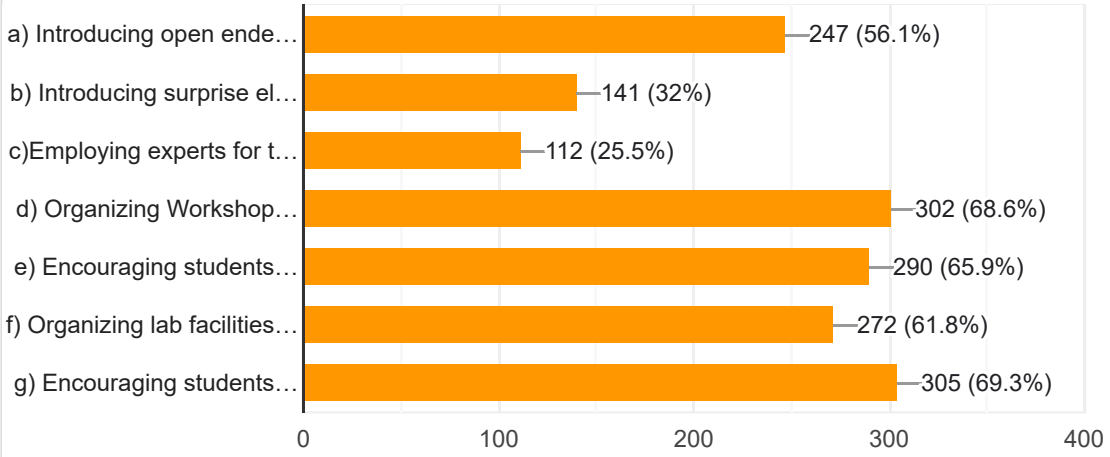
440 responses



20. Which of the following suggestions would help students to learn physics through experiments ?

Copy

440 responses



DPK UG-Students Survey for the Status of Physics Laboratory

463 responses

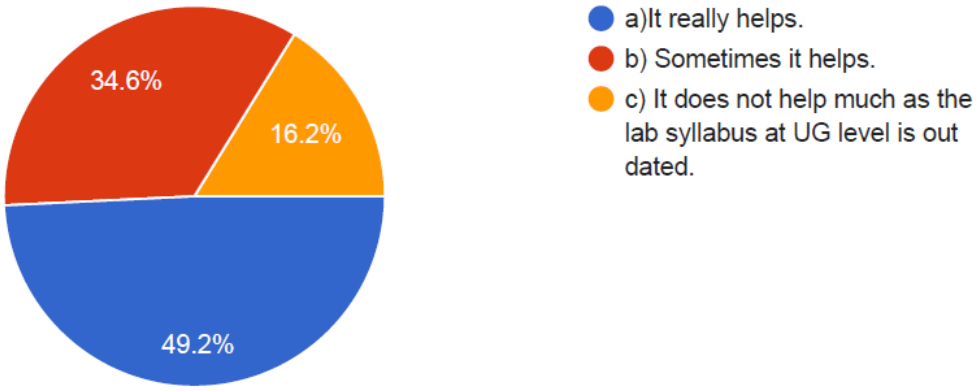
Pictorial Report prepared by Dr K S Mann & Dr P Panchadhyayee

Students of UG

1. How does your lab experience at under graduate stage help to undertake your current lab activity?

Copy

463 responses



2. What is the usual percentage of experiments completed against the allotted in the syllabus?

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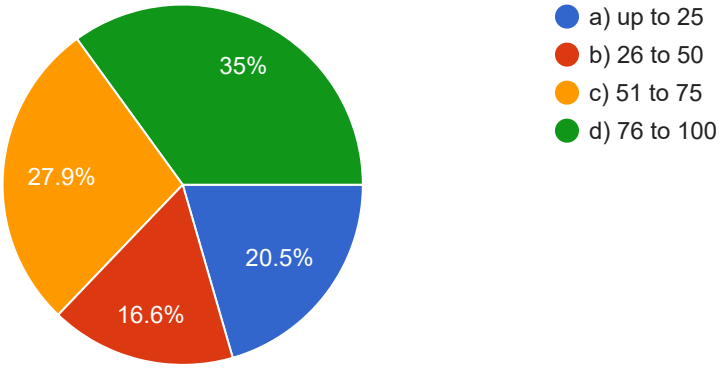
463 responses



3. A Physics graduate is trained to handle the modern instrumentation with currently available instrumentation in UG lab.

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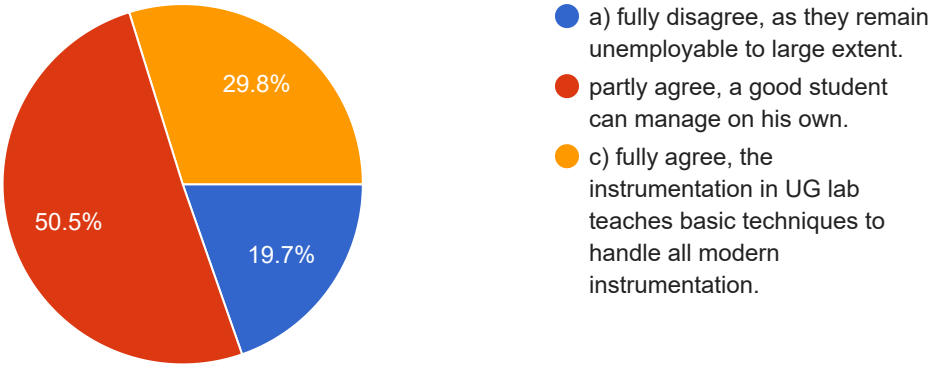
463 responses



4. What is your opinion about the number of experiments prescribed in the syllabus?

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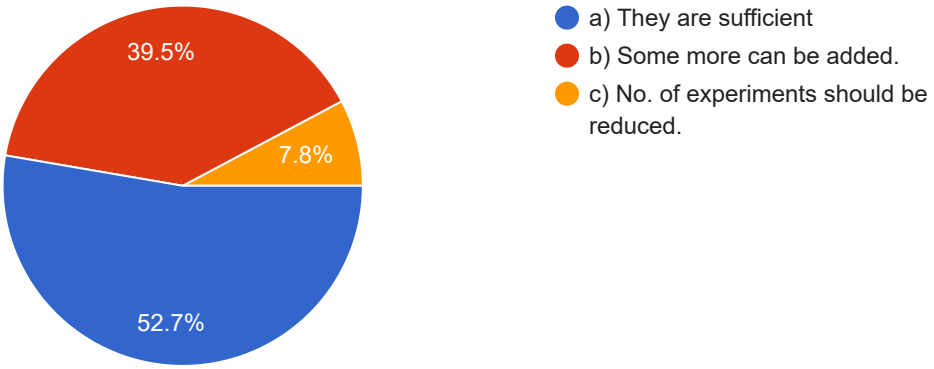
463 responses



5. Is your Lab course in consonance with theory syllabus?

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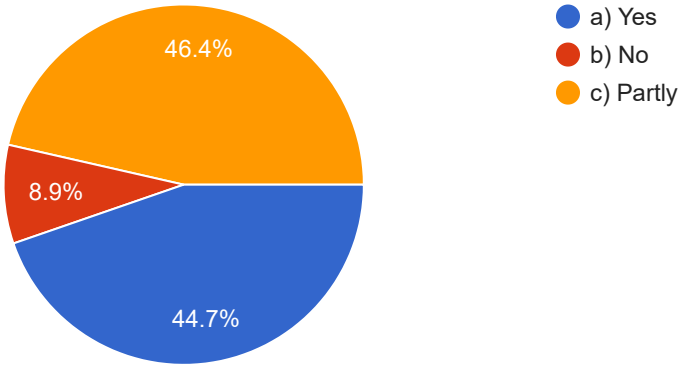
463 responses



6. Are you allowed to handle the lab equipment independently?

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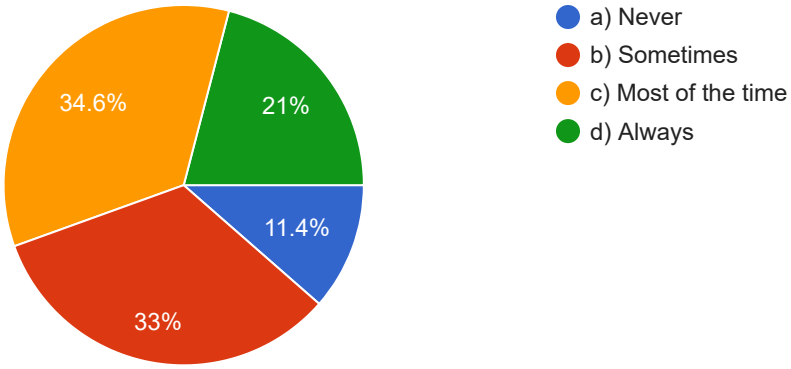
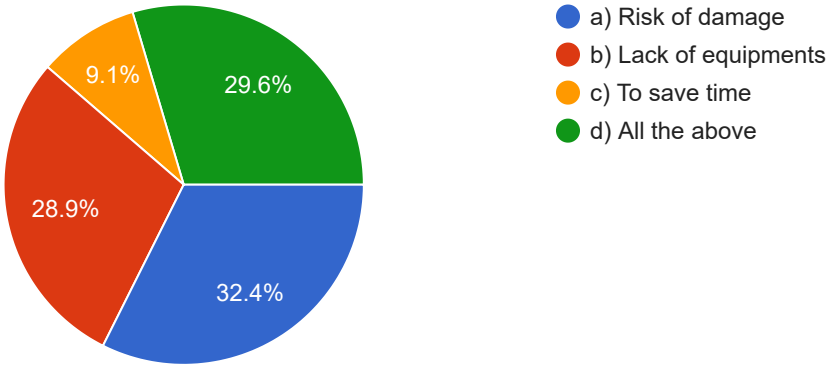
463 responses



8. If you are not allowed to handle the lab equipment independently then please specify the reason

Copy

463 responses



8. Are you allowed to use different/alternate methods for performing the prescribed experiment?

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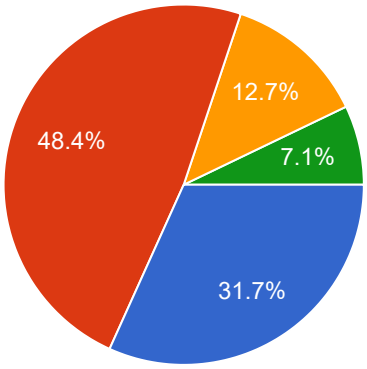
463 responses

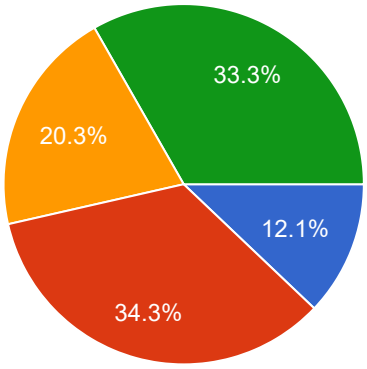


- a) Never
- b) Sometimes
- c) Most of the time
- d) Always

9. Do you get Lab-Orientation(introduction to lab and general instruction) before starting the lab work.

Copy

463 responses

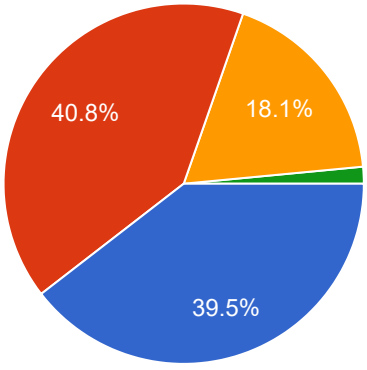


- a) Never
- b) Sometimes
- c) Most of the time
- d) Always

10. Do you keep records of experimental work,

Copy

463 responses

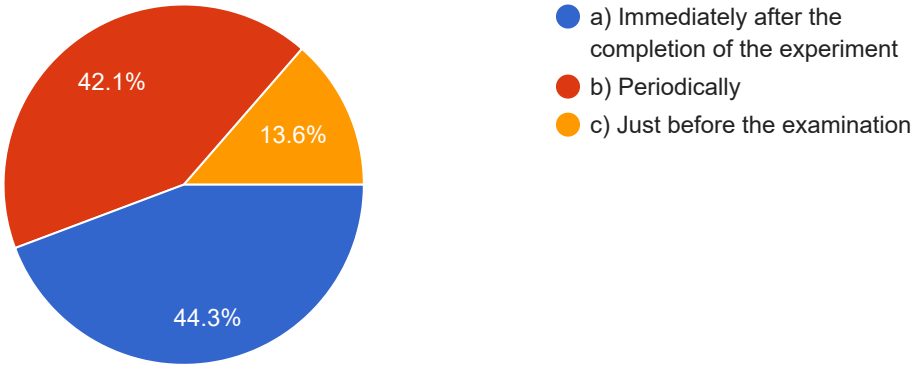


- a) as observed, in the tables given in the practical book.
- b)as observed, in the tables prepared by yourself.
- c) in the tables in practical book, after manipulation to suit the textual results.
- d) without following any norms.

11. How the experimental work is assessed usually?

Copy

463 responses



12. Do you estimate errors/ do uncertainty analysis of measurements after every experiment?

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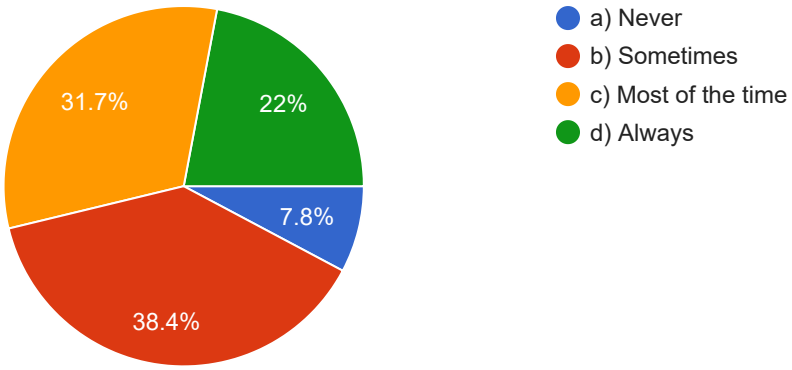
463 responses



13. Do you write your result with proper significant figures?

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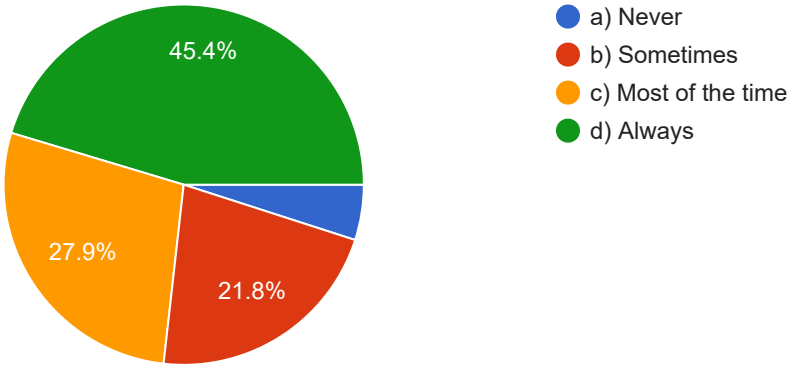
463 responses



14. Number of students normally sharing the same experimental setup for performing a practical

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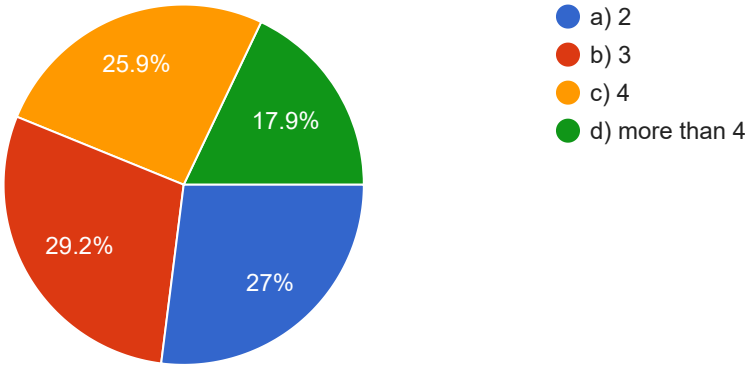
463 responses



15. On an average the extent of interaction between teachers and students during the practicals.

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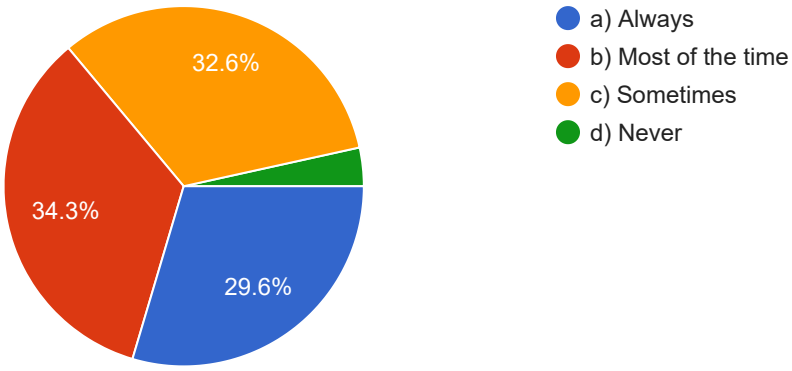
463 responses



16. Are the students encouraged to do the Project work?

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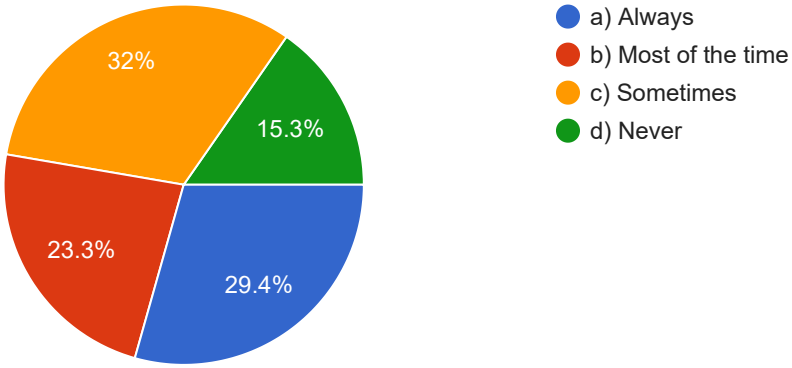
463 responses



17. Do you think the Project work should be the essential component of Lab course?

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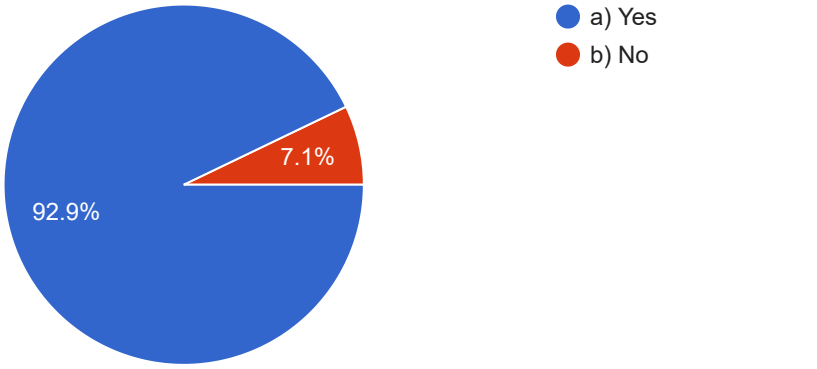
463 responses



18. Is Fun involved in Physics Practical?

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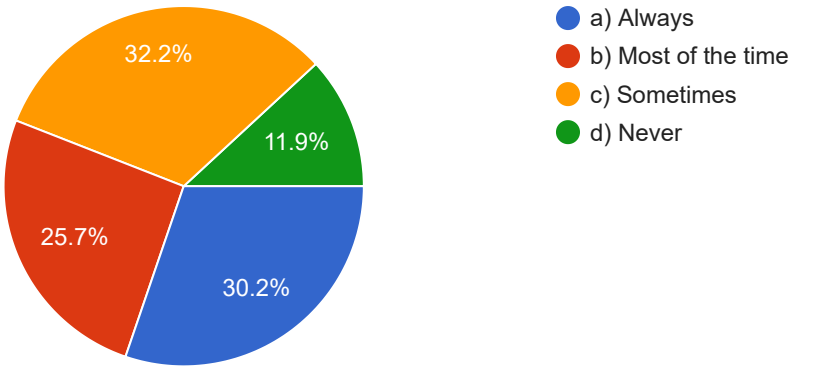
463 responses



19. Demonstrations of experiments are normally given by?

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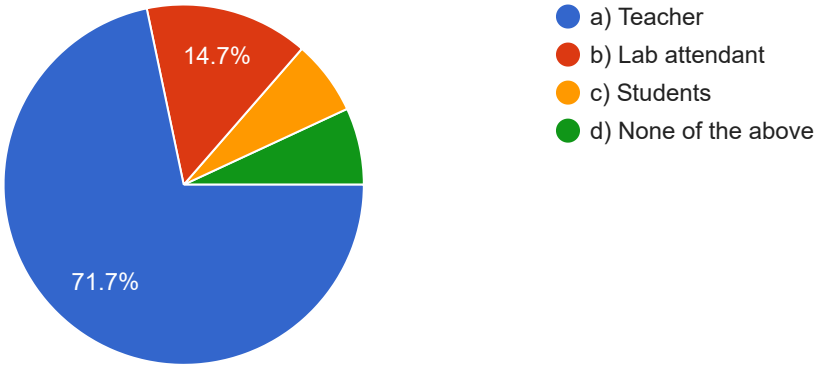
463 responses



20. I have used the following equipment in Physics Lab?

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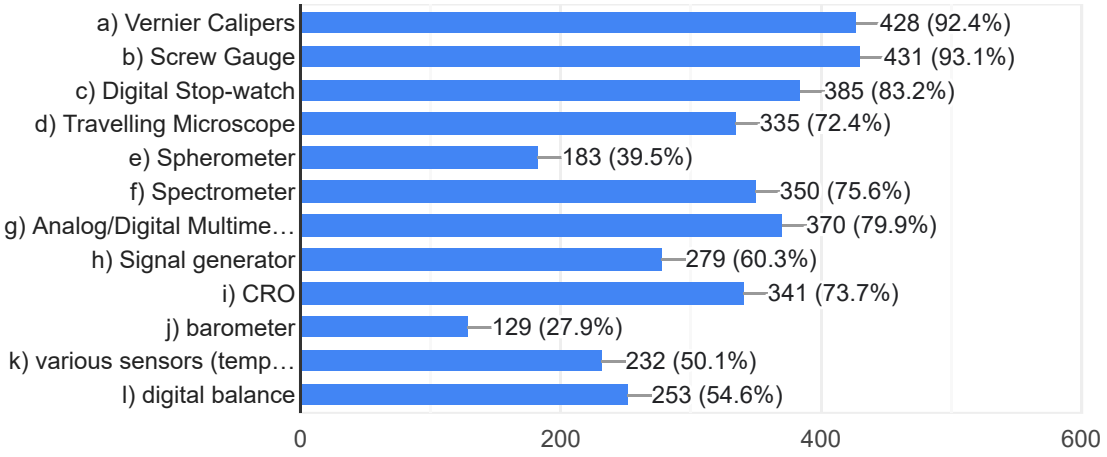
463 responses



21. Have you used any software for data acquisition and analysis.

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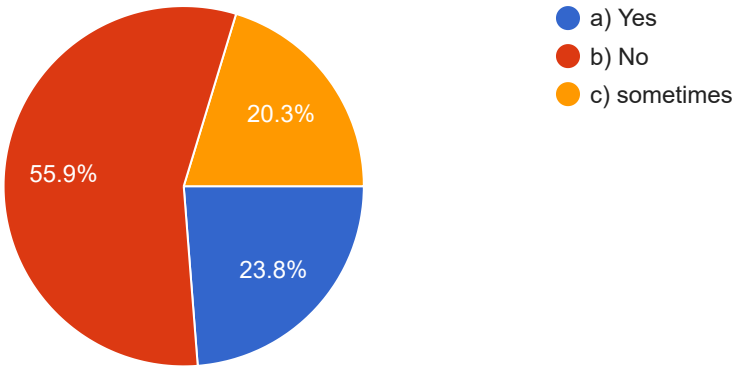
463 responses



22. For your electronics experiments did you use

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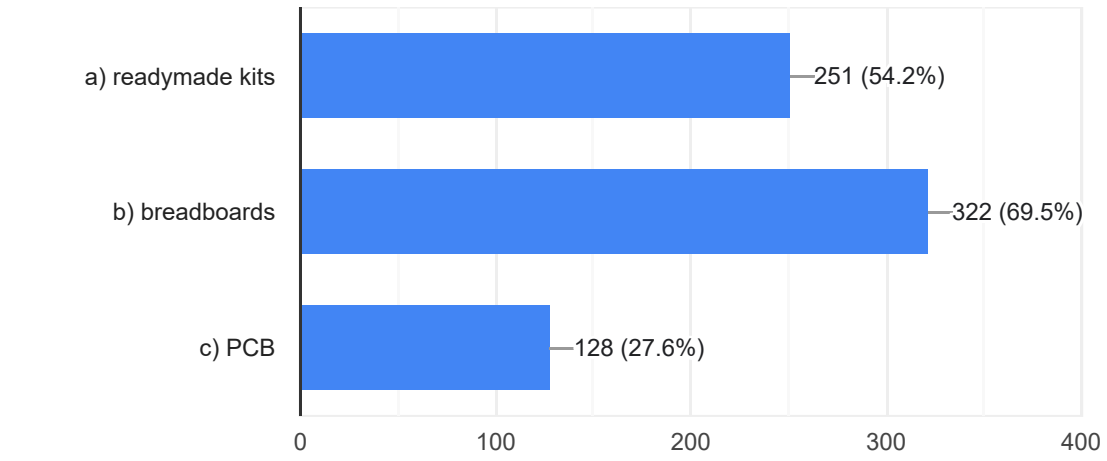
463 responses



23. Reason for liking/loving experiments

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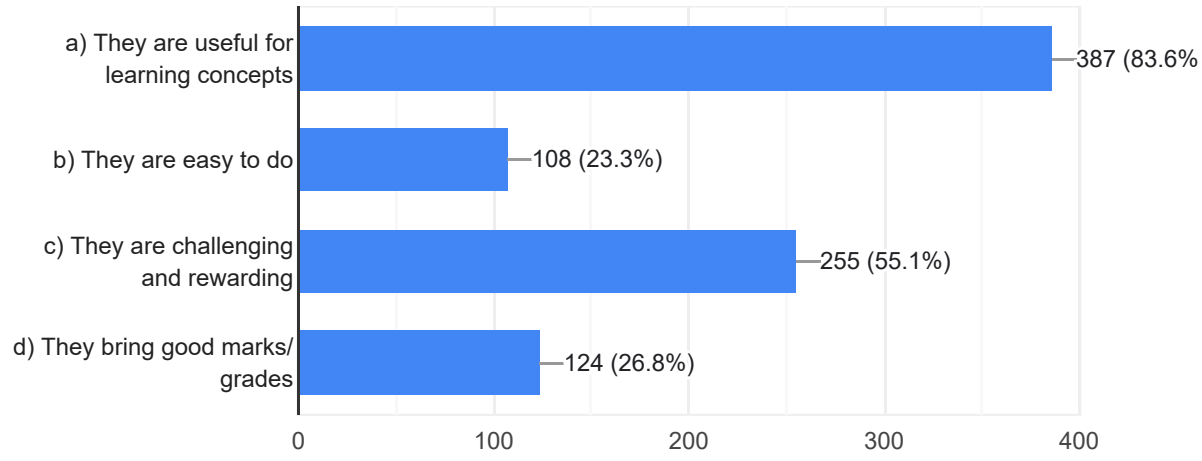
463 responses



24. Reason for not loving experiments

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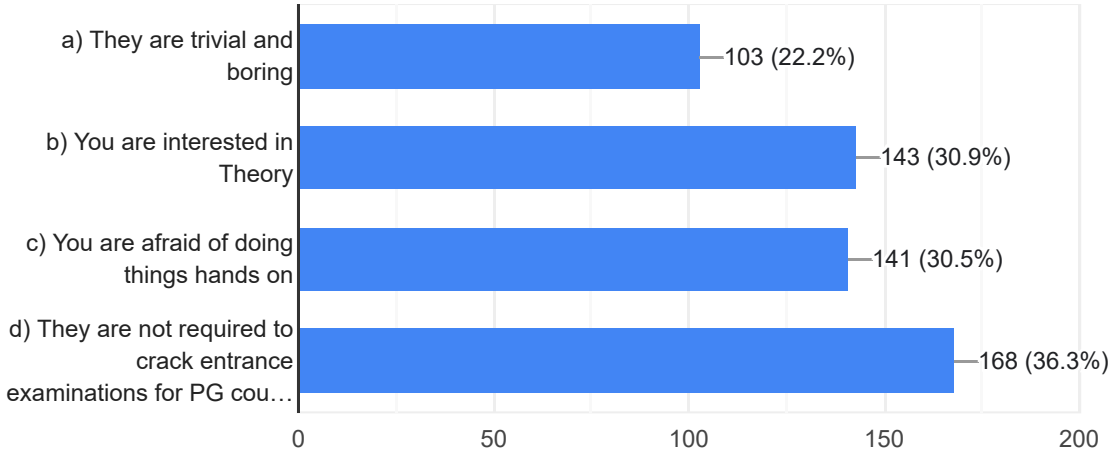
463 responses



25. How to grow interest in Physics Laboratory course?

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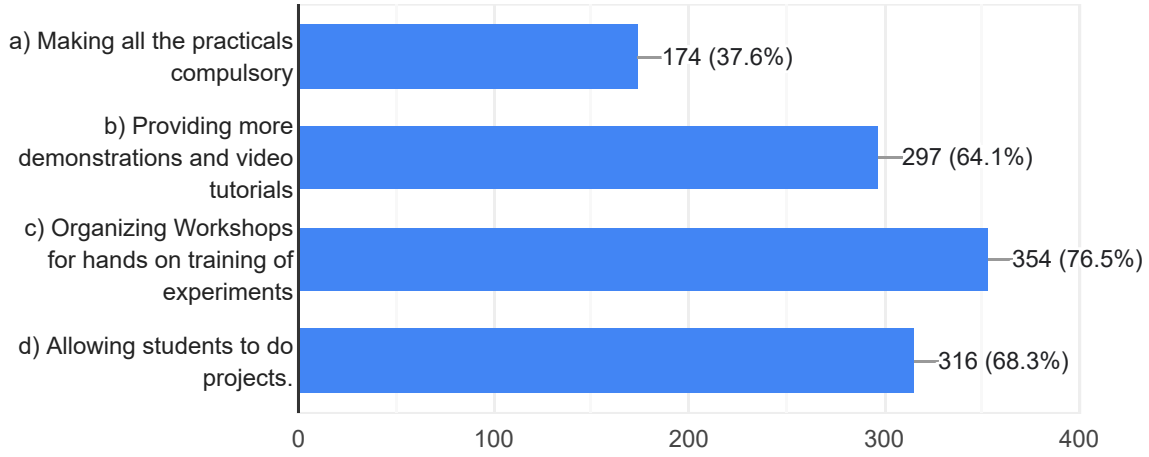

DPK UG-Teachers Survey for the Status of Physics Laboratory

357 responses

Pictorial Report prepared by Dr K S Mann & Dr P Panchadhyayee

1. What is the usual percentage of students performing experiments seriousely?

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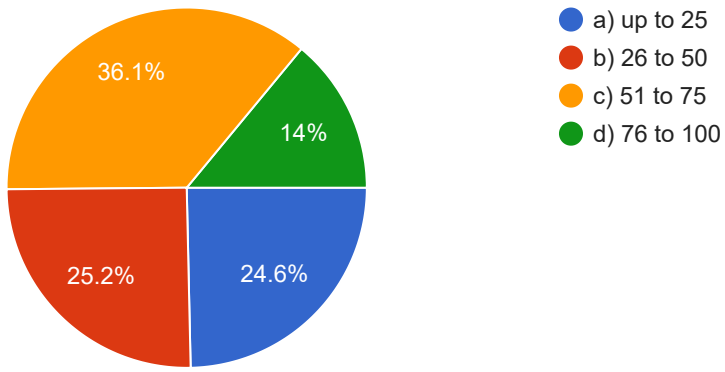
357 responses



2. What is the usual percentage of experiments completed by students against prescribed in the syllabus?

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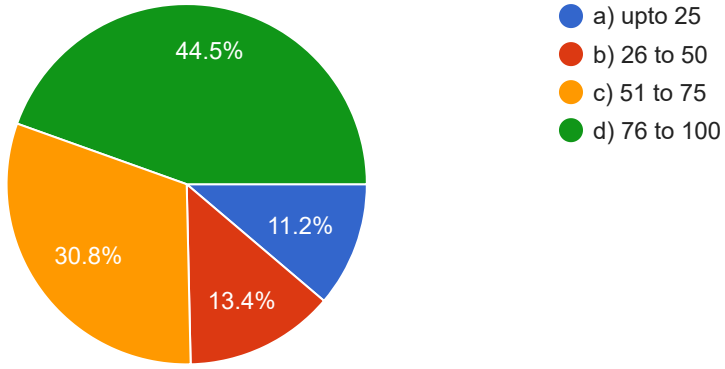
357 responses



3. What do you feel about the prescribed syllabus for the Lab work?

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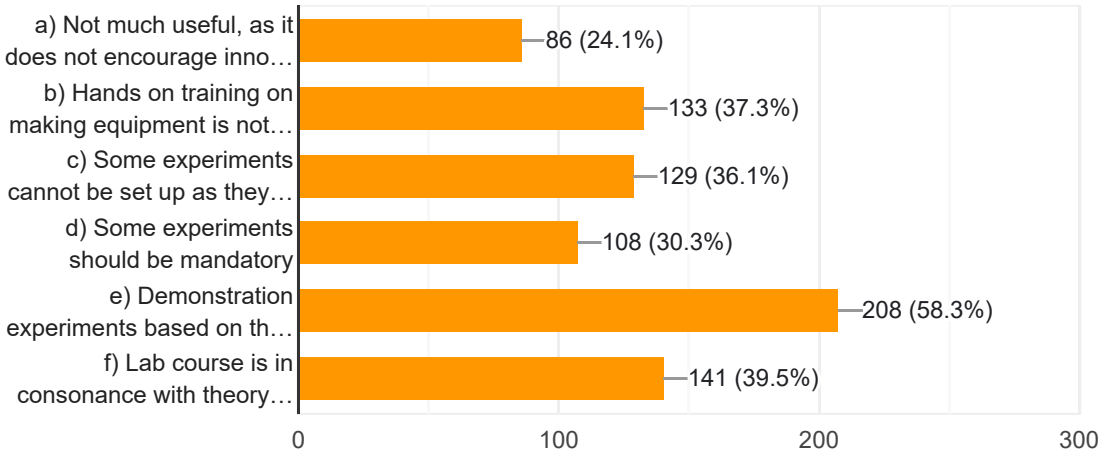
357 responses



4. Do you allow your students to ...

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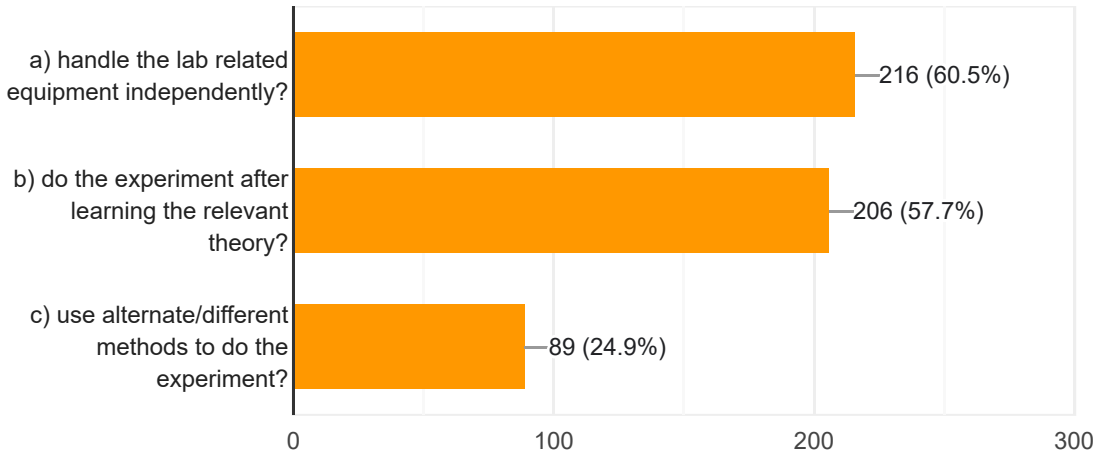
357 responses



5. If you do not allow students to handle the lab equipment independently then please specify the reason/s

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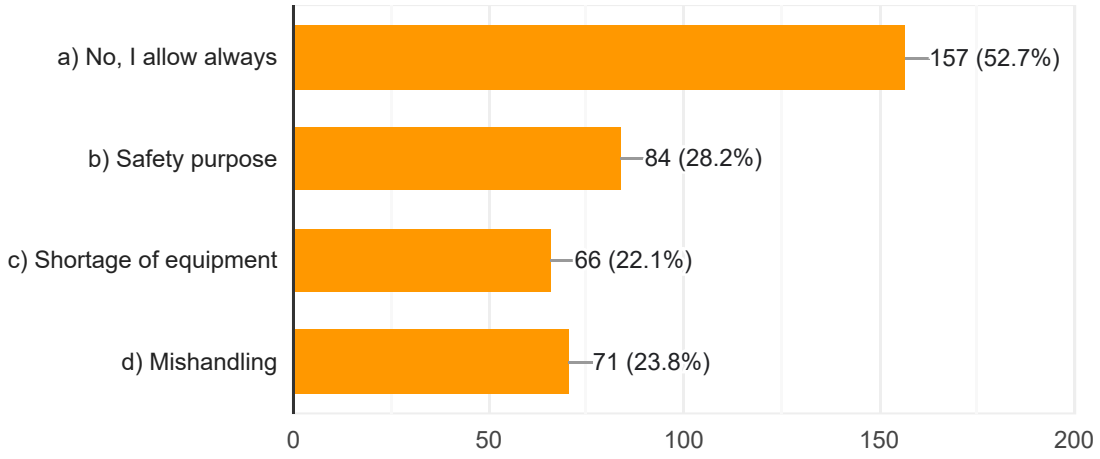
298 responses



6. Do you give Lab-Orientation (introduction to lab and general skills required) to students before starting the lab work?

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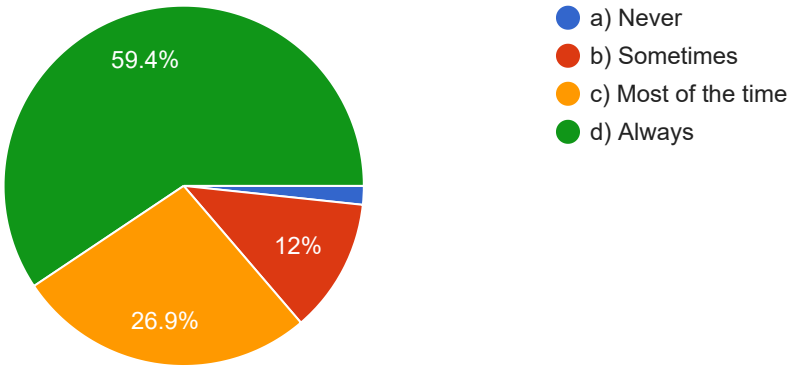
357 responses



7. Do majority of your students keep record of data

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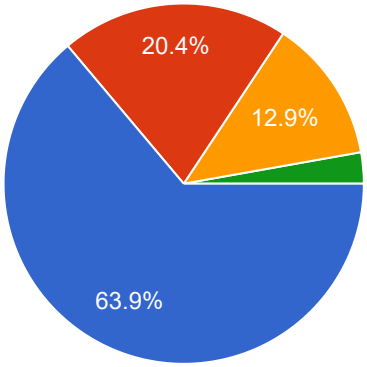
357 responses



- a) as observed, in the tables given in practical books.
- b) as observed, in the tables prepared by themselves from theory.
- c) in the tables in practical books, after manipulation to suit the textual results.
- d) without following any norm.

8. When is the experimental work of the students assessed?

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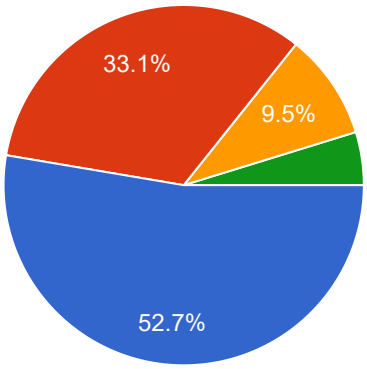
357 responses



- a) Immediately after the completion of the experiment
- b) Weekly
- c) Randomly
- d) Just before the examination

9. Do your students estimate errors/ perform uncertainty analysis of measurements after every experiment?

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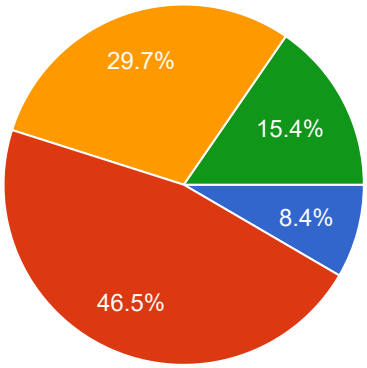
357 responses



- a) Never
- b) Sometimes
- c) Most of the time
- d) Always

10. Do you insist your students to write results with proper significant figures?

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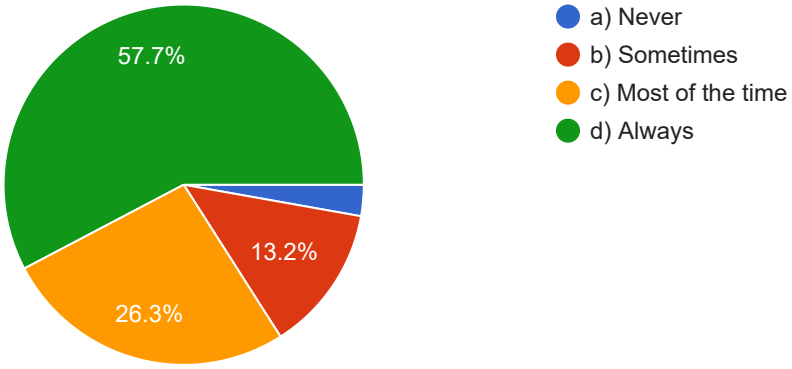
357 responses



11. Number of students normally sharing the same experimental setup for performing an experiment

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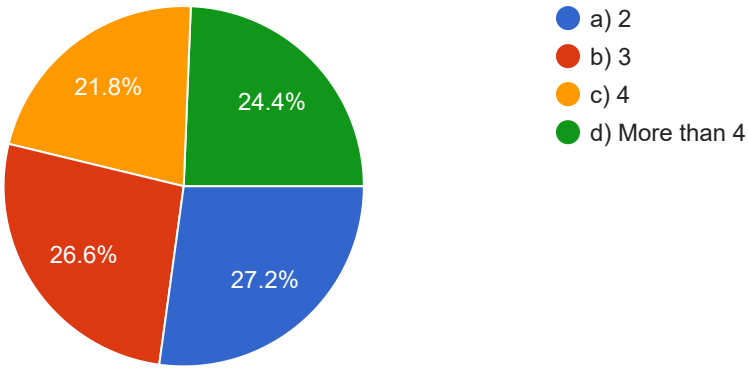
357 responses



12. What is the Teacher-Student ratio, in your institution?

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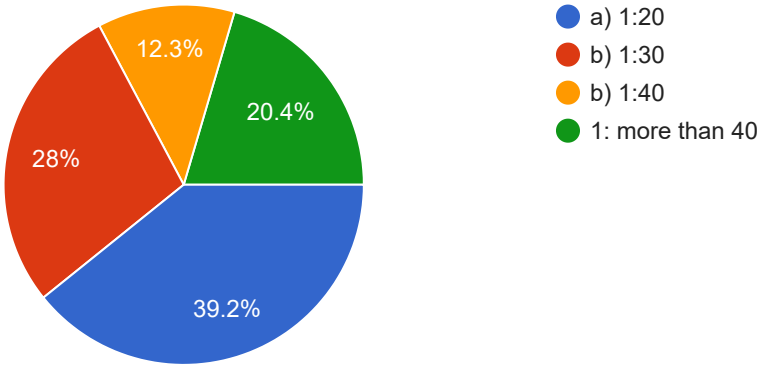
357 responses



13. Do you give weightage to the project in the final marks?

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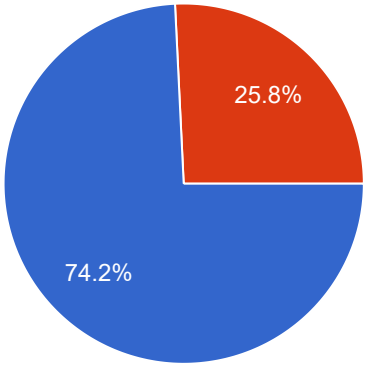
357 responses



14. What percentage of experimental methods in the syllabus are outdated OR new techniques need to be introduced?

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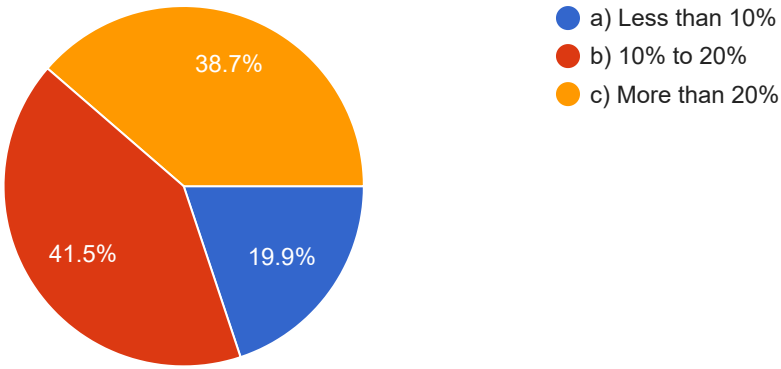
357 responses



15. A Physics graduate is trained to handle the modern instrumentation with currently available instrumentation in UG labs.

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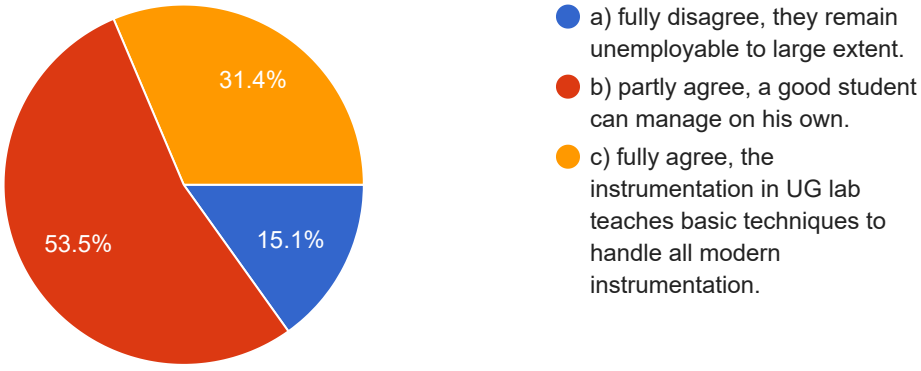
357 responses



16. Evaluation of experimental work includes the following:

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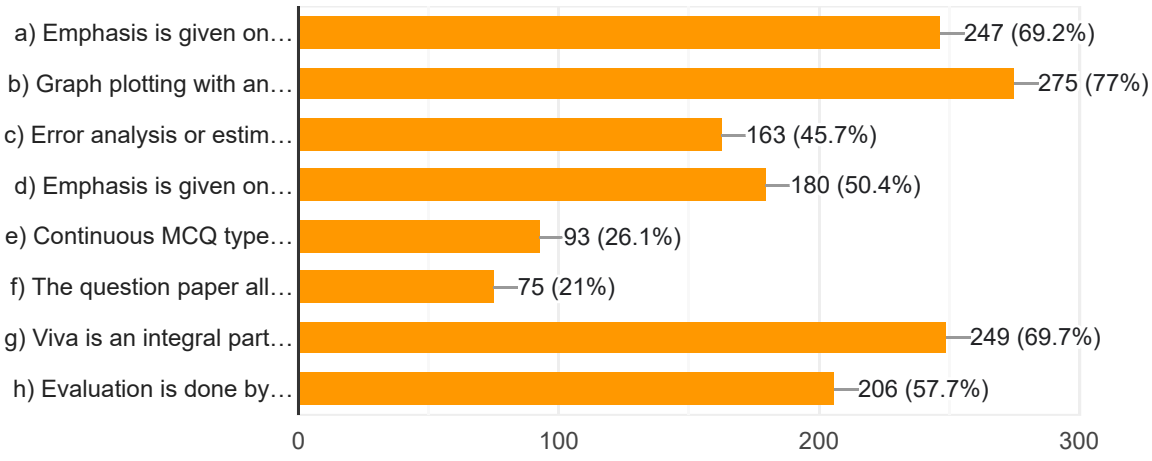
357 responses



17. Is sufficient annual funding available to upgrade your lab?

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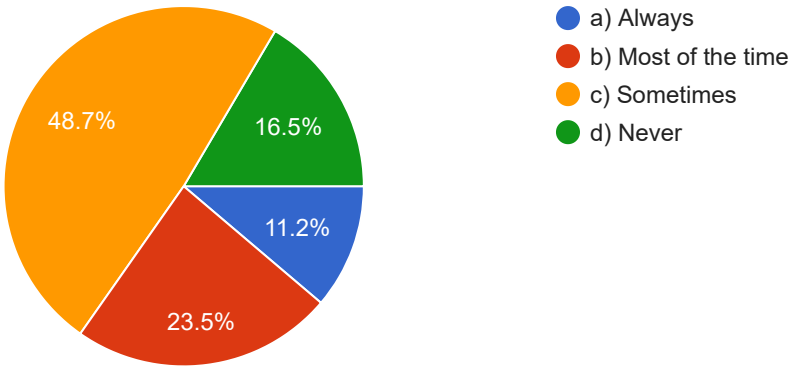
357 responses



18. Do you get grants from the following?

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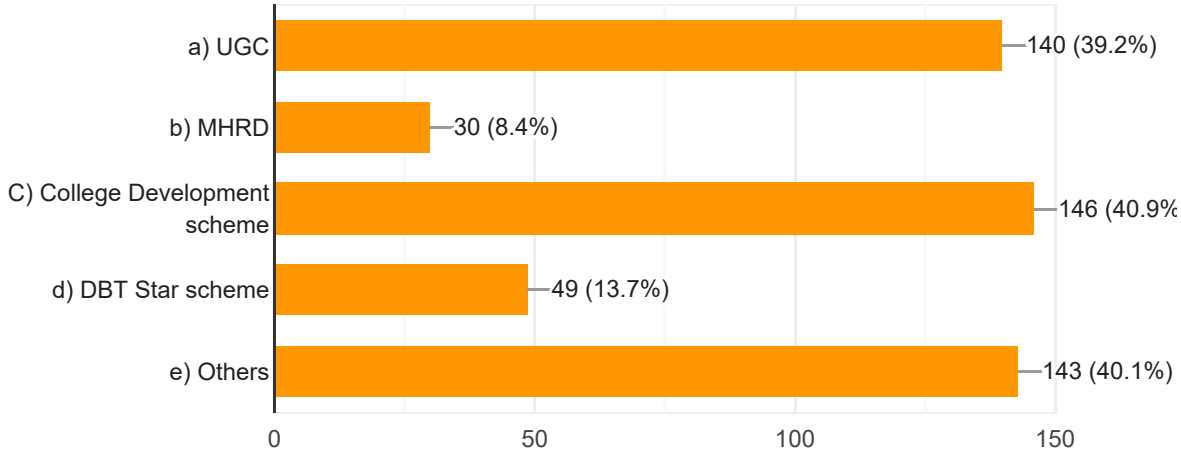
357 responses



19. If a grant available, how do you like to spend it?

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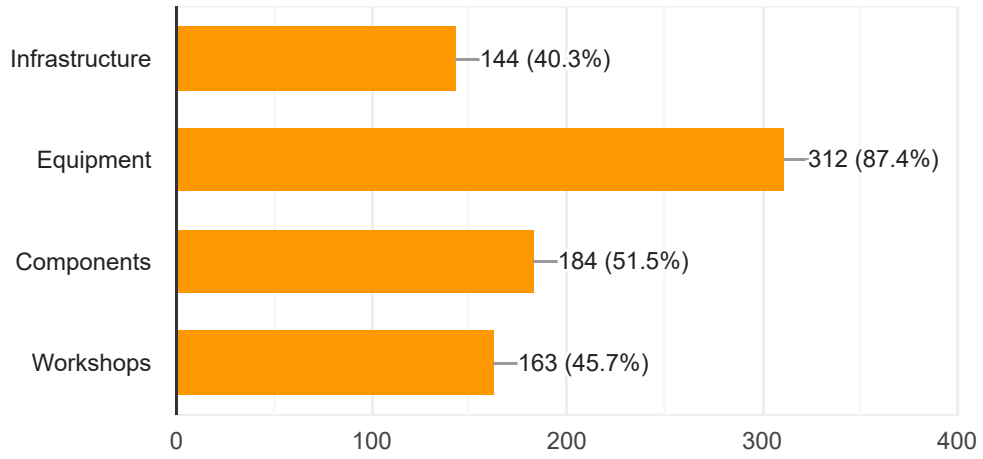
357 responses



20. Are your students performing experiments with available items at home to sharpen their analytical and experimental skills?

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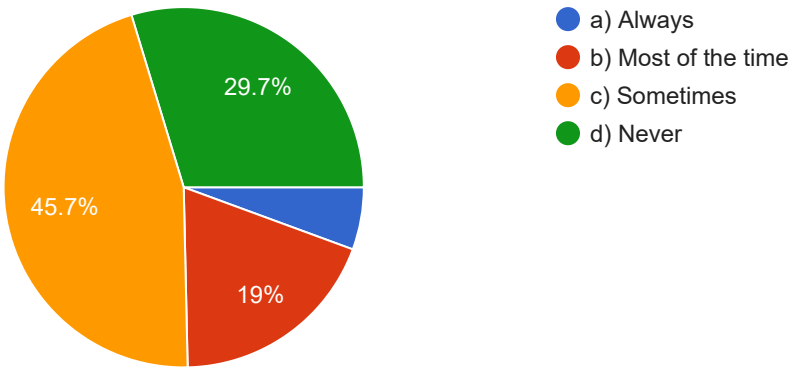
357 responses



21. Which of the following suggestions would help students to learn physics through experiments ?

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357 responses