

An Investigation on University Physics Education in Bangladesh

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ABSTRACT

The present work has revealed an inside story of university physics education in Bangladesh. The four large autonomous universities in the country were chosen to get the real reflection of physics education to perform this investigation. Sophomores, juniors, seniors, and master's students were the participants randomly selected from these four universities at the same time of education years 2013-2014. The number of participants from each year of each university was twenty physics students, and the sample size was 320. The same questionnaire about academic resources and activities in the physics departments was used in the survey. The investigation has revealed that the theoretical results of the secondary and higher secondary students were very good but obtained without complete understanding. About 64% of students study physics against their intention as they were interested in engineering or medical courses, though the interests were not their own in every case. Many of the physics students were not attentive enough to the academic activities in the department. Many students were interested in physics research without proper awareness and induction about research. In addition, teachers were not fully engaged in the department to make the students capable of understanding and learning physics independently. As a result, only 14% of the students were consistent in their opinions and had good confidence about the promising future for physics education and research in Bangladesh. However, devoted quality teachers, students with a substantial interest in physics, and the necessary resources are required to improve physics education.

INTRODUCTION

People's awareness about higher education is developing in Bangladesh as the education rate is increasing daily. The education cost in Bangladesh is much lower than that of the first world. Especially university education is almost free. Though the government has recently modernized the education policy, there is a lack of good teachers and other resources to execute the current education policy. On the other hand, the influence of the traditional education system's deeply rooted mindset and strategy is continuing in social and educational institutions. Therefore, they cannot inspire good students to science education and declining student enrolment in science and physics ([Choudhury, 2009](#), [Ashraf, 2008](#), [Kabir, 2006](#), [Pey-Tee Oon, 2011](#)). In addition, the economic conditions of most of the student's

families are not good enough to provide the living expenses during their higher education. Therefore, only the economic purpose becomes the focus of teaching the students and their families.

Besides, many parents solely decide on the future career of their children, which conflicts with students' opinions or choices. Relatively good students were expected to be admitted to engineering and medical courses by considering all factors. Moreover, due to the global business policy, foreign goods are available in the markets, which has produced marketing jobs, and students also prefer business courses ([Choudhury, 2009](#), [Ashraf, 2008](#), [Pey-Tee Oon, 2011](#)). Therefore, hundreds of students have to pursue their higher education in studies against their interests; otherwise, they have to enroll in private universities ([Ahmed, 2016](#)).

The development of standard laboratory facilities for physics education in universities or colleges is expensive and needs huge funding, and in practice, the proper physics education environment through experimental setup is hardly produced in Bangladesh ([Banu, 2011](#)). Also, in the job market, a poor number of jobs are available for science/physics graduates ([Ashraf, 2008](#), [Pey-Tee Oon, 2011](#)). It has worsened the situation of producing good teachers and researchers for physics education. On the other hand, basic science education is the foundation for developing technology. Particularly, higher physics education has a great role in this case. Besides, higher education in physics is very diverse, and a physics student can build his career in engineering and biomedical sciences for a bright future ([Czujko, 2000](#)). Therefore, accurate information and social awareness about higher education in physics are required in Bangladesh. Thus, this work assesses physics students' interests, activity, performance, and expectations to recommend physics education and research improvement in Bangladesh. To the best of my knowledge, there is no mentionable study performed yet on this issue which has made this work significantly important.

METHODS

A statistical survey was performed in the 2013-2014 education year among physics students based on a questionnaire of academic activities and facilities in the department of physics at the top four universities in Bangladesh. The universities were The University of Dhaka (DU), Jahangirnagar University (JU), The University of Rajshahi (RU), and The University of Chittagong (CU). A stratified sampling was considered to perform the survey based on the availability of the students in a random fashion by using the following formula ([Raymond, 1978](#)):

$$n = \frac{z^2 pq N}{e^2 (N - 1) + z^2 pq} \dots \dots \dots (1)$$

Where n is the sample size, z (= 1.96) is the 5% level of the critical value of a normal test, p (= 20%) is the probability of success (confidence level), q (= 80%) is the probability of failure, N (= 2000) is the size of population (i.e., considered a total number of physics students in the four universities in different years) and e (= 0.04) is the precision of error. Using the assessed values of the parameters in the parenthesis, the sample size 'n' was 320. The sample size was stratified into four groups, one for each university, and each group size was subdivided into four classes such as sophomores (second-year students), juniors (third-year students), seniors (fourth-year students), and master's students. Necessary software (mainly Excel - version windows 10) was used for calculations and data analyses.

A theoretical framework for the questionnaire was designed to assess the basic understanding and interest in physics before university admission. The students were asked the questions: A) What was the Cumulative Grade Point Average (CGPA) in Secondary School Certificate (SSC) & Higher Secondary Certificate (HSC) examinations? B) Did you complete the syllabus of physics courses in SSC and HSC Examinations? C) How did you complete the syllabus of physics courses? D) How many experiments have you performed in physics laboratory classes? E) What was the motivation for physics learning at SSC and HSC levels? Question E revealed whether the students were interested in getting high marks or understanding physics deeply.

The students were asked about their activities for physics learning at the university. The questions were: F) Are you attentive during the lectures? G) How many hours do you spend on physics study individually in a day? The performance of the students of each year from the second year to the master's

was checked by taking the responsibility of the question H) what was Grade Point Average (GPA) in yearly examinations? To know the students' interest, they were asked) Are you interested in physics research? They had to respond to a linked question J) What kind of job do you want after graduation?

Expectations of the students before and after admission at the university were known through the questions K) What was the aim in life before university admission? L) How did you fix your aim in life? M) Do you expect undergraduate-level research experience (closed question for yes or no)? N) What is the future of physics graduates? In addition, the students were asked, " Are you satisfied with the teaching methodology and quality? P) How do you rate the laboratory facility in the department? Q) How do you evaluate the overall physics learning environment in the department? The above questions were mixed within them, so the students cannot directly link the answers to the other questions d

RESULTS

Strength and interest of students in physics before university admission

Students at secondary school (10th Grade) and higher secondary school (12th Grade) are evaluated by board examinations in Bangladesh, and A+ (more than 80% marks in each subject) is recognized as the highest performance of the students in the tests. Among the university students who obtained A+ in their Secondary School Certificate (SSC) and Higher Secondary Certificate (HSC) Examinations were about 64% and 47%, respectively, as shown in Figure 1. A. It is an excellent background performance for university students. However, on average, 77% of students of DU, 50% of students both in RU and JU, and 65% of CU completed their full syllabus of SSC (10th Grade) and HSC (12th Grade) Examinations, as in Figure 1. B. Among 320 students, many were interested in becoming either an engineer or a doctor, whereas only 36 wished to be a scientist or researchers (Figure 1. C). Other students were mostly interested in government jobs (Gov-Job) under Bangladesh Civil Service Commission (Figure 1. C).

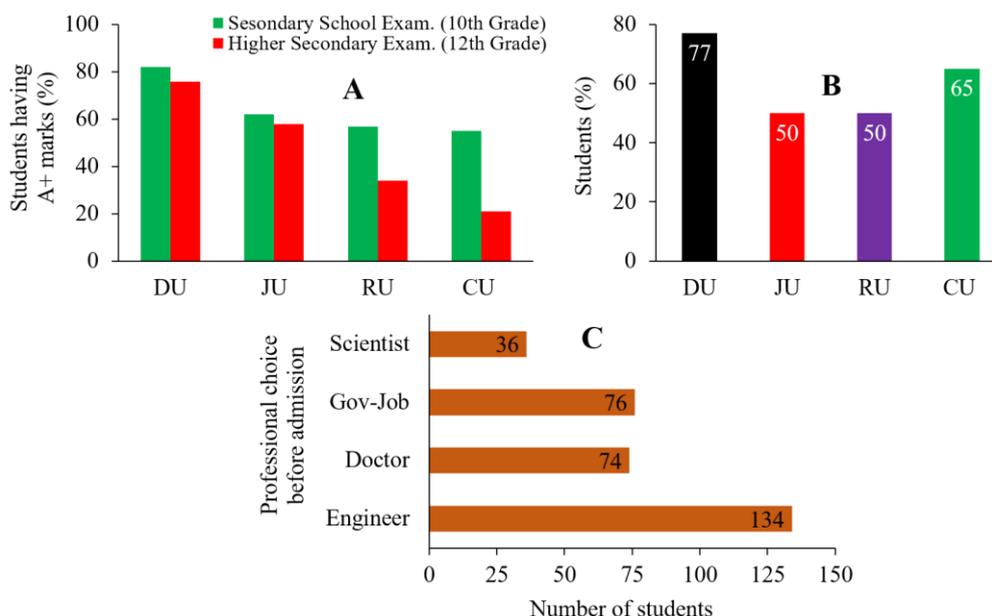


Figure 1. Background study, performance, and professional mindset of university students: A) Highest performance of students in Secondary School Certificate (SSC-'10th Grade') and Higher Secondary Certificate (HSC-'12th Grade') Examination, B) The number of students (%) in each university those who completed their full syllabus at secondary (10th Grade) and higher secondary (12th Grade) schools, C) The professional choice of university students before university admission.

Activities, performances, and expectations of the students

The activities, performance, and expectations of the students were investigated. The students were asked about the attention they paid in class and the study hours of their course contents per day. The picture of the student's attention during lecture time at different universities is presented in Figure

2. On average, the number of attentive students is about 34% only. Many students (~ 56%) were partially conservative in the class, and nearly 10 % were not conventional.

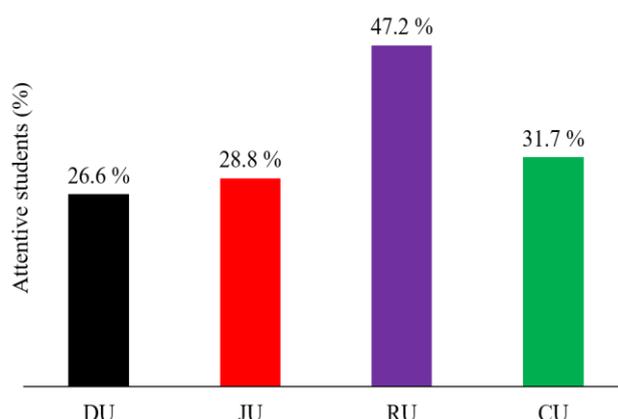


Figure 2. Attentive students during the class lectures in different universities (DU- The University of Dhaka, JU-Jahangirnagar University, RU-The University of Rajshahi, and the CU-The University of Chittagong).

The daily average study time of a physics student at each university of different years has been presented in table 1. According to Table 1, the minimum and the maximum average study time were 2.73 hours and 4.39 hours. Especially the master’s students at the University of Rajshahi spend much more time on physics studies than at other universities. In the case of Jahangirnagar University, the students maintained almost similar study hours in their study life, but it was increased from the second year to masters’ students at the University of Chittagong. However, it is alarming that the study hours of the third-year and fourth-year students at the University of Dhaka were much lower compared to other university students and the average study hour over the second year to master is the lowest.

Table 1. The Daily Average Study Time of Students of Each Year at Each University.

University	Second-year (hours)	Third-year (hours)	Fourth-year (hours)	Masters (hours)	Average (hours)
DU	3.00	1.83	1.66	4.42	2.73
JU	3.83	3.42	4.33	3.33	3.73
RU	3.58	4.33	3.66	6.00	4.39
CU	2.92	3.00	3.75	5.25	3.73

The student's performance during the survey period was measured using their immediate previous year’s result in grade point average (GPA) in the department. Each year, the average GPA of a student in different universities is presented in Table 2. The average yearly performance of the students at Jahangirnagar University is relatively better than that of the other universities. Regarding second-year students at The University of Chittagong, the result of the first-year examination was not published during the survey, and the average GPA of the first-year result was not available, which is marked as ** in Table 2.

Table 2. Average GPA* of Students of Different Years at Each University

University	First-year	Second-year	Third-year	Fourth-year
DU	3.15	2.80	2.82	3.19
JU	3.01	3.40	3.41	3.42
RU	3.21	3.12	3.14	3.32

University	First-year	Second-year	Third-year	Fourth-year
CU	**	2.99	3.22	3.09

*Grade point average (GPA), ** the result was not available

The students were asked about their research interest in physics. Surprisingly, most of the students were interested in physics research shown in Figure 3, though most students were not intended to get admission to physics (Figure 1. C). It was also remarkable that most of the students at all universities (~ 80%) were expected research opportunities at the undergraduate level in different branches of physics, but they did not explain why they were interested in research.

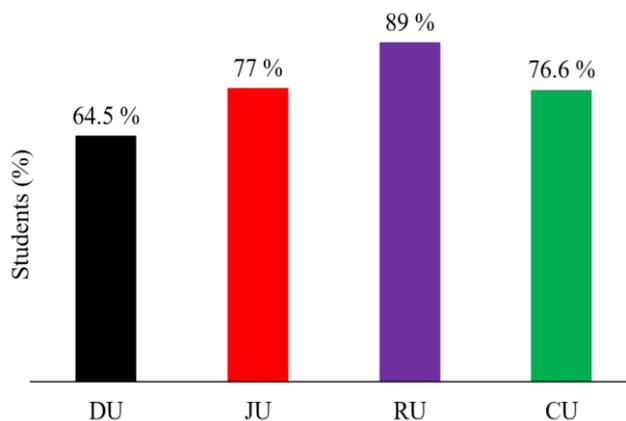


Figure 3. Interested students in physics research at different universities (DU, JU, RU, and CH are the universities where the survey was carried out).

However, on average, about 14% of students were highly optimistic about their bright future as physics graduates, as shown in Figure 4. The students at the University of Rajshahi were not confident about their bright future, which was not explained well, whereas most of these students were highly interested in physics research. Nearly 21% of students were not interested in physics research at all among all universities.

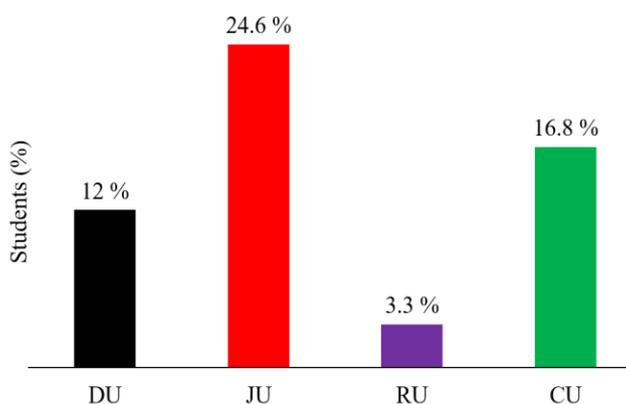


Figure 4. Students' expectations about a bright future after graduation in physics (DU, JU, RU, and CH are the universities where the survey was carried out).

Evaluation of physics teaching and overall environment in the department

University class lecture is very important for the students, as quality teaching and motivation comes from teacher-student interactions to learn and understand physics. Therefore, students were asked

about their satisfaction with the teaching expertise and quality of their teachers in the department. Unfortunately, on average, only 21% of students were fully satisfied with the teaching potentiality and methods in the lectures shown in Figure 5.

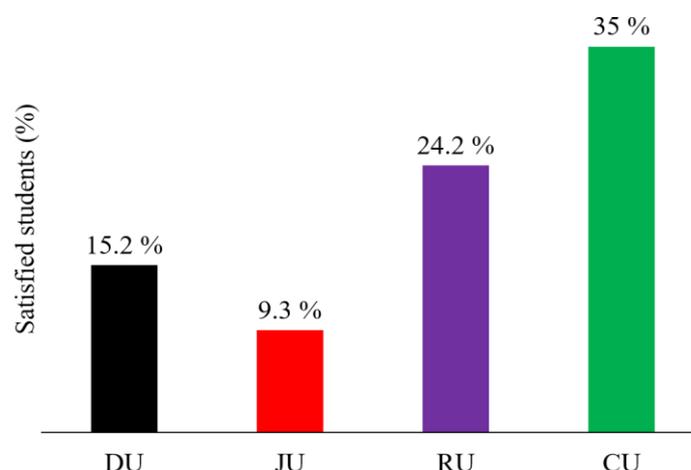


Figure 5. Evaluation of teaching expertise and quality by the students (DU, JU, RU, and CH are the universities where the survey was carried out).

In the case of laboratory facilities and classes, only 13.3% of total students were satisfied among the four universities, presented in Table 3. The student's opinions about the overall environment in the departments were studied. On average, 48% of students responded that their teachers were concerned about the future of students, but 16% had a negative opinion. They said that teachers did not care about them and the department. Many students did not know the department laboratory facilities (Table 3, column 4 - 'Not sure').

Table 3. Students' opinion on laboratory facilities in the department.

University	Good (%)	Bad (%)	Not sure (%)
DUA	11.54	62.82	25.64
JU	2.56	76.07	21.37
RU	30.77	26.37	42.86
CU	8.33	60.00	31.67
Average	13.3	56.3	30.4

DISCUSSION

The present work revealed an inside story of physics education in Bangladesh. Though the teaching style, practice, and laboratory facility were almost similar throughout the country, and the SSC and HSC examinations of the students were taken under the national curriculum and syllabus, the tests were conducted under different education boards. The examination questionnaires were other, and the evaluation process in the examination might vary from board to board. Therefore, it is not easy to directly compare the results under different education boards (Figure 1. A). For example, a student from each education board who obtained the same Grade numerically might not have the same depth of understanding and interest in physics. However, the results of many students in SSC and HSC examinations exposed their strong background in physics. The survey found that many students (about 40%) did not complete the full syllabus of physics courses (Figure 1. B). For those who completed the full syllabus (Figure 1. B), many were after high marks in the examinations rather than understanding physics. Most students intended to complete or revise the physics courses in the coaching centers or by private tutors at home, so they were not fully attentive during the lecture time in the school or college.

Therefore, students with higher grades in physics in SSC and HSC examinations do not reveal that they have a strong foundation in physics or even were among the interested students in physics (Figure 1. C).

The four universities where the survey was conducted are autonomous, and the curriculum and syllabus of physics courses were not exactly similar. The evaluation processes in the examinations might vary among the universities. Thus, the numerical grades might not measure the actual capacity or strength of the students in physics for comparison. However, relatively physics is a difficult subject (Pey-Tee Oon, 2011; Funda, 2008; Shaobo, 2015), which needs more attention and time to digest, but the overall daily average study time of a student obtained from Table 1 was only 3.64 hours. In addition, most students (nearly 66%, obtained from Figure 2) were not fully attentive in class. The average performance of the students at all universities was similar (Table 2). Only a few students (below 5%) showed good performance (GPA above 3.65) in the examinations of different years. Therefore, the overall performance of the physics department in a university was not good enough and cost-effective for Bangladesh, where university education is conducted spending public money. A good number of students were interested in physics research (Figure 3) which were cross-checked by asking about their future job interests after graduation. Some students showed interest in research or university teaching positions, but most responded to having jobs under Bangladesh Civil Service Commission and private appointments with high salaries.

Interestingly, it was found that the highest number of students from RU were attentive in the class (Figure 2) and had the highest individual physics study time (average 4.39 hours, Table 1), where the laboratory facilities might be in good condition relative other universities (as ~ 31% the highest number of students voted for good standard laboratory, Table 3). In addition, the highest number of students (89%) at the University of Rajshahi were interested in physics research (Figure 2). However, only 3.3% of students in the University of Rajshahi department were optimistic about the bright future (Figure 3), which was quite frustrating. Perhaps the trend of job markets for physics graduates relative to business or other courses (Choudhury, 2009, Ashraf, 2008, Pey-Tee Oon, 2011) made them hopeless. Moreover, considering the overall responses to the questionnaire, it was observed that only some students made good and well-organized comments on the importance of physics research and its future. Thus, most of the students' opinions regarding their research interest in physics were inconsistent.

The above situation reflects that students were unaware of the department's physics research and laboratory facilities. It might occur due to a lack of regular and proper presentation of research work through departmental seminars and conferences. In addition, there was no short program to familiarize undergraduate students with physics research activities in Bangladesh. Besides these, a very low number of physics students were satisfied with the overall physics teaching expertise and quality in the departments (Figure 5). It implies that the faculty members were not properly engaged in teaching and research responsibilities, though they might be qualified. The students added that they mainly memorized physics handouts and passed the examinations. It produced trouble for the students in understanding physics. Alternatively, the question set in the tests was not much creative.

The socio-economic conditions of different parts of Bangladesh are similar, and the children grow up in such a condition where money and social factors are responsible for their studies and future career. According to many students' opinions, parents do not care about their interests or capacity. In many cases, the family decides students' future careers (aim in life) and whether they are interested. For instance, a student is not good at mathematics and physics, but his parents wish to be proud of him if he were an engineer. Likewise, it might happen for a student who is not interested in biology but wishes to be a doctor to fulfill his parents' dream. Therefore, exploring their intrinsic quality and basic instinct harms students.

On the other hand, in the prevailing condition of the education practice in society, normally, students do not read books other than class textbooks during school and college life to build their interest or philosophy of life. Moreover, many students in public universities come from rural areas with no rich public libraries or other institutional libraries. They become familiar with the future of various courses of study at the university level and their applications. Therefore, it is hard to grow their interest based on proper awareness and prior knowledge. Besides these limitations, mismanagement of resources, poor efficiency and sincerity of university administration, and improper and non-contextual

planning and strategy for university teaching and research (Golam, 2014) might also create difficulties in higher physics education.

CONCLUSION

Bangladesh, a developing country, is trying to initiate and maintain formal higher education. However, among different bottlenecks, around 14% of students had good confidence about their bright future through higher studies and research in physics, which is similar to the number of students who aimed to be scientists before the university admission test. This number would increase if other universities were also included in the investigation, which is promising for physics education and research in Bangladesh. However, to improve physics education, students of substantial interest in physics and mathematics should be admitted, and student-teacher interactions for the physics learning environment are required in the department.

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