

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2018

Volume 10, Pages 217-222

ICRES 2018: International Conference on Research in Education and Science

Engineering Sustainable Education by Selection The Most Comprehensive Topics

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Abstract: The rapid developments of society in all areas, their reconciliation with each other in a scale that didn't exist before, increasing the degree of integration, adding new knowledge exponentially, have increased the need to find new ways to make learning process more attractive, in full compliance with practice, in order to create concepts and skills that will allow the students to get orientated towards the labor market. Nowadays, different school subjects cannot be taught separately from each other. Topics should be comprehensive and treated in a way in order to complete the requirements to achieve the objectives. In the area of electrical engineering the newest model BLDC motor [Brush Less Direct Current Motor] has been taught by integrating designing, electronics, microcontrollers and by different methods of automatic control. Through complex assignments and projects the intertwining of knowledge in different fields is achieved, leading to the increase of teamwork skills, in order for the students to view it in a more critical way. The lesson is focused in the role that this engine plays in environmental protection, which is analyzed in different ways like effectively managing the usage of different resources while constructing it, in the absence of harsh sounds and frequencies, and in a higher efficiency. In other words, using less energy to complete the task. This complies well with the flexibility and adaption concept that this motor possesses and helps in problem solving. The assimilation of knowledge, is shown with higher results in understanding and achieving different concepts and requirements.

Keywords: Education, Comprehensive topics, Electrical engineering, BLDC motor

Introduction

Lifelong learning is considered as one of the most important indicators of our future development of the society where change is continuous and rapid. The XXI century with developments in all areas requires that students to be able to respond to economic, social, and awareness-raising developments and to be prepared to anticipate or follow developments that will come. Traditional ways are not very effective, knowledge is so great in every field that they now have to learn how to walk from the unknown to the knowledge of how to learn the impossible, the large volume of knowledge. This requires that matters that need to be addressed to be as comprehensive as possible to better understand how mutual reality is interdependent.

At present, material resources are consumed at a daunting pace, as the needs of humanity come and go. Filling these needs with as little expense but also as high as possible is a way towards new findings that need to spend as little material as possible for the same work they produce. In this way, we influence the protection as far as possible of the environment. And we make the students aware of this problem, which is one of the most important at this time. For this reason as everywhere in Albania, the education system is undergoing changes both in the curricula and in the methods used, in the continuing qualifications of the teaching staff. For this reason debates have been developed intensive in the implementation of programs, harmonization and professionalism in education. However, there is no unified reflection on its methodology of teaching and its application. Therefore, recognizing the difficulties faced by students during the teaching process helps improve teaching methods closer to the students' interests and transforms the concept of the school making it more useful and more competitive from a professional standpoint to prepare not only a mere professional people who should

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be able to use their expertise not only in the scientific or technological aspect, but wider as members of the society, both politically and environmentally.[4] So to prepare future professionals not only in the addition of a technical layer in terms of education, but rather in addressing the whole educational process in a way that they should interact with others in their lives professional, through didactic means or guidance, in terms of their sustainability (Barcelona Declaration (EESD, 2004). [5] But in spite of all this, there is still no space available to use methods, and more diverse tools. However, even in pedagogical staff, there are diverse experiences, ranging from the more active organization of students, to group work, to projects, to the use of information technology, and so on. Questions are asked how are they used? at what scale? how much is the benefit? What kind of choices do you choose in their variety? How are the competences that the students have to meet in accordance with the requirements of the 21st century? We propose the selection of comprehensive themes, which perform very well the relationship and the reciprocal dependence that exists between the fields and serves as a very good basis for the development of different competences. On the other hand, these knowledge and skills acquired in this form are much more stable. The study is based on the experience of several years, as well as on the opinions of students who have been engaged every year and in many subjects with independent work assignments.

Theoretical Framework

Selection of Themes

Selecting the most engaging topics affects the best of the relationships and subordinates that exist between processes and phenomena. On the other hand, they influence the creation and sustainability of knowledge and abilities and competences. In this regard, in electrical engineering, the treatment of topics related to the BLDC motor requires a coordination of the design of electric motors, power electronics, microcontrollers, programming, IT, electrical and electronic measurements, materials used for permanent magnets, design of electric motors, AutoCAD program, etc. The BLDC motor is the latest motorcycle motor, which uses electronic schemes to transform the DC current into AC current, microcontrollers for automatic control. The change from other motors is that he can not work without electronic schemes. So it's totally connected with them. It is a reflection of recent achievements in these areas and relationships that exist between them. Being included in some areas helps students work in the group, look critically at each other's job, coordinate their actions, so that the main task can work. Since the fields are so different from each other, the involvement of each member of the group will be 100%, as its work has no one to complete.[1][3]

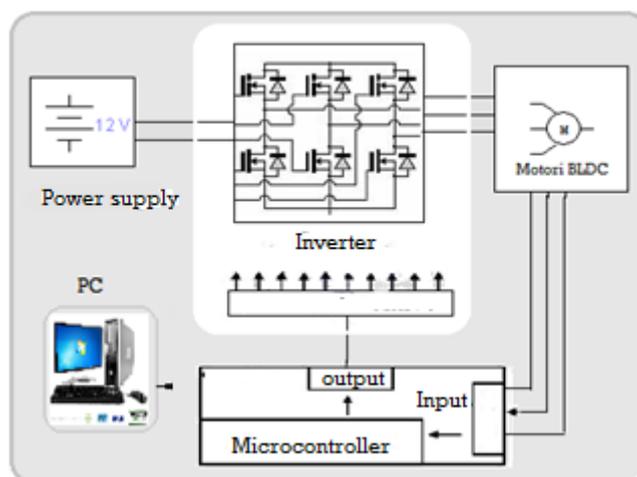


Fig.1 BLDC three phase motor block diagram

On the figure 1 are presented the main part of BLDC motor drives, BLDC motor, Inverter, microcontroller, programming with PC, power supply.

Education for environmental protection, Flexibility and Adaptability

Students' awareness of environmental protection issues can be better achieved through these topics as they provide in many ways this function: From the point of view of the lesser consuming of materials, like a copper, iron, as a result of the use of powerful magnetic materials for the motor poles. On the other hand, the increase in

the magnetic field induction also reduces the current of the stator by decreasing the static section of the stator. Reducing the size of the steel core, hence less packing of steel. Reducing the size and volume of the BLDC motor compared to other AC and DC motors for the same power that saves other materials used for motor construction.

From the point of view of the least impact on the environment, such as noise shortages, interference, lack of brushes and their replacement with inverter, continuous, alternating electronic converters, lower temperatures due to smaller electric currents, and lower losses in general. Electrical, mechanical and other losses are smaller than other motors result in higher performance. Dynamic motor performance with better indicators, faster starting, faster stopping, faster speed stabilization, reduced idle timing, little impact on the environment. Some of these features of the BLDC motor are proven experimentally.

Better than this topic, where the BLDC motors themselves are both flexible and adaptable. The design of these motors is of a different size and size according to the function to be performed and the position where it will be placed. On the other hand, it can be tailored to various tasks due to electronic, programmable microcontroller and rotating position detection. This is seen through various assignments given to students.[1],[2]

Being the most comprehensive theme, the projects are the most varied, where we can use analysis and comparison as well as experimentation and simulation. All of these affect the sustainability of knowledge, affecting many connoisseurs by decreasing the suckling time for them. On the other hand, it complies with the developments of reality.

The transmission of knowledge

The inclusion of the student and the message process. All-round topics also help in co-operation with pedagogues with students starting from searching for information, processing, programming simple tasks, using comparative methods, etc. there are many things that the students can prepare themselves depending on the theoretical luggage they own and the independent work they can do. This greatly increases the interest not only of the students participating in it, but also of the students who follow the work of their companion, as well as knowing that next they will be the focus of attention. Feel appreciated and respected. This increases the degree of initiative and dedication to taking on the tasks they are expecting in the future. If we show confidence in the students at the same time while respecting their work, even in the things do not walk as we have thought, the atmosphere will be very positive.[6]

The transmission of knowledge from one generation to another, the transmission of skills from one generation to the other, creativity, suitability and lifelong learning, is the duty of the school. In this narration the school, the teachers are the beneficiaries and the students its recipient, if does not work properly on both sides of the broadcast can not achieve the required result. On the other hand, broadcasting channels are also important, dealing with the atmosphere, communication, motivation. Awareness of this task is the responsibility of family, school and society. Therefore not the teacher in the center of attention, not the student, but the transmission of knowledge. So teachers, students are equal in positions we have, everyone should do their homework. Today's communication can be done directly in the classroom but also through various IT tools that are available at this time.

Of course, the difficulty is that both students and teachers are not the same, they are individualities that want different treatments, but the increase in the degree of freedom will have a positive impact. In the end, everything has to do with increasing the persistence of knowledge and the ability to use them in different circumstances, as well as adapting to new developments.

This information is important to anyone you learn in every level of education and helps pedagogues adopt their teaching methods in consistent with the needs of students directly or indirectly.[5]

Method

A working group consisting of pedagogues, teachers and students was involved in the experimentation and use of the BLDC motor. To experimentally extract some of its advantages and to draw conclusions on where, why this motor should be used more. The assignment of duties was the electrical technician for the task to be performed by the BLDC motor, the electronics for the connection inverters and microcontroller, IT, who

programmed the task to be performed by the motor, the mechanic, who will fit the mechanical parts etc. Group work has worked very well, discussions and critical look have been in the focus of attention. The idea of how to handle these comprehensive themes to achieve the best results for our purpose.

Then, for students who have been continuously engaged in independent work, a questionnaire was organized, the answers of which are listed in the results section. As the starting point has served the statistics accumulated over the years for the results achieved by independent employment versus annual growth, it is expressed in percentages.

Results and Discussion

From the experience of the years, and a simple statistic it seems that the independent work of the students, course assignments, projects, certain topics increases their preparation and the assessment results with a note or two grades rather than their average annual assessment. (According to the Albanian system the grades are from 1 to 10, the lowest grade is 5, the maximum is 10).

Table I. Increase of evaluation during independent student work

Year	Group	No of participants	Evaluation > 1 note summary	Evaluation > 2 note summary	> 1 note summary [%]	> 2 note summary [%]
2010-2011	1	13	2	2	15%	15%
2010-2011	2	22	5	4	23%	18%
2013-2014	3	16	3	4	19%	25%
2015-2016	4	17	3	4	18%	25%
2015-2016	5	17	4	4	24%	25%
2016-2017	6	24	6	5	25%	21%
2016-2017	7	23	4	5	17%	22%

In fact, there is an influence on the subject's overall character, and the growth of the assessment is greater than with a more specific topic that requires more deepening of the knowledge gained. In recent years it is seen that despite the fact that for the students which may be less prepared in the respective subject, preparation for independent work is serious both in content as well as in the way of presenting and using IT.

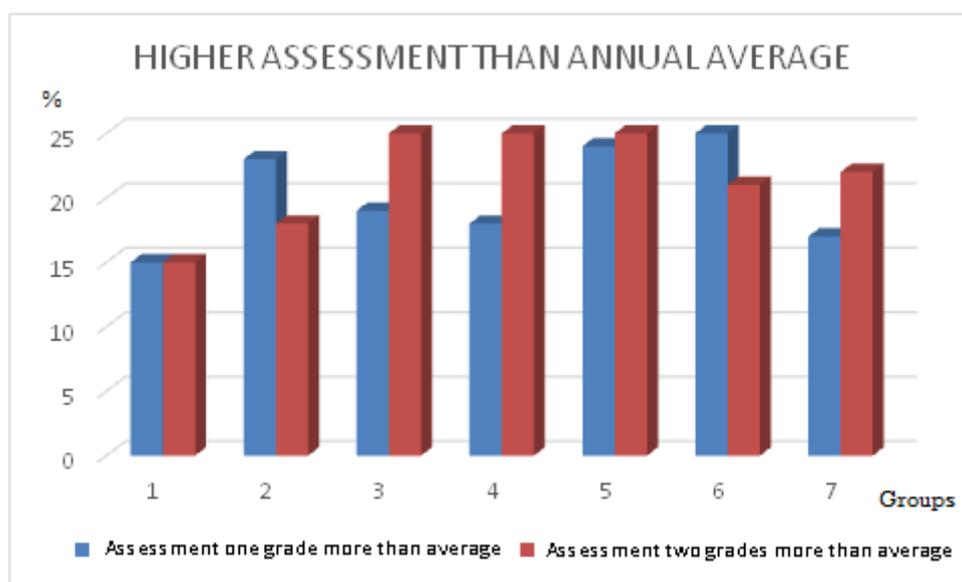


Figure 2. Increase of evaluation during independent student work

The figure 2 shows the increase of student assessment when dealing with independent work, course assignments or projects, for different groups in different years.

The graph shows the increase of the assessment in % compared to the average annual mark. (Series 1, growth is above average, while Series 2 increases two grades above the annual average). Based on this fact, a questionnaire was organized for 30 third and fourth year students of the electronic branch to see their point of view regarding the acquired competences and the sustainability of the knowledge. The questions asked were: 1. Did you like group work? (3.8). 2. How does group work help you to strengthen cooperation (3.6). 3. How do you feel that group work encourages critical thinking? (3.6) 4. Is there room for creativity and imagination for each group member? (3.5). 5. Do you think that problem solving comes faster when you work together? (3.9). 6. How helpful have you been to choose topics to understand that you need to be flexible and responsive? (3.3). 7. In the choices you made, have you considered protecting the environment in terms of saving and high productivity? (3.8). 8. Did the topics help you understand that there are reciprocal relationships and dependencies between the different fields? (3.5). 9. Do you think the knowledge gained in the project is more sustainable? (3.7). 10. How much helps you participate in projects to clarify the concepts and to deepen them in them? (3.8). 11. How does the selection of topics dealt with in the sustainability of knowledge influence? (3.5).

Question Answers had five alternatives, from 1 to 5. Smallest value 1 means the minimum assessment of the question. and the highest value 5 means the maximum assessment of the student's question. 2,3,4, mean interim evaluations. For each question, the arithmetic average of the answers of all the participants is taken, placed in brackets after each question. All are presented in the figure 3.

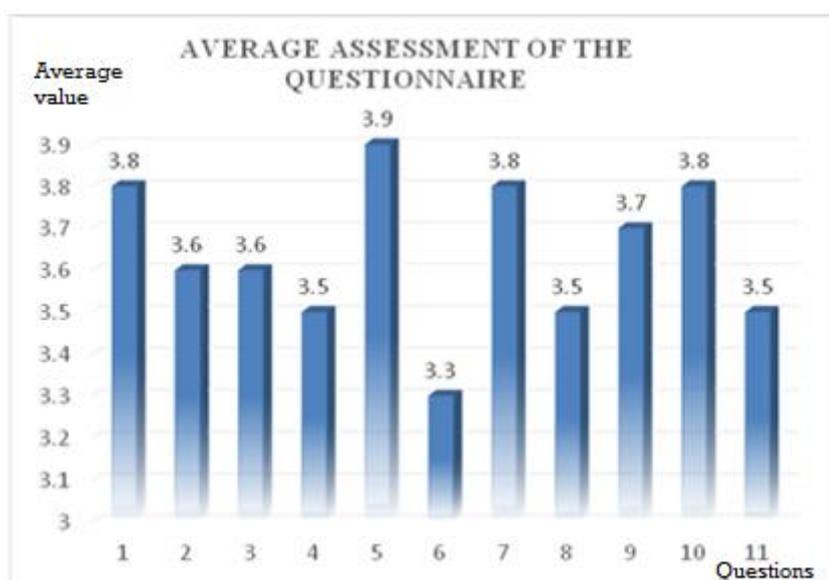


Figure 3. Average rating of each question

From the graph it seems that all the questions have been rated above the average 2.5. Answers to questions range from 3.5 to 3.9. Question 5 received the maximum ratings of the average scorecard 3.9. This means that they appreciate the cooperation to resolve problems as quickly as possible. Also, question 1, 7, 10 is highly evaluated, therefore group work is welcome, more attention is given to environmental protection and project participation help in clarifying the concepts. With a low rating are questions 6, 4, 8, 11, where they find it difficult to understand through selected topics that need to be more flexible and adaptable, have not had the opportunity to be very creative during group work, not they have had a great deal to understand that there are reciprocal dependencies between the various fields, and the selection of topics does not have much to do with the sustainability of knowledge. these conclusions help us to improve our work. So maybe the questions with the lowest average points increase. This is the opinion of the students, but the opinion of some teachers differs little from them in terms of environmental protection that requires more work and is likely to be discussed in any teaching topic, so I think the assessment should be lower, as well as why It is about the sustainability of knowledge, which should give us the opportunity to process more information.

Therefore, we think that the selection of more comprehensive themes, which would have an impact on many of the concepts, would greatly help in the sustainability of knowledge. The handling of electric transmissions with BLDC motors, as we have dealt with, is a combination of fields, as one of the most unusual special motors, due to the large spread that has taken on transport and industry, and is finally spreading quickly in home and residential equipment. Our curricula need to create more space for the handling of comprehensive themes.

Conclusion

To provide a more stable student formation, selection of comprehensive topics that increase their activation and creativity, critical observation for everybody's work and equipment's functionality, to promote group work, to be more adaptable to changing situations etc. For this, handling topics such as the BLDC motor is a good example in this regard. For this they are best suited to the competences required for the 21st century.

Curricula should be treated in a combined form, to pay attention to how to move from unknown to the well-known through using different methods. Greater work must be done with regard to environmental protection. Selecting comprehensive themes is a good way to ensure the sustainability of knowledge.

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