A teaching method based on storytelling of a student social activity in renewable energy education

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***Abstract*-In recent years, renewable energy sources have been of great interest, because they are reversible, available, the environment-friendly and cheaper than conventional fossil fuels. Therefore, suitable policies to expand the use of this type of energy in all countries are important which requires precise planning and investment. One of the first important steps toward these planning is a proper introduction of this kind of energy in the society. Education in schools, universities and mass media can play a major role in building a culture and introduce renewable energy sources. The purpose of this paper is to present and introduce an innovative scheme to introduce renewable energies. This idea is based on a fictional story with real photos of the mountaineering. Because the type and method of teaching is an important factor in the proper induction of concepts to learners, in this paper, after studying the different methods of learning and teaching in different ways, this plan has been proposed. To evaluate the effectiveness, the project has been applied to three groups of students at undergraduate and postgraduate levels. Polls from these groups show acceptable satisfaction from the plan.**

Keywords: renewable energies, teaching styles, education, learning, storytelling.

I. INTRODUCTION

Most dictionaries provide simple definitions of the word 'education' for example, knowledge/skill transfer or presentation of a set of instructions [1]. According to the definition, the Teacher's role will be important to transfer this knowledge or skill. Each teacher should consider that the learners are different in terms of learning style. This means that a single teaching style is not appropriate for all of learners and the behavior and reaction of learners to each subject and how it is presented is different. In fact, the teaching style can be defined as (Fig. 1):

1. The behavior and manner of the teacher in an effort to enhance student learning.
2. Operational behavior of teacher's educational philosophy.
3. A person's teaching style is based on a system of specific values that the teacher believes in.
4. Teacher's teaching style is a direct result of his learning style [2].

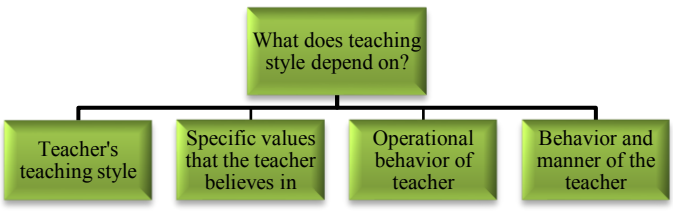

Fig. 1. Teaching style definition.

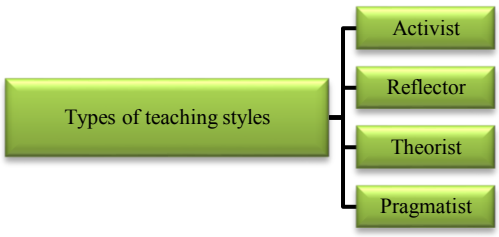

Fig. 2. Types of teaching styles.

Each teacher has a different learning style and will have different teaching styles based on it. Teachers can train their learners in different ways.

a) Recognizing their learning style and understand that how their learning style affects their teaching style.

b) Be aware of their learner's learning style.

c) Change their teaching style according to learners' learning styles.

Types of teaching styles, according to Peter Honey [3], are divided into four categories (Fig. 2):

1- Activist style: This style is referred to by teachers who are very active in their teaching and who are willing to act directly. They have much passion for work and activity and accept new challenges and experiences.
2- Reflector style: Teachers whom mostly think of their teaching style and think of all details carefully before they go into action. These people use the precise approach that they have done many reviews on it.
3- Theorist style: These teachers mainly care about theories and theorizing. They prefer to place different affairs in the form of a holistic and Inclusive pattern. These types of teachers are rational and objective and prefer step-by-step approach about the issues.
4- Pragmatist style: Teachers who are pragmatist in their teaching, they focus on how the topics are dealt with in the real world and in practice. They enjoy the experimentation and experience of new ideas and like to resolve issues and problems. They like to test the subjects they teach.

Each training is examined in two aspects, from the teaching and from the learning. Learning can be defined as a change in the ability of humans to remain for a while and cannot be easily attributed to growth processes [4]. There are other definitions, for example, learning means a relatively stable change in learner potential behavior, providing that this change occurs due to the experience [5]. [6] also calls learning "the process

by which knowledge is created by change, a transformation of experience (reconstruction of experience) is created". Same as education, learning also has different styles. The learning style can be divided into four active, reflective and contemplative categories, theorist and pragmatic. The learning style can be divided into four Activist, Reflective and contemplative, Theorist and Pragmatic.

Effective education is not about an educational method. It is an overall concept for all methods that are consist of the decisions and tasks of the teachers in the classroom, rate of interaction with Student, Presentation Skills, Classroom management method [1].

Cooperative learning and the use of groups, in fact, it is a good strategy for teaching some of the lessons. At this method, teacher makes students work together in several groups. Some teachers look at group work as their general teaching approach. Teamwork not only increases the active participation of students but also increases their social skills, communication and independence. When students work together, they share their ideas and learn from each other. Of course, doing teamwork in a classroom requires a precise program to get the desired learning outcomes. Some of the most important indications that effective education is that first the educational goals are achieved, and secondly, the students truly learn in it. There are some techniques for this kind of education. For example, use exact emotions that include such things as a manner of speaking, movement, Direct involvement of students actively, Dramatic theorems, etc [7].

This paper proposes an innovative method to introduce renewable energies in several different ways. Over 100 years, traditional power systems use fossil resources because they are available and abundant [8]. But these conventional fossil fuels have caused severe environmental problems such as greenhouse effects. These conventional resources are also becoming less and less common today, and everyone is aware of the shortage of global sources of fossil fuels, rising oil prices and natural gas [8] - [10].

In order to overcome these issues, countries are developing another kind of energy sources. Renewable sources that are naturally available in nature and reduce environmental effects. Renewable sources like solar energy, wind energy and fuel cells [8], [11]- [16].

The World Resources Institute has estimated that about 61.4% of greenhouse gas emission is caused by energy consumption. Therefore, investing in and using renewable resources can provide an important part of the energy without harming the environment [17].

According to the reports of Renewable Energy Network policy for the 21st Century (REN21), the extension of renewable energy has increased in recent decades. For example, the production capacity of renewable energy has more than doubled in the 2007-2017 period. It is expected that at the end of 2017, around 26.5% of the world's electricity generation and more than 90% of the required electricity in 17 countries will generate from Renewable Energy [18].

This paper uses the comic story for general education on renewable energy topics for undergraduate and postgraduate students. The strengths of this method are its different presentation methods, the introduction of audience groups and the achievements of this approach. Finally, a general summary is presented using the survey of the audience groups.

This paper is organized in four sections. Section II, presents the description of the proposed method. In section III, the strengths of this method are investigated. Case studies and poll results is shown in section IVand finally, the conclusions are presented in Section V.

II. PROPOSED METHOD

The main purpose of this comic is introducing renewable energies to groups of first and second-grade engineering students. Since the linear method is used in traditional education, learning of content is through the direct transmission of information. Therefore, this kind of education will have a lot of consequences for the students, including lack of focus, quick forgetting of subjects, failure to understand the main purpose of the content of the education, lack of appropriate response, low impact and etc.

This issue has happened in complex and difficult engineering topics more than others. Hence, the use of new education methods to teach and introducing new topics is very effective. Therefore, the main purpose of this study is to create a practical work based on the stimulation of eyesight and hearing and eventually, the active participation of students. The pictures in the figure show the educational tools for introducing renewable energy with the humorous comic which has mountaineering and nature theme (slides 1-12).

III. STRENGTHS OF METHOD

The strengths of this project are using realistic images that make students put themselves in this position. Also, the subject of the story begins with a challenge which makes curiosity in audiences.

The use of humor increases the attractiveness of the subject for the audience, and among those topics, the scientific topic is expressed as a conversation between the characters of the story. Other aspects of this work are the general points of the method, including regard for moral, social, artistic, and health issues. For example, in the social dimension of work, it is possible to advertise group work, consult with others and hope to find an appropriate solution. In addition, positive dialogues and appropriate behavior of story personage are significant ethical points. Starting with the dawn of the sun, attracting the audience to the story in order to achieve the desired answer, and finally, a good and purposeful finishing shows artistic aspect of work. Another significant issue in this work is health. In this project, it has been tried to focus on sports appearances by presenting attractive photos of nature and mountaineering sport. In the following, different ways of presenting this work to the audience are investigated.

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Slide number 2

Slide number 3

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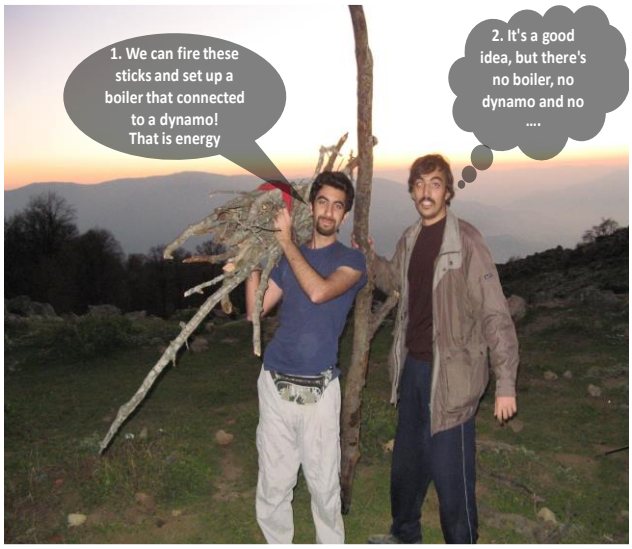

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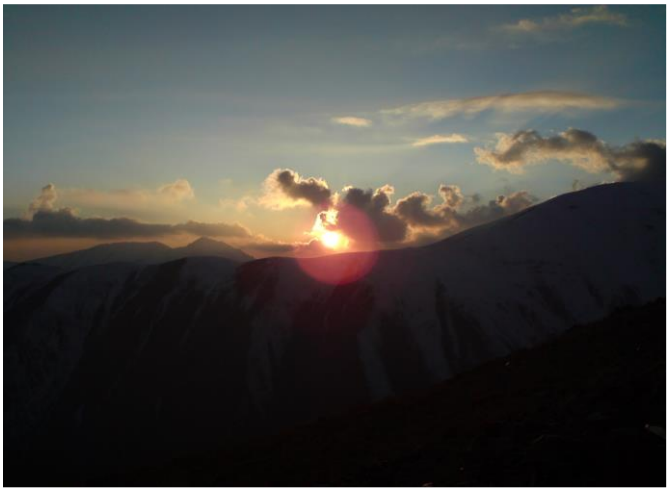

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Slide number 9

Slide number 12

TABLE I
STRENGTHS OF METHOD IN TERMS OF STUDENTS

Real photos	Participation of students	Using visual memory
Short slideshows	Appropriate transfer	Expressing different ideas
Attractiveness of method	Using humor	Spreading physical activity

The advantages of the proposed method are summarized in TABLE I.

After the presentation using comic, topics related to renewable energy will be given to students. The topics include renewable energy sources, energy storage technologies, power electronic system for the renewable system. Discussions on advantages, drawbacks, limitations of each will be made up. Finally, a conclusion will be given to wrap up.

IV. CASE STUDIES AND POLL RESULTS

Studies have been conducted to introduce different sources of renewable energy to different groups of audiences. After presenting the project to the students, getting different feedback and creating various achievements of the survey was conducted on different levels. At this Survey, it was wanted from the students that first respond survey different questions. In writing in terms of satisfaction with the project and then give the right score for the design according to the mentioned items. The questionnaire is shown in Fig.3. The results of this survey and examined items by the students are given in Fig.4-7. Studies were conducted on a group of master students and two groups of bachelor students.

1- Which of the following are the advantages of this method?
A) Using humor
B) Expressing concepts in a simple way
C) Using visual memory
D) Using real photos
E) Short slideshows
F) Encourage students to think about the concepts
G) Participation of students

2- Which of the following are the disadvantages of this method?
A) Not providing details
B) Not being practical
C) Prolonging teaching
D) The subjects are not clear.
E) Dispersion of the proposed subjects
F) The Students are not involved in subjects.
G) The method is inappropriate for students.

3- The appearance of this method has attracted you.
A) Strongly Agree B) Agree C) Undecided D) Disagree E) Strongly Disagree

4- The quality of concept's transfer has been efficient.
A) Strongly Agree B) Agree C) Undecided D) Disagree E) Strongly Disagree

5- This method is appropriate for teaching.
A) Strongly Agree B) Agree C) Undecided D) Disagree E) Strongly Disagree

6- At first sight, you got the general concept.
A) Strongly Agree B) Agree C) Undecided D) Disagree E) Strongly Disagree

7- This method has enough technical contents.
A) Strongly Agree B) Agree C) Undecided D) Disagree E) Strongly Disagree

8- The type of teaching has a strong effect on the efficiency of method.
A) Strongly Agree B) Agree C) Undecided D) Disagree E) Strongly Disagree

9- How much is the general score of this mehod? (1-10)

Fig. 3. Questionnaire about method evaluation.

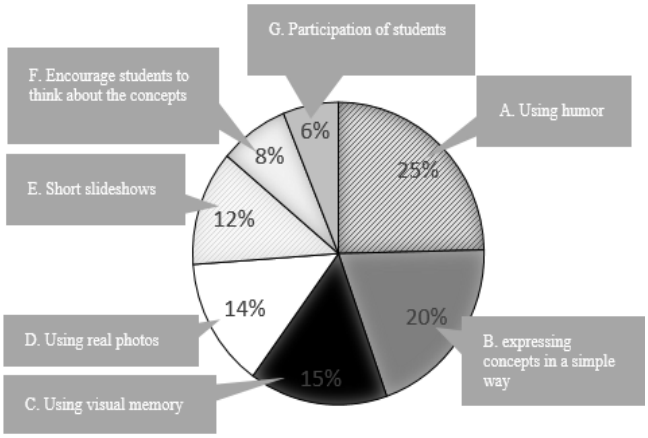

Fig. 4. Results of question 1.

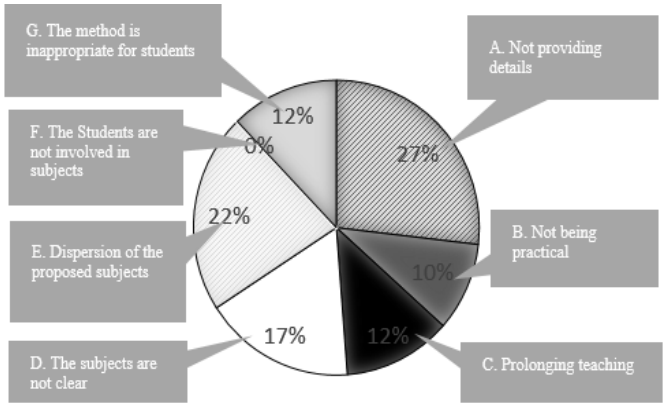

Fig. 5. Results of question 2.

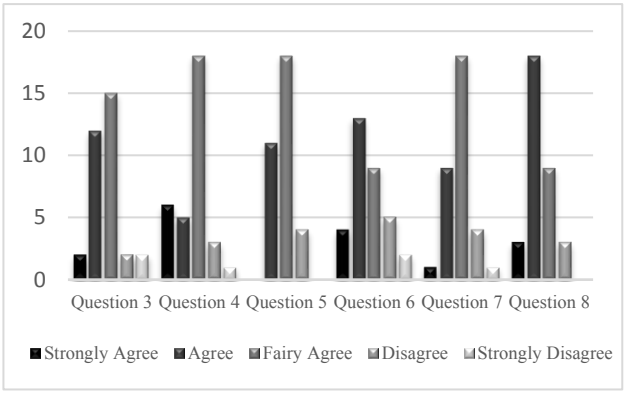

Fig. 6. Results of question 3-8

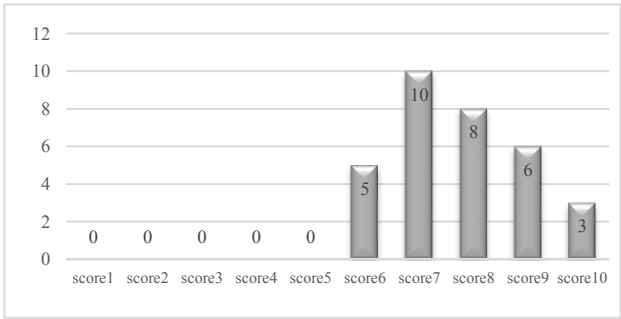

Fig. 7. General score of the method.

As it can be observed in Fig.4, most of the students have chosen using humor and expressing concepts in a simple way as advantages and in Fig.5 not providing details and dispersion of the proposed subjects as disadvantages of this method. Fig.6 shows the results of questions 3-8.

The results of these questions fulfill our expectations. The general score of the method, which is shown in Fig.7, approve that this method is effective in students point of view.

Many factors play a role in determining how the plan is executed.
These include the purpose of education, the subject of the lesson, the level of literacy and information of audiences, the age and gender of the audiences, the personality and position of the teacher, the available facilities, the number of audiences and the educational environment.

One of low-efficiency teaching method is reading-lecture-repetition and exercises. This method has little effect and only focuses on increasing information which will be forgotten after a short time. Subject with following features has an influence on the audience: concise and focused, using humor, organized and targeted, strong beginning and memorable ending.

In addition, the teacher should realize the feeling of the audience and estimate the amount of their learning by making interaction and checking feedback during teaching.

There are different methods for presenting the subject, including enigmatic method, linear method, doing puzzle method, magnifying and minimizing method, a problem-solving method, lecture and conference method, performing a method and student-master method.

V. CONCLUSION

This paper presents an innovative way to introduce renewable energy sources and their applications in life. The overall purpose of this plan, its presentation and its achievements are mentioned in previous sections. Also, a survey is conducted on three groups of students, including a group of bachelor students and two groups of master students. According to survey results, the plan has been able to have an impact on attracting the audience and the introduction of renewable energies. The results of this study show that, by using entertainment tools and innovative methods in expressing the initial concepts of scientific discourse, the motivation to pursue more complex concepts has been developed, while attractiveness will increase its effectiveness while teaching its effectiveness.

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