

## **An Assessment of Teachers' Educational Needs for Introduction and Innovative Approaches to Teaching Science to Improve Teaching**

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This research paper was supported by Department of Science and Technology-Science Education Institute Program.

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**Abstract.** The needs and interests of science teachers for the implementation of innovative approaches to teaching are the critical factors that determine to raise the quality of education at the school. In this context, it should be borne in mind that the educational needs of teachers are carefully linked to the necessity of lifelong learning because nowadays the science teachers work skills are not enough that they adopted during schooling twenty years ago or more. The paper analyzes the educational needs of teachers in implementing and exploring innovative approaches to teaching science. The most significant interest of teachers is for introduction and implementing individualized teaching.

**Keywords:** educational needs; innovative models; modern teaching; teacher; application; approaches; improve teaching; teaching science; inquiry-based approaches

### **1. Introduction**

Although the pedagogical, anagogical and psychological literature ardent many research papers and discussion of educational needs of people in different professions, ages, and position in the work process, still cannot be concluded that the achieved responses were entirely satisfying. It is an accepted standpoint that the needs are in the range from biological to cultural and educational.

In the broadest sense, human needs are defined as dynamic forces that drive human activities and influence his behavior. It is also an accepted standpoint that the human needs should and must be studied from various aspects. At multidisciplinary explanation of needs, even Maslow (Maslow, 1982) pointed out with his theory of self-actualization and commented that the requirements are hierarchically related because lower level needs must be fulfilled before it initiates needs of higher levels. It is also acknowledged, that man as a social being must fulfill the educational requirements that are only one relevant part of its total needs throughout his work and life. Hence the discourse of lifelong learning as a process that educational needs are fulfilled throughout the work and life of man.

Furthermore, it is essential to know that the needs are directly related to the endeavors and the desires of the individual, not only to enhance the absence of something (homeostasis) but also provide to his development, which fulfills him (self-actualization). This is primarily important for the determining the training needs of the working staff in education, including the faculty who work in the next application of teachings. In this regard, it should be noted down that despite several explanations, in general, the nature of human needs, and especially the educational needs of teachers. There is a predicament as to whether educational requirements or the need for broad or specific education, is part of every educational activity, i.e., whether they have the character of employee motivation or they lack motivational force.

It is also an accepted understanding by most of the authors who deal with the glitches of educational needs, and notwithstanding of the different views on the structure of educational needs as well as differences in their definition. That they are the source of every educational endeavor and that they are an unavoidable aspect of any research study in education.

According to Bransford the educational requirements are desirable to be between the current, possessed, and reached, desired, anticipated, or demanding standardized state on the other hand or the difference between what is and what is necessary (Bransford & Donovan, 2005). Educational needs are straightforwardly related to the individual's wishes and can be a strong driving force in innovation and modernization of scholarly work in general, and particularly in the modernization of the direct teaching of each teacher.

The internal initiator is the needs of human activity. It is hard to consider something as a need when an individual doesn't experience it as such. Innovations will progressively enter into the practice of our schools if teachers have developed positive attitudes towards innovation if they perceive innovation as the need for modernization of educational work. There is no chance for success, if teachers are not motivated enough, innovation, regardless of its internal capabilities. (Mitchell et al., 2004).

### **Introducing innovations into teaching**

Innovations are advent into teaching over the influence of very rapid progress of science and technology. But, school as a very conservative institution, takes a long time for scientific and technological break-through to be introduced into education. Innovations should facilitate, better use of the teacher's work and increasing economic efficiency, technical resources, and improving performance in teaching and educational work, augmenting productivity. Innovation is the prerequisite that the school is not lagging behind the social and technological changes in the reality that everyday intensive change (Etheredge & Rudnitsky, 2005).

A large number of teachers who feel safer when they apply traditional methods, proven methods and resources, rather than innovation are the substantial cause for the slow penetration of innovation in the teaching process is the conservatism, whose results they suspect (Fischer et al., 2005). Conservatism and traditionalism of teacher's area major obstacle to the entry of information technology in teaching and learning. Teachers responses to the introduction of innovation and new technologies in the school bounds between two extremes – from absolute rejection to complete enthusiasm. Teachers consider multimedia welcome and want to incorporate it into their lessons, but they are still reserved to use the technology itself, its purpose in learning and teaching and support to students teachers who use it. This means that teachers should have rather practical skills for programming and specific theoretical knowledge, monitoring and evaluation of innovative models of work, and introduction to teaching practice. This ability indicates not only knowledge of the content, i.e., expert expertise in the field where

innovation is done by applying innovative models of work, but also quite specific methodical knowledge (Balasubramanian, 2003).

According to Roth that the teachers are the primary, critical factor and most essential and carrier innovation in the educational and teaching organized in school. Without an innovative teacher, there can be no innovative school” ( Roth, 2002).

Classes in quality - innovative school itself should be such, quality and innovative. “To make the learning innovative, rich, good, processes, indispensable well-prepared teachers are highly competent and didactic - methodical culture, the teachers themselves are constantly improving. Teaching has the necessary qualities if respected cognitive and other differences among students and enables everyone to solve tasks in their way” (McDonald, & Hannafin, 2003).

According to Perkins that teachers, students, and the school itself have now found themselves in a very different information environment than before. Schools that accept this context will be much more modern and more successful and will not look like traditional schools where the teacher and the textbook are the only available sources of knowledge. The schools can continually innovate their new experience, by applying information technology. So that the institution does not stay at the traditional level, innovation is the requirement (Perkins, 1998).

Educational innovations are the connective “tissue” of the information society without the changes it cannot be. Promotion and realization of innovation in the information society in all aspects represents a large number of industry-specific factors. But in these activities, the primary element is a man, and his willingness and ability to innovate enrich the educational process. To make educational innovations enter the development and realization of the information society requires a collective competence for innovative activities. (Prensky, 2001)

A teacher’s decision to accept or reject the innovation is conditioned by many factors. According to Glazier that the teacher is faced with choices: he can take it as a potential asset, but to upgrade and elaborate it by his vision of teaching, and only then to apply it. Furthermore, he can partially correct his view of the teaching problem by the understanding and knowledge of the innovation and then to relate it sensibly or he can entirely dismiss his understanding and knowledge of a particular educational issue and to accept the innovation (Glazier, 2011).

### **Theoretical orientations about teaching and studying**

For the education and teaching process in general, the academic directions are essential, which should cause the increase of the quality of teaching activity to a higher level. Among the most current theories of studying are constructive, humanistic and interactive. Interactive theories are based on Hegel’s postulate of the “I” identity, which states that identity and self-confidence cannot be formed without interaction between the “I” and others. This idea is offered in the critical theory of the Frankfurt philosophic group, which requires on an independent discourse as a way of reaching cognition and truths. On these ideas, critical-communicative didactics were developed, in which the student-student and student-teacher interaction are one of the key categories. That is in a collision with the educational process, in which the student is the object. What is required is that the teacher-student interaction, although asymmetric, should be a relationship of mutual respect even though students are less experienced than teachers. Petersen points out that didactics, unusually communicative one, in its basis have to have three essential factors: the school obligation to act socially, interactive relation to the educational process, and finally, the attitude towards the reality of the acting subject. Bruner and Prensky point out in their conceptions of studies that interaction has prime importance for the personal development of a student. The underlying assumption for the

interactive teaching is modeling of working and living situations, scenic reviews, and mutual problem-solving. There is no dominion of any of the contributors in the educational process. Each student is a subject, each one of them actively contributes to the studying process, and each one has her or his studying path. The teaching process is democratic, students and teachers work together. Every individual brings his individuality into the teaching process. They also carry their knowledge, experience, ideas, and a way of activity. Forms of work are individual, in pairs or groups. What is produced is the environment of educational interaction, which is characteristic for its openness, mutual communication of the participants, and breach of arguments, joint marking, and control. Feedback is obligatory.

According to Wartofsky (1990) a famous psychologist that a child is not some particular person who is developed from some fixed configuration of disposition, previously formed possibilities and characteristics. On the other hand, the world is not some eternal and objective network of conditional factors, which are acquired at birth, so that from a passive succumbing ball we could shape it into an externally predetermined structure. The child is a participant in its formation, as well as the formation of the world, but that participant whose participation develops in the context of the necessary social and historical practice.

This Wartofsky's attitude is in complete accordance with the theories of Z. Piaget, in which they point out that the influence of the environment on the individual and vice versa. By their nature, these theories are collaborative because they point out the interaction between the environment as a development priority and an individual, but between them, there are individual differences about the role of particular environmental elements in the process of development. Both these theoreticians perceive the event as a series of qualitatively different phases, not as piling of developmental cubes. A child grows and matures through universal developmental stages, characteristic of the individual age, but going through the physiological development is not enough. It is essential for a child to be active in its environment. In constructive conception, especially with Piaget, it is required for an individual to possess cognitive imbalance, that is, the conflict between what they already know and new knowledge. As long as an individual can assimilate the surrounding world, the development goes through the same phase. If the existing cognitive structure of an individual is too narrow and cannot accept new information, then it is accommodated or changed and thus moves to a higher level. This is, by Piaget, the confrontation between the view of an individual in the world and the environmental objects which cannot be embedded into their cognitive schemes, so they are mandatory to create new ones, and assimilation, by doing so, and accommodation are permeated.

From Piaget's theory, a fundamental pedagogical message can be deduced: student's cognition has to be the effect of their activity through which they create their cognitive structures. The student's activity should not be understood only as their relationship with the physical environment, but also as a thinking activity, since action goes from the external into the internal, mental plan.

Although Piaget pointed out the importance of social relations for the development of an individual, this is more stressed with Wiggins and McTighe, who underlines an essential formative function of social interactions, without which there is no development. It is a mechanism in which the biological in an individual becomes cultural. Teacher and student are in an asymmetric interaction since the former has more knowledge and experience than the latter. Wiggins and J. McTighe consider this asymmetry as a developmental factor since it enables the formation of functions which become the student's property. Developmental enhancement starts from the zone of real development which a student has already learned and is moving into the zone of the next level of growth which a student has yet to receive. The pedagogical value of this assumption is significant. In the zone of the next level, a student cannot attain absolute functions by himself, but he will be able to if facilitated by a teacher. The zone of the following developmental level is characteristic of the fact that a new structure is started on it, which, with the

assistance of a particular teacher, can be formed entirely. In that zone, the guidance of the teacher has the most significant developmental effects, that is, it contributes to the acquisitions of new cognitive structures.

The humanistic theory has started a new dimension in education and studying. Its founder, Abraham Maslow (1954), in his work *Motivation and Personality* incline in his approach to man and investigating to the subjective determination in contrast to the behaviorist Skinner, who pointed out an apparent resolution as critical to both behavior and studying. Considering education more widely than it was traditionally accepted, Maslow points out that it is primarily necessary to nourish humanity in each. He does not consider learning primarily as the pure acquisition of associations, habits, and skills which by its character refer externally to a man. Indeed, it is a useful part of a person's studying in the technological society, which helps him study objects and things more efficiently. A man can practice his habits by using a behavioristic approach, can study a foreign language by using a method of associations, but in that way, he cannot be explained humanity. Apart from that, the world can give someone only what he or she is up to, what he or she is suitable for, and finally, a person can get from the world or give to it only what he or she represents. Maslow reckons that today we can see two specific approaches to studying. In the first method, education is considered as transferring of knowledge required for the industrial society. Students do not ask themselves why they study and what for. The primary concern of school is efficiency, that is, to make students acquire as many facts as possible with minimal spending of time, money and energy. The function and the primary goal of education are, in its nature, human. A pedagogic, in that case, is captivated in self-actualization, that is, to help the student grow into a good man as much as possible.

The two mentioned approaches are external and internal. The humanistic method is characterized by private education which enables the student to acquire such knowledge and skills which will make him a right person. In that case, the problem of education will not come down to a requirement for acquisition of information with a less or bigger waste of time and money, but how the student will best understand and evaluate that piece of information. So that the students could include it in their experience for further usage in various areas of life and work. In that case, knowledge becomes useful, as well as the learning process itself.

## **2. Methodology**

The subject of this empirical research is to examine the attitudes and opinions of teachers about the impact of innovative working models in teaching in the function of improving the quality of educational work in school. Accordingly, the researcher set a goal of this research - to determine the educational needs of teachers for implementing and exploring innovative models in teaching and that the views and needs, as well as the dependent variable, bring into a functional relationship with gender, level of education and work experience, as independent variables of research.

It was placed as the starting general hypothesis that teachers express a strong need for exploring and applying innovative models of teaching in total, and there are no statistically significant differences in the needs of the respondents for exploring and implementing innovative models in teaching based on their gender, level of education and work experience. In this study was used the descriptive scientific and research method in its pronounced analytical variant (Survey research method). By using this method, data will be collected about the attitudes of teachers towards the implementation of innovative approaches, which will allow the detection of relevant causal connections and performing the appropriate conclusions about the impact of innovation on the quality of the teaching process.

In a statistical analysis of the obtained data were used in the following statistical procedures:

1.  $\chi^2$ -test we will apply to the processing of data provided in the form of frequencies (i.e., qualitative data). The cumulative trait of the  $\chi^2$ -test allows combining a greater number of other values in the same test. The significance of the hypothesis that contains more datasets we will calculate the established pattern.
2. For testing the significance of differences in independent samples of our research, we will apply rank sum test (Wilcoxon-Test or Mann-Whitney U-test). Value of rank sum test we will calculate the established pattern.

Given tasks and associated with a hypothesis, will be tested on a representative sample which will consist of 300 teachers of six elementary schools in Tacloban City Division. The sample will be stratified - just a random character which will allow the researcher to look like on the underlying set from which it was taken. The researcher combined a group of intentional (stratified) samples with unintentional (just-random) samples, by which the researcher ensure that respondents are grouped into subgroups (stratum), and selection of respondents in the sample may be made within the stratum, using a sample just-random nature.

### 3. Results and Discussions

To investigate the educational needs of teachers for surveying and implementing innovative approaches to teaching a Likert scale is constructed, with the list of twenty statements. It evaluated the innovative models of teaching according to the degree of interest of teachers. Teachers were directed to respond as much as they are interested in training in the field of innovative approaches to teaching. On the scale: "I'm very interested," "I'm interested," "I'm mostly interested," "I'm not interested," "I'm really not interested." In the so-constructed scale of attitudes of teachers' answers "I am very interested" were assessed by five points, and the answer "I am very uninterested" with one point.

In this way, by adding the answers for all teachers at all innovative working approaches of teaching it would be feasible to determine the cumulative value (cumulative index) for each innovative model and scale as a whole. And so are determined individual gross scores (individual score) for each teacher and the whole scale.

Then they calculated the scale value, or the arithmetic mean (M) as the average value assessment of interest in exploring and implementing innovative working models of teaching at all innovative approaches, as can be seen from the outcomes that are presented in the tables. Analysis of so presented results of descriptive statistics for understanding the educational needs of teachers for exploring and implementing innovative approaches to teaching shows the most significant teachers' interest in learning about the application. The following are the Hands-on Learning (Inquiry-Based) teaching (M = 4.39), storytelling teaching (M = 4.17), science text cards teaching (M = 4.05) and role play teaching (M = 4.01).

The least interest was manifested to learn and use: video clips teaching (M = 3.59), documented problem solving teaching (M = 3.57), peer-to-peer teaching (M = 3.52), mobile apps for science teaching (M = 3.51), experiential teaching (M = 3.50), build your model teaching (M = 3.47) and interactive science journal (M = 3.37).

The findings show that the educational needs of teachers, i.e., teachers' motivating in implementing and exploring innovative approaches to teaching, are not distributed according to the normal distribution. But it is significantly different because it is evident that a much higher percentage of teachers are with more positive than with the volatile and negative attitudes, according to the obtained Skewness and Kurtosis for the scale as a whole and each innovative model.

That the teachers are most interested in implementing and exploring hands-on learning teaching, storytelling teaching, science text cards teaching and role play teaching shows not only the most significant scale values than the percentage of teachers who are interested in their introduction and implementation.

**Table 1 Descriptive statistics for understanding the educational needs of teachers for exploring and implementing innovative models in teaching**

Innovative models	Mean	Std. Dev.	Skewness	Kurtosis
1. Hands on Learning	4.39	0.77	-1.2	1.08
2. Story Telling	4.17	0.94	-1.4	2.88
3. Science Text Cards	4.05	0.91	-1.09	1.37
4. Role Play	4.01	1.04	-1.13	1.44
5. Instructional Conversations	3.96	1.11	-1.38	2.25
6. Graphic Organizers	3.86	0.94	-0.24	-1
7. Social media	3.78	1.18	-1.34	2.2
8. Virtual science labs	3.71	1.04	-0.55	-0.23
9. Word walls	3.7	0.97	-0.65	1.11
10. Context-Based Learning	3.63	1.04	-0.22	-1.1
11. Remote labs	3.63	1.06	-0.54	0.22
12. Multimedia Approach	3.61	1.28	-0.79	0.02
13. ICT Enabled Learning	3.6	1.12	-0.62	-0.015
14. Video clips	3.59	1.2	-0.91	0.62
15. Documented Problem Solving	3.57	1.13	-0.48	-0.18
16. Peer-to-Peer Teaching	3.52	1.14	-0.53	-0.02
17. Mobile apps for Science	3.51	1.09	-0.5	0.13
18. Experiential Teaching	3.5	1.13	-0.6	0.49
19. Build your model	3.47	1.14	-0.36	-0.55
20. Interactive science journals	3.37	1.1	-0.31	-0.17
<b>Cumulative index</b>	<b>3.67</b>	<b>0.86</b>	<b>-0.3</b>	<b>-0.01</b>

Thus, 53.06% of the teachers pleaded like “very interested“ for hands-on learning, 43.87% for storytelling teaching, 33.67% for science text cards, and 38.77% for role play teaching. On the other hand, only 24.48% of the teachers pleaded like “very interested“ for introduction and application: video clips teaching, documented problem-solving teaching 24.48%, 22.44% of peer-to-peer teaching, 20.40% mobile apps for science, 21.42% experiential teaching, 21.42% build your model teaching and 17.34 % interactive science journals teaching. Obtained results showed that the teachers expressed a great need for exploring and implementing innovative working approaches in teaching, although there are distinct and significant differences in the intensity of interest in the introduction and implementation of innovative employed methods in teaching. In fact, there were found significant differences in some innovative approaches to teaching.

In this way, it confirms the initial hypothesis that respondents expressed a strong need for the introduction and implementation of innovative approaches to teaching as a whole.

#### 4. Conclusions

Needs for innovative interventions in education are distinctive because there is a significant discrepancy between the quality of the educational process, on the one hand, and the scientific and technical achievements and demands of labor, on the other. Weaknesses of traditional teaching - the dominance of teaching approaches, one-sidedness in the application forms, teaching system, media poverty, methods - cause very negative consequences. The pupils are passive learners, and the teacher is active; to unequal pupils are placed the same requirements; requires a multitude of facts in which loses rules and laws; encourages the memorizing and disadvantage opinion; required reproduction, and absent application and creativity. The teaching process is monotonous and uniform, causing apathy among students. Modern achievements of technical and technological advances, pedagogical science, and didactical theory, particularly the development of communication- media technology and information allow traditional organizations of teaching and learning to abandon gradually and to apply organizational forms, teaching system, solutions, methods and media that will make the learning process more efficient and more intensive. In teaching, it is essential that teachers must bring innovation.

Innovations have accelerated progress in each activity, as well as teaching at the school. The contribution to the higher efficiency of the educational process is innovations. The school must continuously be under change. The requirement that the school does not behind other social and technological changes is innovations. School, as it was pointed out by Tolstoy must be the laboratory where the continuous discover, change and experiment.

The value of the teaching process is measured by how much a teacher while working with students, insists on the practical applicability of the acquired knowledge. This means that the teacher attempts to enable students to apply self-same knowledge in a variety of situations (knowledge transfer). The quality of the applied practical knowledge is far higher than the bookish perfectly mastered content which in life was not used and remained only in the memory of students. The man is valuable evolving, intellectual, diligently and forming in practical activities. If the working process is valued, it will have a significant motivational incentive to teachers who will try to expertly and didactic-methodically perfect.

Without innovative changes and development, there is no growing quality of pedagogical work in school. For specific innovations to become an integral part of the teaching process, they must be accepted by the teacher. It is necessary first that teachers know about them and that they have formed positive attitudes. Attitudes, like valuable relation towards innovation, lead to their application in educational reality.

It is accepted that man as a social being, must satisfy and the educational needs that are relevant to only one part of his total needs throughout his work and lives. Hence the discussion of lifelong learning as a process that educational needs are satisfied throughout the practice and experience of the man.

The results of this study observed as a whole, show that the surveyed teachers do not have the same level of values of some innovative models in teaching and information about the didactical characteristics because it is apparent that there are significant differences in the level of awareness of teachers in this concern. The results showed that teachers are informed of different strength about some of the innovative models, but that differences were determined only with some innovative models in teaching.

Analysis of the findings of descriptive statistics for understanding the educational needs of teachers for implementation and introduction of innovative models in teaching shows that the most significant teachers' interest in learning about the application: hands-on learning or inquiry-based teaching ( $M = 4.39$ ), storytelling teaching ( $M = 4.17$ ), science text cards teaching ( $M = 4.05$ ) and role play teaching ( $M = 4.01$ ).

## 5. References



- Balasubramanian, N. (2003). *Smart education: Blending subject expertise with the concept of career development for effective classroom management*, University of Georgia, Instructional Technology Forum Website: Retrieved April 11, 2005, from <http://it.coe.uga.edu/itforum/paper73/paper73.html>
- Bransford, J. D. & Donovan, M. S. (2005). *Scientific Inquiry and How People Learn*, M. S. Donovan, & J. D. Bransford (Eds.), *How Students Learn: History, Mathematics, and Science in the Classroom*, Washington, D.C.: National Academy Press.
- Etheredge, S. & Rudnitsky, A. (2003). *Introducing Students to Scientific Inquiry: How do we Know What We Know*. Boston: Allyn and Bacon.
- Fischer, G. E. Giaccardi, E., Eden, H., Sugimoto, M. & Ye, Y. (in press) (2005). "Beyond Binary Choices: Integrating Individual and Social Creativity," *International Journal of HumanComputer Studies, Special Issue on Creativity* (Eds: L. Candy and E. Edmond). Retrieved April 11, 2005, from <http://13d.cs.colorado.edu/~gerhard/papers/ind-social-creativity-05.pdf>
- Glazier, R. *How to Design Educational Games (4th ed.)*, Cambridge, MA: ABT Associates.
- Maslow, A. H. (1982). *Motivation and personality*. Beograd: Nolit.
- Mc Clelland, D. (1961). *The Achieving Society*. New York: Von Nostrand Reinhold Co.
- McDonald, K.K. & Hannafin, R.D. (2003). Using web-based computer games to meet the demands of today's high-stakes testing: A mixed-methods inquiry. *Journal of Research on Technology in Education*, Vol. 35, No. 4, pp. 459-472.
- Mitchell, A. & Savill-Smith, C. (2004). *The Use of Computer and Video Games for Learning: A Review of Literature*, London: Learning and Skills Development Agency.
- Perkins, D. (1998). *What is understanding?* In M. S. Wiske (Ed.), *Teaching for Understanding: Linking Research with Practice*. San Francisco: Jossey-Bass, pp. 39-57.
- Prensky, M. (2001). *Digital Game-Based Learning*. New York: McGraw-Hill.
- Rasmusen, E. (2001). *Games, and Information: An Introduction to Game Theory (3rd ed.)*. Malden, MA: Blackwell.
- Roth, K.J. (2002). *Talking to understand science*. In J. Brophy (Ed.), *Social Constructivist Teaching: Affordances and Constraints*. Oxford, UK: Elsevier Science, pp. 197-262.