Journal of Theoretical and Applied Information Technology
20th March 2015. Vol.73 No.2

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

BAYESIAN ESTIMATION FOR ASSESSMENT BASED LEARNING ICT

[1]J. ALVAREZ-CEDILLO, [1]J. HERRERA-LOZADA, [1]J. SANDOVAL-GUTIERREZ, , [1]M. OLGUIN-CARBAJAL, [1]M. HERNANDEZ-BOLAÑOS, [1]I.L RIVERA-ZARATE, [2]T. ALVAREZ-SANCHEZ, AND [3]R. CADENA-MARTINEZ

[1]Instituto Politécnico Nacional, CIDETEC, UP Adolfo López Mateos Edif. CIDETEC, México D.F., MEXICO
[2]Instituto Politécnico Nacional, CITEDI, Av. del Parque No. 131O, Mesa de Otay:: Tijuana, Baja California, MEXICO
[3]Universidad Tecnológica de México. Av. Marina Nacional No. 162, Col. Anáhuac, México, D.F. , MEXICO

E-mails: jaalvarez@ipn.mx, jlozada@ipn.mx, jsandovalg@hotmail.com, molguinc@ipn.mx, mbolanos@ipn.mx, irivera@ipn.mx, tass_83@hotmail.com, rocadmar@mail.unitec.mx

ABSTRACT

Incorporating Information Technology and Communication (ICT) in education improves the level with sophisticated tools to increase a competence system in education. Bayes theorem is valid in all applications of the probability theory. In essence, the followers of traditional statistical probabilities only support repeatable experiments and have empirical confirmation while so-called Bayesian statistics allow subjective probabilities. The theorem can then serve to indicate how our subjective probabilities should be modified when receiving additional information from an experiment. Bayesian statistics prove their utility in certain estimates based on the subjective prior knowledge and reviews these estimates based on the empirical evidence. This feature is opening up new ways of understanding. This situation has had a strong tendency envisioned by offering new interpersonal communication systems worldwide and obtains and provides information of all kinds, instantaneously. This paper shows the tests performed in a study to measure learning under a Bayesian approach.

Keywords: *Information Technology and Communication, Bayesian statistics, Bayesian algorithms, Learning, Education.*

I. INTRODUCTION

The new digital age of technology and its great influence in society have influenced plans and educational programs. (Kafyulilo, 2013) These institutions need to include the digital training curriculum, including the creation of technological infrastructure, the organization and management of schools, training materials and methodologies.

This allows sensitization, induction and aims at adapting new uses of cyberspace and the development and updating of knowledge, skills and attitudes that lead to this new learning environment.

For these reasons, today the role of Teachers, Facilitators and Trainers have been transforming the traditional teaching approach to implementing schemes focused on teaching the student to be transformed into a self-promoting cognitive-behavioral development through the use of ICT tool activities. (Malapile, 2013) There are several important elements to develop these concepts:

1. Teacher Profile
2. Professional Development.

[1] 1.1 Teacher Profile

The teacher must assimilate and develop general and specific knowledge related to ICT (Stiggins, 1989) (Orlando, 2014), as follows:

a) Basic Knowledge of Computer Systems.

b) Capacity Building and General Skills for the use of Computer Hardware, Operating System, files and folders, Security Antivirus, Des-installation of software.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

c) Implementation of the Technical Standards and Quality published by various National and International organizations related to information systems.

d) The constant development of values that help strengthen the personality, not only in the teaching role, but also in personal and professional life.

[2] 1.2 Professional Development.

During the process of curriculum development the teacher should identify their training needs, areas of opportunity, detect errors that must be corrected, or develop knowledge and skills to new technologies (Brasic, 2013).

The teacher is oriented to training professional and personal; the development of teachers' process shall incorporate the reflective conceptual plans (acquisition and deepening of a conceptual framework on educational processes in the classroom) (critical reflection and on their own teaching practice) and ICT practical use (leading to the generation of alternative and innovative solutions to their teaching) practices. (James, 2010)

It is further considered that there are four areas that teachers must consider at all times to prepare the student in the development of skills, (knowing) that represents the transmission of knowledge and cognitive feedback, procedures, rules, regulations involved in the teaching-learning process.

Expertise and knowing how to innovate undoubtedly involves practical feedback on what contextualized knowledge, project generation, problem solving, application of innovative practices and ideas within the workplace.

The implementation of proposals to improve used in this paper, allow resolving among others the result of a perfect harmony of teaching-learning processes and synchrony of student skills for the sake of learning, the self.

(Doris, 1999) Applied techniques and methodology Fuller, consistent and reliable development of implementing powers should seriously consider updating processes on teaching techniques to detect this activity to support needs based on curriculum practice (Gellel, 2010).

These important aspects are the following:

a) The correct updating of knowledge allows their proper application to reduce the narrow path of the congruence of thought and action.

b) The Teaching of common sense, which refers to the spontaneous ideas the teacher calls on and a simplistic view of teaching and learning occurs. It is considered that teaching is something simple, common sense or appropriating some recipes or techniques and represents a natural failure of students in science subjects, for a fixed view or bias of their intellectual abilities, gender or social background.

In addition, negative attitudes and low motivation of students towards scientific knowledge of external causes and ignorance was attributed to the role of the teacher.

(Herran, 2011) This proposal seeks to identify the underlying causes for poor academic achievement. The result may be that teachers are not prepared to use instrumental technological tools not know the major operating systems, modern programming languages, or simply do not know the technology and how it is currently applied in enterprises.

Table 1. Comparison Between Different Approaches To Teacher Education.

Class				
Modalities	Training program	Meaning of formation	Instructional focus	Common Methods
Pre-construction	Predefined and closed	Modeling	Direct instruction	Models and e xposure
Re-constructive	Undefined and open	Conflict	Reflection on action	Analysis of cases
Co-constructive	Dimensions and negotiated	Re-describing	Transfer of control and regulation-making	Thinking out loud

The teacher needs to distinguish between theory and practice in training and refresher courses, plus everyday implementation of their knowledge, skills and attitudes in business practice and academia. This will support teachers to create in students a full vision of the new technology trends that will have to be handled and at the same time be able to attract students' interest towards the subject and promote a pro-active attitude. See Table 1.

Journal of Theoretical and Applied Information Technology
20th March 2015. Vol.73 No.2

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

2. TEACHING METHODOLOGY

The teacher should prepare their class, for example, plan students should to follow and learn, it is necessary to assess and comply within the curriculum frameworks in force and materials used for the understanding of the topics and implementation of strategies for meaningful learning. (Herran, 2011), See Figure 3.

The academic objectives concern expected learning in relation to curriculum content. The teacher should consider the conceptual level and motivation of their students, their knowledge, skills and attitudes and their own previous significance of auxiliary materials of a conceptual analysis or to perform the same tasks.

The University of Minnesota in the article proposed by David and Roger Johnson suggested 18 steps that allow the teacher to structure the learning process based on cooperative learning situations, which are:

a) Specify learning objectives
b) Decide the size of the group
c) Assign students to groups
d) Condition the classroom
e) Plan teaching materials to promote interdependence
f) Assign roles to ensure interdependence
g) Explain the academic task
h) Structuring the group goal of positive interdependence
i) Structuring the individual assessment
j) Structuring inter-group cooperation
k) the criteria for success
l) Specify the desired behaviors
m) Monitor student behavior
n) Provide assistance in relation to the task
o) Intervening to teach collaborative skills
p) Provide closure to the lesson
q) To assess the quality and quantity of student learning
r) Assess the functioning of the group.

\section{Implementation and result}

3. IMPLEMENTATION AND RESULT

The following results were obtained from a thousand students and our study was applied to different schools in Mexico City, in order to evaluate teachers regarding the knowledge acquired by students. The following was assessed:

1. Academic achievement
2. Socio-affective relations
3. Professional relationships, group size and learning products.

Bayes theorem was enunciated by Thomas Bayes as the probability theory, and is the result given the conditional probability distribution of a random event A with respect to Bevent in terms of the conditional probability distribution of Bevent with respect to A event and marginal probability distribution of only A.

Given $\{A_1, A_2, \ldots, A_n\}$ a set of mutually exclusive and exhaustive events, and such that the probability of each is non-zero. Let B be any event in which the conditional probabilities are known $P(B|A_i)$.

Then the probability is $P(A_i|B)$ given by the expression

$$P(B|A_i) = \frac{P(b|A_i)P(A_i)}{P(B)} = \frac{P(b|A_i)P(A_i)}{\sum_{i=1}^{n} P(B-A_j)P(A_j)} \quad (1)$$

Where:

$P(A_i)$ are the a priori probabilities.

$P(B)$ is the B probability of the hypothesis.

$P(A_i|B)$ are the posterior probabilities.

This is valid if: $\forall i = 1,2,3,..,n$,

$$\sum_{i=1}^{n} P(A_i|B) = 1 \quad (2)$$

Given a set of analyzed n=1000 students with a proven reference $P(A_i) = 0.7$.The actions taken

$$\theta = \begin{cases} \theta_0 & \leq 0.7 \quad amend \\ \theta_0 & >0.7 \quad allow \end{cases} \quad (3)$$

Our parameter space is defined by:

$$\theta = \begin{cases} 0 & \leq 0.7 \\ 1 & > \end{cases} 0.7 \quad (4)$$

Journal of Theoretical and Applied Information Technology
20th March 2015. Vol.73 No.2

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

The best value of Beta is found, in this case it was specified that the median is (50% percentile) of 0.85, a second value 99.999% percentile of 0.95, and a third value percentile is 0.60 0.001%.

Beta values are obtained for:

a= 71.5425925925926

b= 16.8548148148148

Where $\varphi_i = 1,2,3, \dots, n$ and $\varphi_i = \frac{\sum_{i=1}^{n} \varphi_i}{n}$.

The distribution of our data, expressed by a function, is shown in Figure 1, Figure 2, shows the likelihood

Input data, a represents the percentage of learning achieved, and b=1-a failure rate in our implementation.

Applying Bayesian inference to the problem, gives:

$$\theta_{bayesian} = \frac{a+b}{a+b+n} \cdot \frac{a}{a+b} + \frac{n}{b+n} \cdot \varphi \quad (5)$$

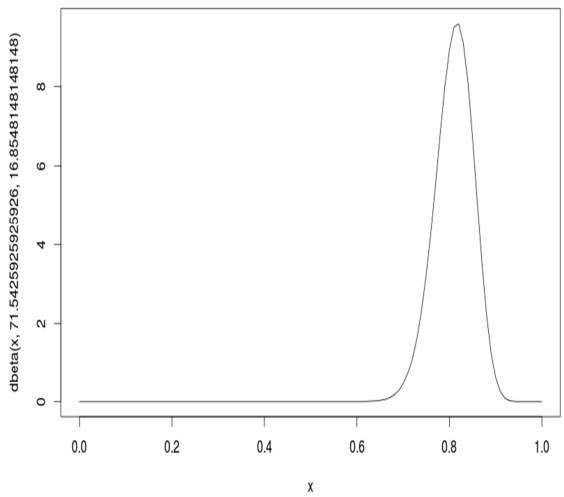
a=0.48625$ and b=0.51375$ and φ_i=0.689.

Substituting obtained values in (5)

$$\theta_{bayesian} = 0.00048 * 0.88 * 0.688$$

$$\theta_{bayesian} = 0.0.68877979383$$

Figure 1. A prior distribution.



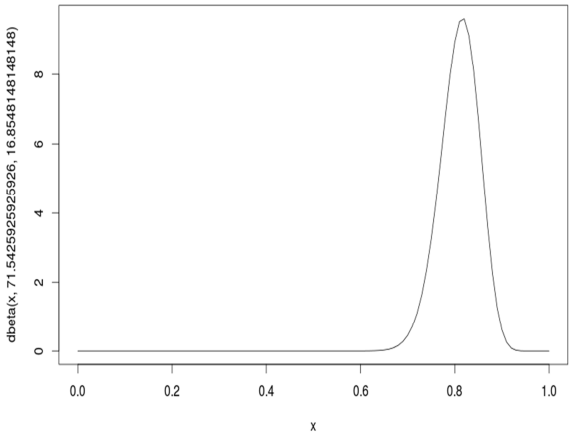


Figure 2. Calculation Of The Likelihood.

The result shows a knowledge of 68.87% in the use of ICT.

Figure 3 shows the comparison of the Beta distributions at the beginning and end of Bayesian analysis.

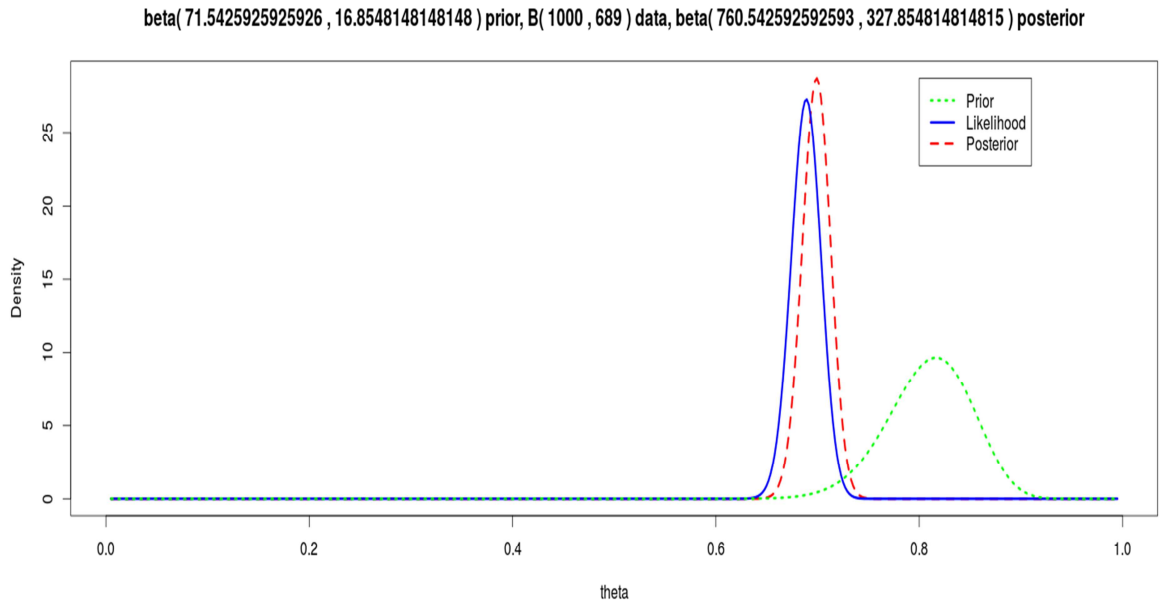
4. CONCLUSION

The main goal of the evolutionary human recognition is to (bring about change), which is why this proposal contemplated each of the skills that students must apply to make them their own.

Each student should measure their true ability to create change and not only their ability to adapt to the others and began to create.

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

A. Towards meeting business needs.



In the mathematical analysis it was observed that the value obtained a priori 0.7 achievement corresponds to RMS, so when analysis is used creates the perfect joint between information likelihood and posterior.

The information model sample shows that the technological bases allow the use in our model of 68. 68% learning.

The main base of teacher education and development to achieve cognitive consistency, allows creating professional competences. These in turn benefit the student, who is the one who acquires the reflection learning. According to our action model, it appears that the value is below Pr=0.7, ,indicating that the model must be corrected

Our suggested actions are:

1. The teacher should adopt cognitive consistency as this activity directly affects the younger generations, without it the result of the teaching-learning process will remain a traditionalist model of teaching and will stay on the opposite side of the desired objective. The new model focused on meaningful learning.
2. Skills development to train teachers, but mainly the student, must be directed in the following competences:

B. Adapting new technology tools.

C. Updates and modern technical knowledge.

D. Attitudes towards the formation of entrepreneurial leaders.

E. Creators of the new changes that are conducive to achieving the desired success.

F. Promote the values that allow to go with head held high toward your goals.

G. Create awareness that they are potentially successful.

H. Problems were observed in the two assessment points presented above:

1. In terms of academic performance: The cooperative learning situations are superior to competitive and individualistic learning in diverse areas such as social studies, science, language arts and math, and tasks, both involving acquisitions, retention and transfer of knowledge, such as Nature's conceptual (rules, concepts and principles). This effect was found in all educational levels studied.

2. Socio-emotional relationships: Significant progress was noted in the interpersonal relations of students who took part in cooperative tasks. Particular mutual respect, solidarity and mutual feelings of obligation and support, and the ability to take the perspectives of others increased. An important effect was the increased self-esteem of

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

students, including those who had at inception a low performance and self-esteem.

3. With respect to the group size and learning products: There are not a series of factors that influence the effectiveness of the work in cooperative teams. However, one factor was the size of the group in which it was observed that increasing the number of students per class, the performance of these was lower. This study recommends the creation of small working groups (no more than six members per team). Among the younger students the effectiveness of cooperative learning experiences is higher than in groups even less numerous. Furthermore, it was observed that the performance and learning outcomes are high when students must prepare a final exam.

REFERENCES:

[1] Brasic, Ch.Kramer, P. (2013): Realising Exemplary Practice-Based Education,Practice,
[2] Education, Work and Society.Professional Preparation for PracticeVolume 7, pp. 25-32.
[3] Pronin, D. (1999). The Role of Higher Education in Professional Preparation for Early Childhood Education.Child and Youth Care Forum, Volume 28, Issue 1, pp. 33-42.
[4] Gellel, A. (2010). Teachers as Key Players in Values Education: Implications for Teacher Formation, International Research Handbook on Values Education and Student Wellbeing 2010, pp.163-177.
[5] Herrán, A. (2011). Técnicas didácticas para unaenseñanza más formativa. En N. Álvarez Aguilar y R. Cardoso Pérez (Coords.), Estrategias y metodologías para la formación del estudiante en la actualidad. Camagüey (Cuba): Universidad de Camagüey, ISBN: 978-959-16-1404-9.
[6] McDonald, J. T., \& Dominguez, L. A. (2010). Professional preparation for science teachers in environmental education. In The inclusion of environmental education in science teacher education(pp. 17-30). Springer Netherlands.
[7] Kafyulilo, A., and Keengwe, J. (2013). Teachers perspectives on their use of ICT in teaching and learning: A case study Education and Information Technologies, pp.1-11.
[8] Malapile, S., and Keengwe, J. (2013). Information communication technology planning in developing countries.Education and Information Technologies, pp.1-11.
[9] Aguiar Jr, O. G. (2014). The Implications of the Conceptual Profile in Science Teaching: An Example from a Teaching Sequence in Thermal Physics. In Conceptual Profiles(pp. 235-259). Springer Netherlands.