

UNDERSTANDING THE RELEVANCE OF K-YAN IN GOVERNMENT SCHOOLS FROM TEACHERS PERSPECTIVE

Bikash Barai

Assistant Teacher, Dalsingparasree Ganesh Vidyalaya High School, Alipurduar, West Bengal, India

Received: 21 Aug 2018

Accepted: 27 Aug 2018

Published: 28 Sep 2018

ABSTRACT

Technology has now become an integral part of educational practices. The present study is an effort to understand the relevance of K-Yan in the teaching-learning process at government schools of West Bengal. The author conducted a qualitative research to understand the opinion and experiences of ten teachers who were using K-Yan for a considerable period of time. The study revealed that K-Yan is a very useful tool that helped in transforming the traditional methods of teaching-learning towards more effective, joyful and activity-based learning.

KEYWORDS: *K-Yan, Traditional Method of Learning, Activity Based Method of Learning, Educational Technology, Information and Communication Technology*

INTRODUCTION

Background of the Study

Technology in education is very quickly changing the traditional pedagogical activities of the school education in the global scale, India is no exception in this case. All the states of India following the National Council of Educational Research and Training (NCERT) has implemented comprehensive programmes to move from the traditional method of teaching-learning toward more learner-centric education. In the state of West Bengal, the first step taken toward this change was an implementation of new curriculum based on activity-based methods of learning (ABML) in the year 2012 in all government primary and secondary schools. ABML was found to be very effective in increasing the achievement level of the school learners over traditional methods (Barai, 2018) but ABML need to be supported by tool of educational technology (ET), to enrich the present curriculum information and communication technology (ICT) based tools are required and Knowledge-Yantra (K-Yan) is one such tool with many added features that has promising prospect in adding quality to school education. In the context of the present study ET may be defined as the verity of technology based programmes, scientific methods, machines and software are that helps in increasing the effectiveness and productivity of teaching-learning process. The present study by the author is an endeavor to understand the relevance of K-Yan in government schools from the experiences of school teachers with K-Yan.

Recent Trend of ICT based Resources and Tool in Education

Our society is very rapidly adapting itself to the evolving scientific, technical and communication innovations. ICT has now become an integral part of the society with youths from many countries are getting used to with the resources of ICT more than ever (Davis, Deil-Amen, Rios-Aguilar,&Canche,2012). This integration of ICT with society can now be seen in education also, where many countries including India have implemented ICT in education through various policies,

curriculum and by facilitating the development of teachers' technological pedagogical content knowledge. It is found that for professional development of in-service teachers, the training programme is very important and such a programme must include ICT as its major element in the curriculum. In various teacher training programmes ICT is playing a crucial role to build a positive attitude of the trainees toward the training programme (Barai, 2018). Not only trainers but trainees must also develop the skill of using ICT then only the quality and effectiveness of the teacher training programme will increase (Rajan, 2012). Worldwide Special emphasis on ICT literacy is being given and ICT literacy is widely acknowledged a sacrificially important component of what has been labeled as 21st century skills (Voogt, Knezek, Cox, Knezek, & ten Brummelhuis, 2013). The trend of ET in classroom is increasing and will keep on increasing in near future also. The technology approaches most widely used in schools, especially supplemental computer-assisted instruction (CAI), have the least evidence of effectiveness. But the integration of classroom instruction and computer-assisted instruction and the utility of video, computer content, and embedded multimedia as a component of beginning reading instruction have a much more promising aspect (Cheung & Slavin, 2012). Despite many advantages proper implementation of ICT is still difficult to achieve because of the problems like limited access to ICT in school and teacher education programme, misconception about the use of ICT and inadequate modeling of pedagogic use of ICT (Martinovic & Zhang, 2012). In India also government and private bodies are investing in development of new tools and application that can transform the traditional pedagogical process into a more efficient and productive one. One such good example of it is K-Yan developed in India and now gaining global attention.

K-Yanas a Tool of ICT in Secondary Schools

As per the recommendations of the National curriculum framework (NCF) 2005 by NCERT, all the states of India developed programmes for transforming their traditional teacher-centric school education curriculum to learner-centric curriculum. The two major steps were an introduction of textbooks that promote ABML and integration of ICT to support ABML and transforming the classroom into a digital classroom. The most important resource of ICT that revolutionize the teaching-learning process is K-Yan.

In the year 2007-2008 government of West Bengal with the support of its department of Information and Technology implemented computer-aided learning (CAL) system titled K-Yan in a phased manner with Bardhaman and Bankura being the first districts to implement the project. West Bengal Electronic Industry Development Co-operation Ltd mandated infrastructure leasing and financial services-education and technology services (ILFS-ETS) as the implementing agency of the K-Yan project. K-Yan was developed by Dr. Kirti Trivedi of IIT Bombay in the year 2004 as an all in one community computer. The key idea behind his innovation was to provide CAL for mass with minimum financial requirement thus it was promoted as community computer. The K-Yan is a computer with integrated projector, hi-fi stereo speakers, optical drive, USB ports, digital pen, windows operating system, educational content developed by ILFS and separate power supply. A mouse and keyboard are also included with the K-Yan. The most unique feature of it is eye RIS software that along with a digital stylus or pen that can convert any nearly smooth solid surface (like walls of class-room) into a digital interactive board. Such digital interactive board can be used for presentation, interactive games and learning, video conferencing, 2D and 3D audio-video presentation, writing text, drawing geometrical diagrams and many more.

Studies on K-Yan has revealed that it is highly effective in increasing the enthusiasm of both the teacher and learner (Mondal, 2014). Use of K-Yan in teaching learning process is thus increasing exponentially (Adam & Zanna, 2016). A study was done by Barai (2018) regarding the professional experiences of teacher trainer during a teacher training programme toward K-Yan revealed that K-Yan was very useful during training programme of teachers but no studies were conducted to find out the experiences of teachers at school level using K-Yan. Such studies on ICT based tools have motivated the author to take up the present study that will try to understand the relevance of such tools in the context of government schools of West Bengal. As very few works has been done on K-Yan so author's present study is significant to understand the prospect and usefulness of ICT and CAL based tools of ET in schools of West Bengal as well as at national level also, as it may help in improving applicability and efficiency of both the programme and the tool.

THE STUDY

The guiding questions for the author that helped in framing the objectives of the study are: 1) How K-Yan is transforming the pedagogic practices in schools? 2) How K-Yan is helping the teachers with their subjects? 3) How useful K-Yan is and what are its problems? 4) What are teachers' experiences with the K-Yan in the classroom?

Objectives of the Study

The study is aimed to achieve the following objectives based on the guiding questions of the research:

- To understand the teachers' experience with K-Yan during the teaching-learning process.
- To understand the usefulness of K-Yan in teaching-learning process at the school level.
- To find out the drawbacks of K-Yan and issues related to its usage.
- To understand the role of K-Yan in transforming the traditional methods of teaching-learning.
- To understand the effect of K-Yan on learners from the teachers perspective.

Design of the Study

A qualitative design has been used to execute the present study. Though qualitative approaches are incredibly diverse, complex and nuanced (Holloway and Todres, 2003), but they give very in-depth view of the subject. The qualitative design is very much suitable when the resources are limited and study is restricted to a small number of sample for this reason qualitative design was preferred by the author over the others. An author with a long experience in research developed an open-ended questionnaire to collect the data from the participating teachers. The collected data then was analyzed by adapting the inductive methods. In the inductive method sub-themes and themes are to be generated from the collected contents either by software or by manual color coding.

Participants

As participants ten (n=10) teachers from two different government schools were purposively selected from the population that includes all the teachers of the schools equipped with K-Yan in the Alipurduar district. All the ten teachers met the eligibility criteria for the teaching profession as decided by the government. The demography of the participants is presented in table 1.

Table 1: Demography of the Participants

ID of Participant	Gender	Age	Post and Subject	Teaching Experience (in Years)	Highest Qualification(S)	Language(S) Known
KR	Male	32	Assistant teacher, Commerce	4	M.Com, B.Ed	English, Hindi
DY	Male	31	Assistant teacher, Hindi	9	M.A Hindi, B.Ed	English, Hindi, Bengali
MS	Male	35	Assistant teacher, Physical science- Chemistry	7	M.Sc, physical science and maths, B.Ed	English, Hindi, Bengali
SN	Male	34	Assistant teacher, Geography	10	B.A Geography, B.Ed	English, Hindi, Bengali, Nepali
SP	Male	31	Assistant teacher, Hindi	4	B.A Hindi, M.P.Ed	English, Hindi, Bengali
PP	Male	29	Assistant teacher, Economics	3	B.A Economics, B.Ed	English, Hindi, Nepali
BT	Female	34	Assistant teacher, English	4	M.A English, B.Ed	English, Hindi, Bengali, Nepali
SC	Female	36	Assistant teacher, English	8	M.A English, B.Ed	English, Hindi, Bengali,
NC	Female	29	Assistant teacher, Geography	3	M.A Geography, B.Ed	English, Hindi, Bengali, Nepali
BK	Male	35	Assistant teacher, Hindi	4	M.A Hindi, B.Ed	English, Hindi, Bengali, Nepali

*M.Com- Master of Commerce, M.A- Master of Arts, M.sc- Master of Science, M.P.Ed- Master in Physical Education, B.Ed- Bachelor of Education, B.A- Bachelor of Arts

Each participating trainers were given an ID to maintain their privacy. Out of ten teachers, 30 percent were female and 70 percent were male. The average ages of the teachers were near to 32 years, with youngest of age 29 and oldest of age 36. Thus most of them were young with an average teaching experience of nearly 5 years. All of them had a bachelor of education (B.Ed), a compulsory professional degree for teaching at secondary and higher secondary schools. One teacher was from commerce stream whereas another one from science stream and rest all from the humanities.

Data Collection and Analysis

For the collection of data for the present study, the author used author made open-ended questionnaire to get the very precise and in-depth opinion and experience of the participating teacher. Before administrating the open-ended questionnaire all the questions were properly explained to the participants. Due to the busy schedule of the participating teachers, the questionnaire was given in printed format with space to provide the response and they were asked to submit it within a couple of weeks. Question was in English but freedom was given to them to response either in English or Hindi. Some of the participants in a few questions made the response verbally so the author made its transcript manually in the questionnaire only. Six easily understandable questions that were framed to elicit the views, opinions, perceptions, and reactions of the participating teachers are Q1) What is your opinion about K-Yan in connection to the subject which you teach? How is students' response to using K-Yan by you? Q2) Which features of K-Yan are more useful? What additional feature you want in K-Yan? Q3) What are the problems (Both technical and non-technical) you face while using K-Yan in the classroom or lab-room? Q4) How are you involving students in Activity Based method of learning using K-Yan? Q5) Give your concluding opinion about K-Yan as a tool of

educational technology at secondary level school?Q6) How K-Yan is transforming the traditional method of teaching-learning?

The author used the copy(s) of the original response sheet during the entire analysis process. For the analysis the inductive coding method as suggested by Creswell (2012) was followed, color coding was done to develop themes as proposed by Braun and Clarke (2006) that can be related to draw out the conclusion and developing the theory.

Establishing Reliability and Validity

The content validity of the questionnaire was established by presenting the questionnaire to a group of experts in the field of qualitative research with expertise in educational technology. The reliability and validity were also maintained by the author through data triangulation method. Following the data triangulation, the author collected the data from participants of two different schools and also they were from different subject streams. The thematic coding of the responses was done by the researcher manually with close association and consultation of the fellow researcher with expertise on qualitative research. Following the ethics of research, the privacy of the participants was maintained and they were designated with IDs in this study also the name of their schools were not disclosed.

FINDINGS

Thematic color coding of the data leads to the development of five major themes which are: 1) Preferred features of K-Yan and implementation in teaching learning process 2) Issues related to K-Yan and its usages 3) Changes needed and support required 4) Teacher's experience and effects on students 5) K-Yan promoting ABML and transforming traditional method.

Preferred Features of K-Yan and Implementation in Teaching Learning Process

K-Yan was designed to be a multipurpose tool for educational practices, after using it for some period of time nine (n=9) out of ten teachers considered it as very helpful or useful for teaching their respective subjects. One unique and most used feature of K-Yan by the teachers was its digital smart board feature powered by Intel is pace software. Seven (n=7) participants highly preferred this feature. With this feature, teacher transformed the wall of the classrooms into an interactive smart board. Smartboard was used to write contents, to show pre-loaded content, diagrams, maps and even solve mathematics. Digital pen given with the machine was used to interact with the smart board with it teacher used to write, draw and select contents. About it SN wrote, *"each and every feature of K-Yan are useful and important, but for me Intel is pace seems to be more useful with its distinct features of writing, erasing, drawing, painting etc. I also like the 'curtain' feature for asking questions and checking the IQ of the students. The 'torch' focusing feature also seems to be very useful as one can easily focus and concentrates on a particular topic or word."* Another important feature of K-Yan which five participants (n=5) emphasized was its use as an audio-video (or projector) tool for teaching learning. As an audio-video tool teacher mainly used it shows animated videos related to subject and textbook contents. As K-Yan is a fully functional computer it can easily be connected to internet. Seven participating teachers (n=7) mentioned about their usage of the internet with K-Yan for enriching the teaching-learning process, some used it to download various subject related content and some for showing educational content in YouTube. In this regard NC wrote, *"with all its hi-tech innovations helps me a lot to teach my subject geography. It has PC,TV, and internet which brings immense classroom experience to me and to the students. In my subject geography, I taught students a topic of the volcano and show all*

diagrams....” K-Yan comes with a pre-loaded content developed by ILFS which have all the textbook related topics of all subjects from class five to class ten. These pre-loaded contents are very attractive for the students as they are enriched with videos, audios, and diagrams which makes learning joyful for students, five participants (n=5) mentioned about it and used them regularly during their classes. One major advantage that many participant mentions about K-Yan was its ability to store contents for a very long period of time, like a class presentation prepared by some teacher can be stored in hard disks of K-Yan for using it in future academic years. So K-Yan can be considered as a feature-rich tool of ET that has unlimited potential and usage. It can easily replace blackboard, projector, textbooks and normal PCs of any modern classroom. According to the participants K-Yan was used very successfully at every stage of the teaching-learning process, it was used for content selection, presentation preparation, for making classroom interactive, for promoting activity-based learning and as the tool of writing, audio-video presenter and community computer.

Issues Related to K-Yan and its Usages

Like any other gift of science and technology, K-Yan also is not free from drawbacks. Participants found many issues related to K-Yan, based on their responses some major issues are:

Issue with Mobility

Though K-Yan is much smaller than a desktop PC it has a power backup UPS and battery unit as a result of which it has a considerable weight which makes it difficult to carry around every now and then. So four (n=4) participants found it difficult to move around with K-Yan from class to class thus restricting its use within a particular room.

Shadow Problem of SmartBoard and Digital Pen

Smartboard is actually an illuminated solid smooth white surface (generally the smooth white wall of the classroom) by the projector lamp of the K-Yan. The content of the smart board can be accessed either by mouse or by the digital pen. For using the digital pen the user has to stand very attentively or the user’s shadow makes the screen unresponsive for usage. Seven (n=7) participants considered it as a major problem, as BK wrote about it, “...*the sensor and pen also gives a little problem because of our own shadow. We can’t stand anywhere and use the pen freely on the projector.*”

Insufficient Pre-Loaded Content in Only One Language

Each K-Yan is pre-loaded with text and video content based on the syllabus of class five to class 10 so that the dependence of both teacher and student on the textbooks can be reduced but these contents were developed mainly in one language (Bangla). Thus four (n=4) participants described that pre-loaded content should be made available in English and Hindi languages too also the content should be richer as all topics of textbooks were not covered in it.

Apart from above major issues some other problems are also their like as highlighted by KR and SC, only two units of K-Yan was given to each pilot schools but for school, with a large number of students, it’s not sufficient as all teacher can’t use them simultaneously. Another problem as mentioned by SN and DY is K-Yan works on AC electricity so in case of power failure one has to depend on UPS which don’t give a backup of more than half an hour. According to participating teacher PP, K-Yan price is expensive which makes it difficult for schools to purchase it in mass numbers and since it’s very sophisticated so require regular maintenance.

Changes Needed and Support Required

Based on the professional experiences of the participants with K-Yan during the teaching-learning practices, they suggested some improvements and supports required for making K-Yan more efficient and productive. Some of their suggestions were:

Refinement in Software

Five participants (n=5) suggested software refinements required to improve Intel is pace, to make handwriting recognition more accurate, to improve touch input by the digital pen and overall user-friendliness of the operating system. Apart from it as SP wrote, “ *I think if K-Yan comes with some more software like Windows Word, Powerpoint and Excel along with living mic and audio system than it would definitely take us towards the future of digital classroom.*” So the addition of Windows Office package was also desired by participants for effective use of K-Yan.

Additional Hardware Support

Six of the participants (n=6) suggested some add-on hardware for making K-Yan more suitable for promoting activity-based learning in the classroom. An addition of web-cam and microphone will be helpful for the interactive session within different schools. Voice recorder will be great to store audio stories and poems recited by teacher or students for future use or evaluation. Online networking and connection with other mobile devices like tablet PC and smartphones is also desired by participants so that students can work in groups even from their home as PP said in this regard, “*K-Yan’s connectivity should be extended to mobile (smartphone) and tablets learning so that objective based problems can be practiced and teacher can post the link online*”. Such features, if added to K-Yan, will improve its capabilities in many folds.

Improvement of Pre-Loaded Content

Four participants (n=4) recommended for making pre-loaded content in multiple languages so that schools of different mediums can be benefited from it. Also, more contents comprising the whole syllabus should be added especially in the subjects of Geography, History, and Hindi.

Making the K-Yan Unit More Mobile

As only two units of K-Yan was given to each pilot schools so using it by all teachers at one place is not feasible hence three participants (n=3) suggested for a trolley with K-Yan so that it can be easily moved around from class to class.

Training and Co-Operation

K-Yan is just like a PC with many features and it requires continuous training to get properly skilled in using and utilizing it. Participants KR and SC suggested organizing training sessions by block-level trainers and group training among the teachers of each school.

Teacher’s Experience and Effects on Students

The main purpose of K-Yan is to keep students at the center of the learning process and giving a teacher the role of guide or facilitator. Use of K-Yan by the teachers had a great impact on learners as well as on the practice of teaching by the teacher.

Teacher's Experience

All the participants (n=10) used adjectives like 'very useful', 'very helpful', 'hassle free', 'effective', 'attractive' etc. which reflects their satisfaction with K-Yan. Five participants (n=5) mentioned the effectiveness of taking classes using smart board and audio-video features of K-Yan. As MS wrote, "*On using K-Yan instead of traditional method, the smart board made the images and text very attractive for students and videos and animations helped in creating more interest among the students*". Likewise, SN and SP praised the large screen that can be projected in the classroom using K-Yan as it gains attention and creates enthusiasm in students. SP raised the point about teaching a class with a large number of students in absence of K-Yan was a problem but with the arrival of it, SC wrote that now teaching a larger classroom is also possible, though SN and BT suggested for the need of more spacious rooms to accommodate a large number of students. Participants also pointed out that using K-Yan saves time, helped in searching and storing educational content from the net and reduced the dependence on traditional tools of teaching-learning. They also showed concern over more training on K-Yan for developing the skill of properly using it.

Effects on Students

As PP mentioned that teaching platform should be easy for teacher and K-Yan created a great influence on teachers as well as learners by creating a healthy environment for learning. K-Yan has motivated the students and turned them into an active learner. It helped them to be a part of the interactive classroom. Teachers noticed the increase in the achievement level of the learners with the continuous use of K-Yan.

K-Yan Promoting ABML and Transforming Traditional Method

All the participants (n=10) believed that K-Yan is a revolutionary tool of educational technology based on ICT that is helping in transforming the traditional method of teaching by embedding learning with activities and digital learning. Each participant used K-Yan in such a way that it made the classroom interactive and learners were encouraged to learn in groups through various activities. Like KR used it to give them projects which learners used to do in groups and they also used K-Yan to search related content from the net for completing the project. Smartboard was also used to do problem-solving and question answer by KR with active participation of students. DY used K-Yan to show animated versions of textbooks stories available in YouTube and pre-loaded contents of K-Yan. Being a teacher of science and mathematics MS used smartboard very effectively for teaching geometry and construction by using intelispace geometrical tools and pre-loaded lessons. MS also used YouTube to teach properties of chemicals and used smart board to draw diagrams and reactions. It helped in improving teacher-students and student-student co-ordination in the classroom. According to MS such use of K-Yan results in easy learning and improvement in retention by learners. SN strongly advocated the use of K-Yan over the traditional methods as it gives learners a chance of interaction in the classroom. As a community computer SN used it for showing various videos on chapters of geography, for giving projects, conducting quiz and group discussions of students. It has almost abandoned the use of blackboard in the classroom. Similar views were mentioned by SP and PP also that K-Yan has increased the student's activity, participation, interest, and creativity. English teacher BT and SC considered that K-Yan has integrated learning with ICT and it was designed to involve activities in the learning process. Traditional learning is oneway process where learner just remains passive receiver but with K-Yan participation and attentiveness in classroom increases, information can be given to whole class very easily, questions can be asked by showing text, videos, animations, and audios. NC wrote that K-Yan emphasizes on task and time management

and encourage activity based group learning. Unlike traditional methods NC used K-Yan for organizing student feedback session. NC recommended for providing K-Yan to the other developing nations so that community learning using tools of ICT can be encouraged. Finally, BK also considered the use of K-Yan for teaching Hindi far superior to the monotonous traditional way of teaching. So considering all the above opinions and practices followed by participants with K-Yan it is evident that only traditional method will not meet the purpose of teaching-learning in the present scenario. Thus a blended approach combining traditional methods with tools of ET, ICT which promotes the ABML is essential for making learning purposeful for the learners.

DISCUSSIONS

The study was conducted by the author on ten teachers of two different schools from different blocks of Alipurduar district. The objective was to understand the effect of K-Yan on teaching-learning process, how it is transforming traditional methods, learner's response and teacher's experience with it. The study revealed that adding K-Yan in pilot schools of West Bengal by the government was a revolutionary step. It improved the classroom environment and learning outcomes of the learners, teachers are now more efficient and enjoy their profession. K-Yan has added the element of CAL, ICT and digital technology with activity based learning thus transforming the traditional methods of teaching-learning towards the blended approach of teaching-learning. The study also revealed that still, some software issues are there with K-Yan also some structural modification like reducing its weight and making it more mobile is essential. But such issues can be resolved in future upgrades of the machine. Also, teachers asked for more regular skill improvement training on K-Yan. So the tool like K-Yan is a boon for government schools and for making our educational system productive and efficient. At school level, each and every school must be equipped with K-Yan.

REFERENCES

1. Bababe, A., & Zanna, S. (2016). *Impact Of K-Yan Machine On Borno State School Pupils. International Journal Of Law, Education, Social And Sports Studies*, 3(4), 35-38, eISSN: 2394-9724.
2. Barai, B. (2018). *Primary Teachers Attitude Toward Personal Contact Programme – A Quantitative Study. International Journal Of Creative Research Thoughts (IJCRT)*, 6(1), 856-862, ISSN: 2320-2882. Retrieved from <http://doi.one/10.1729/IJCRT.17312>
3. Barai, B. (2018). *A Study On Effectiveness Of Learning Physical Science Through Activity Based Methods At Secondary Level In Alipurduar District Of West Bengal. International Journal Of Creative Research Thoughts (IJCRT)*, 6(1), 289-294, ISSN: 2320-2882. Retrieved from <http://doi.one/10.1729/IJCRT.17295>
4. Barai, B. (2018). *Professional Experiences of Teacher Trainer With K-Yan During Primary Teacher Training Programme. IMPACT: International Journal Of Research In Humanities, Arts And Literature*, 6(9), 195-206. Retrieved from <http://www.impactjournals.us/journals.php?id=11&jtype=2&page=80>
5. Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology. Qualitative Research In Psychology*, 3(2), 77-101. doi: 10.1191/1478088706qp063oa
6. Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (4th ed.)*. Boston: Pearson.

7. Cheung, A., & Slavin, R. (2012). How features of educational technology applications affect student reading outcomes: A meta-analysis. *Educational Research Review*, 7(3), 198-215, ISSN: 1747-938X. <http://dx.doi.org/10.1016/j.edurev.2012.05.002>
8. Davis, C. H. F., Deil-Amen, R., Rios-Aguilar, C., & Canche, M. S. G. (2012). *Social media in higher education. A literature review and research directions. Report printed by the University of Arizona and Claremont Graduate University. Retrieved 01.03.2018 from <https://works.bepress.com/hfdavis/2/>.*
9. Holloway, I., & Todres, L. (2003). *The Status of Method: Flexibility, Consistency and Coherence. Qualitative Research*, 3(3), 345-357. doi: 10.1177/1468794103033004
10. Bikash Barai, *Professional Experiences of Teacher Trainer with K-Yan During Primary Teacher Training Programme, IMPACT: International Journal of Research in Humanities, Arts and Literature (IMPACT: IJRHAL), Volume 6, Issue 9, September 2018, pp. 195-206*
11. Martinovic, D., & Zhang, Z. (2012). *Situating ICT in the teacher education program: Overcoming challenges, fulfilling expectations. Teaching And Teacher Education*, 28(3), 461-469, ISSN: 0742-051X. <http://dx.doi.org/10.1016/j.tate.2011.12.001>
12. Mondal, P. (2014). *Effect Of K-Yan Technology On Enthusiasm For Learning Geography. Golden Research Thoughts*, 4(1), 1-6, ISSN 2231-5063.
13. Rajan, K. (2012). *ICT Enabled Teacher Education. Indian Journal of Experimentation and Innovation in Education*, 1(2), 1-10, ISSN: 2278-1730.
14. Voogt, J., Knezek, G., Cox, M., Knezek, D., & ten Brummelhuis, A. (2013). *Under which conditions does ICT have a positive effect on teaching and learning? A Call to Action. Journal of Computer Assisted Learning*, 29, 4e14. <http://dx.doi.org/10.1111/j.1365-2729.2011.00453.x>.