

# APPLICATION OF MULTIMEDIA AND HYPERMEDIA IN TEACHING AND LEARNING OF TECHNICAL VOCATIONAL EDUCATION AND TRAINING (TVET): THE GLOBAL CHALLENGES

---

*J. O. Nwoko-Ojo, Ph.D*  
*Department of Vocational and Technical Education,*  
*Benue State University, Makurdi,*  
*Benue State.*

And

*Shitmi Nicholas Longkoom*  
*Department of Vocational and Technical Education,*  
*Benue State University, Makurdi,*  
*Benue State.*

## **Abstract**

*Application of multimedia and hypermedia in teaching and learning of Technical Vocational Education and Training (TVET): The global challenges were a survey carried out in Benue State Nigeria. 200 technical teachers from eleven approved government technical colleges were used for as population of the study. No sample was carried out as the number of technical teachers in the eleven approved technical colleges was accessible. Data were collected through a well structured questionnaire tagged multimedia and hypermedia application in teaching and learning of TVET. (MHATVETQ). 30 items questionnaire, validated by three lecturers was used and was tested using test-re-test method to determine the internal consistency of the instrument and coefficient of 0.75 was obtained, using Richardson formula (KR-1). Mean and standard deviation were used in analyzing the data. The result of the study showed that the use of multimedia and hypermedia in teaching and learning of TVET will improve student's achievement and that the adequate provision of funds and facilities will enhance effective teaching and learning of TVET, for students to face the global challenges of world of work.*

Application of multimedia and hypermedia technology in teaching and learning is probably one of the most exciting innovations that have brought about fundamental changes to education. Multimedia and hypermedia technologies and applications are probably one of the most exciting innovations in the age of information evolution. According to Enemali (2015) technology has provided new paradigm shifts in the way we live, read, learn, teach, and work. This technological revolution brings the opportunity to reshape literacy skills in education to prepare citizens for a global multicultural world, and created new opportunities to mankind. Multimedia and hypermedia have the potential to create high quality learning environment, with the capability of creating a more realistic learning context through its different media (Esmaeili, 2015). It also helps a learner to take better control of the classroom especially when the class size is large.

A technological driven global economy challenges demands that people be able to identify problems, gather synthesize data, think critically, synthesize data, make decisions and evaluate the results. Multimedia offers remarkable opportunities and challenges for teaching technical and vocational trades' subjects. The use of multimedia and hypermedia in teaching TVET will augur and even heavier reliance on the products in the classroom and workshops. The system of TVET provides opportunities for the students to practice skills and extend learning by focusing on high level of cognitive skills using specific software applications. The new labour market demands have cause many graduates with various certificates to be unemployed. The massive rate of unemployment and the changing face of economic, social, political labour market in the century have led to new education reforms/policies with emphasis on TVET geared towards the youths and adults to be self – dependent.

Technical vocational education and training (TVET) is used as a comprehensive term referring to those aspects of educational process involving in addition to general education, the study of education and technologies related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life.(UNESCO, 2002). According to Federal Republic of Nigeria (FRN, 2014) TVET is further understood to be: an integral part of general education, a means of preparing for occupational fields and for effective participation in the world of work; an aspect of lifelong learning and preparation for responsible citizenship; an instrument for promoting environmentally sound sustainable development; and a method of alleviating poverty. TVET has been recognized by great scholars in several developed parts of the world as tool for alleviating poverty and enhancing industrial development due to its emphasis on skills acquisition (World Bank, 2002). It is a tool to combat this economic challenges and for personal enrichment.

TVET, world over is an innovative and creative means of acquiring skills, competences aimed at providing the youths, graduates and undergraduates of a given nation the required training to be productive to their society and nations as a whole.

Multimedia and hypermedia offer remarkable opportunities and challenges for teaching technical and vocational education. It is pertinent that educators examine the opportunities and challenges of TVET in globally depressed economy in order to enhance their teaching styles. Multimedia and hypermedia are combination of information presented to different senses (like seeing, hearing and touching) that can be actively influenced by the users via computer application. It is an interactive process between the learners, the learning system and learning materials. According to Vaughan (2003) multimedia involves a combination of text, data, pictures, sound, video among other, as on a CD-ROM compact disc, for interactive access through electronic computer. Meyer (2001) defined multimedia as presenting words (such as printed text or spoken text) and pictures (such as illustrations, photos, animation or video). According to Deliyannis and karydis (2011), multimedia is an extremely wide area that includes the fields of informatics, communications, the audio-visual production sector, cinema and digital. Multimedia refers to the combination of multiple media to effectively convey a message. It is a combination of various digital media types such as text, images, sound and video into an integrated multisensory interactive application or presentation to convey a message or information to an audience.

Hypermedia is an enhancement of hypertext documents, using a non sequential access of text documents, using a multimedia environment and providing users the flexibility to select which document they want to view next based on their current interests. Hypermedia refers to linked media. The combination of media such as video and audio with text makes them multimedia; the ability to navigate from one media / information element to another makes them hypermedia (Babalolo, Kurand Adepoju (2015). Hypermedia is a system that links text to files containing images, sound and video.

From the definition above, multimedia and hypermedia could mean to combine or mix mode of technology such as live virtual classroom, self paced instruction, collaborative learning, streaming, video, audio and text to accomplish an educational goals most especially in learning. Both multimedia and hypermedia are common terms, through their meanings may seem to coincide; there is significant difference between the two concepts.

Multimedia is the presentation of text, graphics, animations, audio and video using computers in an integrated manner, in computers, whereas hypermedia is the compilation of the above media in an interconnected manner. Multimedia and hypermedia is a powerful medium for the teaching and learning of TVET. Multimedia enhances learning through exploration, discovery, and experience. With multimedia, the process of learning can become more goals oriented, more participatory, and

flexible in time and space, unaffected by distances and tailored to individual learning styles. There is a great opportunities in harness a myriad of new information and communication technology resources that can be put to use in the services of TVET (Nwokolo-Ojo, and Nande, 2015). Multimedia and hypermedia are the effective methods of delivering TVET courses. TVET has to do with acquisition of knowledge and skills necessary for the world of work, to increase the opportunities for productive work, sustainable livelihood, personal empowerment and socio-economic development in both urban and rural communities (TVET summit 2007) in (Nwokolo-Ojo&Nande, 2015).

Although multimedia and hypermedia seem to same time, reduce simple learning errors, motivates, arousing interest in participating in teaching and learning, yet it has not been found to be very effective as a problem solving tools. Hence the purpose of this study is to determine the application of multimedia and hypermedia in teaching and learning of TVET and the challenges.

### **Purpose of Study**

The main purpose of the study is to determine the influence of application of multimedia and hypermedia and its Challenges in teaching and learning of TVET. Specifically, the study sought to:

1. Determine whether the use of multimedia and hypermedia approaches as a new teaching tool can influence student's achievement in TVET in higher institutions in Benue State.
2. Determine the factors militating against the effective use of multimedia and hypermedia in teaching and learning of TVET in higher institutions in Benue State.
3. Identify ways of enhancing the use of multimedia and hypermedia for effective teaching and learning of technical and vocational education in higher institutions in Benue State.

### **Research Questions**

1. How can the application of multimedia and hypermedia improve the student's achievement in TVET in higher institutions in Benue State?
2. What are the challenges facing the effective use of multimedia and hypermedia in teaching of TVET in higher institutions in Benue State?
3. What are the ways to enhance the use of multimedia and hypermedia instruction for effective teaching and learning of TVET courses in higher institutions in Benue state?

### **Hypotheses**

The following null hypotheses guided the study and were tested at .05 level of significance.

1. There is no significant difference between the mean responses of federal and state technical teachers on the use of multimedia and hypermedia approaches to improve the student's achievement in TVET in higher institutions in Benue State.
2. There is no significant difference between the mean responses of rural and urban technical teachers on the challenges hindering the effective use of multimedia and hypermedia in teaching and learning of TVET in higher institutions in Benue State.
3. There is no significant difference in the mean responses of male and female technical teachers on the ways to enhance the use multimedia and hypermedia instruction for effective teaching and learning of TVET courses TVET in higher institutions in Benue State.

### **Method**

Descriptive survey research was adopted for the study as recommended by Gall, Gall and Borg (2007) for study that use questionnaires or an interview to collect data from a group or sample that has been selected to represent a population to which the findings of the data analysis can be generalized. The study population comprises all the technical teachers in eleven Government approved technical colleges in Benue state, totaling 200 teachers. The entire population was used for the study. 30 items questionnaire developed by the researchers, tagged multimedia and hypermedia application in teaching and learning of TVET (MHATVETQ) was used for data collection and was validated by two experts from the department of vocational and technical education, and one from curriculum and teaching, Benue State University Makurdi. Validated copies of questionnaire were tested; using test-retest method of establishing reliability on ten (10) technical teachers from Government Technical College Assikio in Nasarawa state, and the reliability co-efficient was .81. Out of 200 copies of instrument administered, 180 copies were retrieved and used for data analysis representing 91percent return rate. Mean statistics was used to answer the research questions while t-test was used to test the hypotheses at .05 level of significance and mean of 2.50 was used as a cut off decision points, any item with mean equal or above 2.50 was regarded as agree and mean scoreless than 2.50 was regarded as disagree.

### **Results**

**Research Question 1:** How can the application of multimedia and hypermedia improve the student's achievement in TVET in higher institutions in Benue State?

**Table 1: Mean and Standard Deviation of Technical Teacher's Responses on How Multimedia and Hypermedia can Improve Student's Achievement in Technical Vocational Education and Training (TVET) in Higher Institutions in Benue State**

S/N	Item statements	X	SD	Decision
1.	Use of multimedia and hypermedia will provide a technology based constructivist learning environment.	2.67	0.57	Agree
2.	Students remember 75percent of what they see, hear, and do simultaneously	2.63	0.56	Agree
3.	Students can be able to solve problem by means of self-exploration, collaboration and active participation	2.50	0.61	Agree
4.	Students can use hypermedia projects to complete a project or term papers	2.90	0.82	Agree
5.	It facilitates high retention rate, hence high recall of knowledge content	2.57	0.90	Agree
6.	Immediate feed-back from interactive session tends to increase students motivation	2.63	0.56	Agree
7.	It is an effective and flexible communication tool in technical and vocational education	3.00	0.91	Agree
8.	The study of materials like animated, graphics, video, and audio integrated in a structural manner facilitate the learning of knowledge much more effective in TVET	2.67	0.58	Agree
9.	It encourages cooperative learning and stimulate teacher and student interaction	2.67	0.58	Agree
10.	It opens up multitude of creative avenues for both students and teachers	3.33	0.92	Agree
11.	It helps the learners to make decision and evaluates progress	3.10	0.85	Agree
12.	It makes learning more students centered	2.70	0.84	Agree
	<b>Grand mean</b>	<b>2.78</b>		<b>Agree</b>

The data in table 1 shows that the teachers agreed on the use of multimedia and hypermedia to improve students' achievements in technical vocational education and training (TVET) with respect to all items. The respondents were homogeneous with standard deviation of 0.56 to 0.92 and grand mean of 2.78. This indicates that the teachers agree that the application of Multimedia and Hypermedia will improve the student's achievement in TVET in higher institutions in Benue State.

**Research Question 2:** What are the challenges facing the effective use of multimedia and hypermedia in teaching of TVET in higher institutions in Benue State?

**Table 2: Mean and Standard Deviation of Teacher’s Responses on the Challenges Facing the Effective Use of Multimedia and Hypermedia in Teaching and Learning of Technical Vocational Education and Training (TVET) in Higher Institutions in Benue State**

S/No	Item statements	X	SD	Decision
1	Inadequate manpower with lack of knowledge which makes them feel reluctant to use multimedia facilities	2.50	0.67	Agree
2	Low infrastructures in many of our technical institutions such as appropriate rooms and building, effective and accessible electricity, telephone and basic facilities for computer based online learning	2.60	0.70	Agree
3	Poor funding of technical education for purchase of information communication technology equipment	3.00	0.54	Agree
4	High cost of the required hardware and software materials	3.20	0.55	Agree
5	Attitudes of lecturers and students towards hypermedia use	2.70	0.87	Agree
6	Memory and storage problems, hypermedia files are bulky and tends to fill the storage space on the computer hard drive quite easily	2.90	0.81	Agree
7	Lack of training and retraining of technical teachers. Teachers need extensive training to be fully utilize in technical education instructions	2.80	0.79	Agree
8	Nigeria power holding company have continued to keep the country in the dark	2.55	0.75	Agree
9	Non affordability of ICT gadgets	2.60	0.82	Agree`
10	Lack of local companies which develop multimedia contents	3.10	0.79	Agree
11	Problem of disorientation	2.80	0.84	Agree
12	Attitudes of school management and authorities towards procuring and installation of ICT devices	2.50	0.67	Agree
	<b>Grand mean</b>	<b>2.77</b>		<b>Agree</b>

Data in table 2 shows that all the item statements with regards to the challenges facing the effective use of multimedia and hypermedia in teaching and

learning of technical vocational education and training were agreed upon. It revealed that twelve items have their mean rating from 2.50 and above. The standard deviation ranges from 0.54 -0.87 and then grand mean also indicate that the opinions of the respondents are synonymous. This implies that teachers agreed that the items listed in table 2 constituted the challenges facing the effective use of multimedia and hypermedia in teaching of TVET in higher institutions in higher institutions in Benue State.

**Research Question 3:** What are the ways to enhance the use of multimedia and hypermedia instruction for effective teaching and learning of TVET courses in higher institutions in Benue State?

**Table 3; Mean and Standard Deviation of Teachers Responses on Ways of Enhancing the Use of Multimedia and Hypermedia in Teaching and Learning of (TVET) in Higher Institutions in Benue State**

S/N	Item statements	X	SD	Decision
1	Establishment of facility for electronic distance learning networks and ensures effective internet connectivity which will provide opportunities for educationally disadvantaged	3.00	0.65	Agree
2	Software for integration of multimedia content should be made available to technical colleges	2.90	0.57	Agree
3	Multi- applications should be provided in adequate number to enable easy access to quality information	2.70	0.56	Agree
4	TVET educators should adopt the use of multimedia and hypermedia in the presentation of concepts where practical is applicable and valid knowledge is required	3.05	0.86	Agree
5	Necessary equipment to access multimedia resources must be available and maintained to provide access to TVET users	2.80	0.90	Agree
6	Use of multimedia and hypermedia should correspond with and to the contents of what is being taught at that time	2.80	0.90	Agree
7	Staff responsible for multimedia resources should belong to and participate in media related professional activities regularly	2.60	0.70	Agree
8	Regulation concerning the use of multimedia and hypermedia will eventually help to be able to evaluate the effectiveness of the process	2.70	0.69	Agree
9	Development of relevant multimedia and hypermedia curricular for TVET	2.90	0.58	Agree
10	Search strategies for multimedia production and utilization of multimedia	2.95	0.91	Agree
11	Training and retraining of teachers on production and utilization of multimedia	3.20	0.89	Agree
12	Employment of adequate, competent and experienced ICT technical staff	3.30	0.62	Agree
	<b>Grand mean</b>	<b>2.91</b>		<b>Agree</b>



The data in table 3 shows that the twelve items have their mean scores more than cut offpoint of 2.50 with corresponding standard deviation and the grand mean of 2.91. This implies that the ways of enhancing multimedia and hypermedia in teaching and learning of technical vocational education and training (TVET), were agreed as listed in table 3 above.

**HO<sub>1</sub>:** There is no significant difference between the mean responses of federal and state technical teachers on the use of multimedia and hypermedia approaches to improve the student’s achievement in TVET in higher institutions in Benue State.

**Table 4:t-test of Mean Responses of Technical Teachers from Federal and State Technical Colleges on the Use of Multimedia and Hypermedia Approaches to Improve Student’s Achievement in TVET in High Institution in Benue State**

<b>Respondents</b>	<b>N</b>	<b>X</b>	<b>SD</b>	<b>df</b>	<b>t-cal</b>	<b>t-critical</b>	<b>Decision</b>
Federal technical teachers	80	17.50	8.72	178	1.18	±1.96	Not Rejected
State technical teachers	100	16.60	4.40				

Table 4 indicates that the calculated t-value 1.18 is less that the critical value 1.96 at 178 degree of freedom and .05 level of significance. Hence the null hypothesis which states that there is no significant difference between the mean responses of federal and state technical teachers on the use of multimedia and hypermedia approaches to improve the student’s achievements in TVET is not rejected. This implies that both technical teachers agreed on the use of multimedia and hypermedia approaches in teaching and learning of TVET will enhance the student’s achievement in higher institutions in Benue State.

**HO<sub>2</sub>:** There is no significant difference between the mean responses of rural and urban technical teachers on the challenges hindering the effective use of multimedia and hypermedia in teaching and learning of TVET in higher institutions in Benue State.

**Table 5: t-test of Mean and Standard Deviation of Respondents on the Challenges Hindering the Effective Use of Multimedia and Hypermedia in Teaching and Learning of TVET**

<b>Respondents</b>	<b>N</b>	<b>X</b>	<b>SD</b>	<b>df</b>	<b>t-cal</b>	<b>t-critical</b>	<b>Decision</b>
Urban technical teachers	80	17.38	7.67	178	1.88	±1.96	Not Rejected
Rural Technical Teachers	100	15.80	6.50				

**Table 5:** the result presents the t-test analysis in table 5 shows that urban and rural technical teacher's response on challenges hindering the effective use of multimedia and hypermedia in teaching and learning of TVET. The t-calculated value 1.88 which is less than t-critical  $\pm 1.96$  at .05 level of significance. Therefore, the null hypothesis is not rejected as non-significant. This implies that both urban and rural technical teachers agreed on the challenges hindering the effective use of multimedia and hypermedia in teaching and learning of TVET in higher institutions in Benue State.

**Table 6: t-test of Mean Responses of Respondents on Ways to Enhance the Use of Multimedia and Hypermedia Instructions for Effective Teaching and Learning of TVET Courses**

Respondents	N	X	SD	df	t-cal	t-critical	Decision
Male technical teachers	100	12.40	6.55	178	1.77	$\pm 1.96$	Not Rejected
Female Technical Teachers	80	11.80	6.10				

Table 6 revealed that the calculate t-value 1.77 is less than t-critical value of  $\pm 1.96$  at 178 degree of freedom and .05 level of significance. Hence, the null hypothesis which states that there is no significant difference in the mean responses of male and female technical teachers on the ways to enhance the use of multimedia and hypermedia instructions for effective teaching and learning of TVET was not rejected. Thus there is no significant difference in their opinions.

### Major findings

1. The study revealed that there is no significant difference; there is evidence that the use of multimedia and hypermedia approaches in the teaching of TVET will improve student's achievements in technical colleges.
2. The study revealed that the following challenges listed on table 2 hindered the use of multimedia and hypermedia for effective teaching and learning of TVET
3. The study revealed that the measures listed in the table 3 should be adopted to improve the use of multimedia and hypermedia instructions for effective teaching and learning of TVET.

### Discussion

The finding of research question one in table 1 indicated that the use of multimedia and hypermedia approaches in the teaching and learning of technical and vocational education and training will improve the student's achievements in technical colleges. This was supported by the Grand mean of 2.78 from table 1. It was revealed also that multimedia is an interactive process between the learner, the

learning system and the learning materials. This is in line with the opinion of Meyer (2001) who stated that multimedia based learning motivates teachers and students, and teachers become guides to learning rather than simply purveyors of knowledge, supplemental tutorials free instructors to help the students gain the conceptual materials, and computer simulations and tools elicit divergent, not converge, responses for students.

The table 2 shows that inadequate manpower, low infrastructures such as appropriate rooms and buildings, effective and accessible electricity and basic facilities for computer based online learning are among the challenges facing the use of multimedia and hypermedia in teaching and learning of TVET. This is in consonance with Enemali (2015) who pointed out that acceptable level of success can be attained if teachers and students be supported to engage on hands- on –training wherever they are available, and that basic, comprehensive and sustained training and retraining programmes for the teachers and students will empower them to use technology with confidence. The author further stressed that the project must be properly planned and funded to ensure sustainability and that teachers are more likely to integrate computers and the internet into their instructions, if they have access to adequate number of computers and connections in the classrooms. According to Nwokolo-Ojo, Igwe and puyete (2016), many schools that are fortunate to have some computers, do not have the laboratory, if at all there is, and thus the usage of multimedia and hypermedia is hindered.

The findings on the research question three in the table 3 reveals that establishment of facilities for electronic distance learning networks and ensuring effective internet connectivity will provide opportunities for educationally disadvantaged in TVET. This findings agrees with previous findings of Udonudoh and Dahwah(2015) who remarked that multimedia facilities can provide an enhanced or augmented learning experience at a low cost per unit, making the process of learning more purposeful, participatory, and flexible in time and space, and modified toward individual learning styles that unleashes a long term gain to all. The high value and potentials of hypermedia as an educational technology tool for teaching TVET cannot be obtained without paying greater attention to the hypermedia development tools (facilities). Multimedia and hypermedia offer remarkable opportunities and challenges for teaching technical vocational education and training, hence, it is pertinent that technical teachers examine the opportunities of the new technologies in teaching TVET in order to enhance their teaching styles and student's achievement.

## **Conclusion**

Based on the findings of this study, it has been learnt that multimedia and hypermedia approaches in teaching and learning of TVET has enormous potentials to impart flexible and lifelong education to learners. Evidence suggests that interactive

video, simulations, models, animated graphics have special effective when the skills and concepts to be learned have a visual component and software incorporate a research-based instructional design, it demonstrates a significant positive effect on students achievements. Hence, it was concluded that using multimedia and hypermedia in teaching and learning of TVET is one of the effective approaches at technical colleges, since it has the potentiality of improving student's academic achievements, interest and retention towards TVET.

### **Recommendations**

Based on the findings of the study, the following recommendations were made:

1. Government and the administrators of technical vocational education and training programmes should organized workshops, conferences, and seminars to train TVET teachers on current trends on the use of multimedia and hypermedia instructions.
2. Governments and stakeholders of technical colleges should provide adequate funds and infrastructures to TVET programme. These funds should be for purchasing of software, computers hardware facilities and internet networks that will enhance the effective teaching and learning of TVET and to face the challenges of the world of work.
3. Government should encourage local companiells to develop TVET related multimedia and hypermedia contents of what is been taught at that time, and to enable easy access to quality information.
4. Deliberate effort should be made to improve the supply of electricity to support infrastructure and regular supply of power to ICT systems.
5. Technical teachers responsible for multimedia resources should belong to and participate in media related professional activities regularly.
6. Curriculum of TVET should be re-designed to include the multimedia and hypermedia approaches, and the curriculum developers, planners, and implementers, should be effectively and efficiently trained on the use of interactive multimedia and hypermedia, for the enhancement of student's achievement.

### **References**

- Babalola G.A, Kur, J.T. and Adepoju S.A (2015).Improving the productivity of rural populace through multimedia and hypermedia tools in Oluyole Local Government Area of Oyo State, Nigeria. *Proceedings of 3<sup>rd</sup> international conference of School of Science and Technology Education, F.UT.Minna.*
- Deliyannis, I. and karydis, I (2011). Producing and broadcasting non-linear art- based content through open source interactive internet –TV, *ACM, EURO 1 TV, Lisbon Portugal.*

- Enemali, J.D. (2015). Building technology based skills for quality delivery of technical vocational education and training through multimedia and hypermedia instructions. *Proceedings of 3<sup>rd</sup> international conference of School of Science and Technology Education, FUT Minna.*
- Esmaeili, A. (2015). Enhancing information management, science and technology education through interactive multimedia and hypermedia instructions. *Proceedings of 3<sup>rd</sup> international conference of school of science and technology Education, FUT Minna.*
- Federal republic of Nigeria (2014). *National Policy on Education*. Abuja: NERDC press.
- Gall, M.D.; Gall, J. P. & Borg, W.R. (2007). *Educational research: An introduction*. Boston; Pearson Educational.
- Meyer, R.E. (2001). *Multimedia learning*. New York: Cambridge University press.
- Nwokolo- Ojo, J.O, Igwe, C.O. & Puyete, S.T. (2016). Relevance of multimedia and hypermedia instructions in enhancing the teaching and learning of industrial technology education. *Journal of teachers of technology (JONNAT)*.11(1), 119-129
- Nwokolo-Ojo, J.O. and Nande, B.K. (2015). The effect of the use of e-learning in teaching technical education and training for job creation and employment opportunity. *Proceedings of 3<sup>rd</sup> international conference of School of Science and technology Education, FUT, Minna.*
- Udonudoh, S.J. & Dahwah, M.K. (2015). Enhancing Library and Information Management through multimedia and hypermedia instructions. *Proceedings of School of Science and Technology Education, FUT. Minna.*
- United Nations Educational Scientific and cultural organization.(2002). Technical vocational education and training. *UNESCO and ILO recommendations. Paris and Geneva: Authors.*
- Vaughan, T.(2003). *Multimedia technology. EDUCAUSE*. <http://www.educause.edu/pub/er/ermoo/article>.
- World Bank (2002). *World development report (2000/2001)*. Washington: Author