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STUDY AND EVALUATION OF AN INNOVATIVE PEDAGOGICAL TOOL EDUCATIONAL SYSTEM: COMPUTER ASSISTED INSTRUCTION

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Abstract- Among the new techniques of information and communication opening the way to effective learning, the computer-assisted instruction (CAI). The aim of this work is the evaluation of the contribution of this practice on the assimilation of the course (C), tutorials (T), and practical work (PW) of the subject of physics and chemistry, in students of the qualifying secondary. This study concerns 48 teachers of physics (aged from 30 to 50 years), practicing in public high schools (region of Rabat- Sale-Kenitra). A questionnaire composed of 15 items was established and validated (Cronbach's alpha 0.7). The results show that 33.3% responded that they use this practice to teach the course, 16.7% to teach the T, and 50% to teach the PW. Moreover, the chi-square test shows a significant association between satisfaction with CAI and certain factors such as performance (p<0.001) and interaction with students, especially in practical work (p<0.002). However, the respondents encountered some difficulties such as; I did not receive enough training (43.8%); lack of time (18.8%), (16.7%), lack of equipment, and (20.8%) high number of students per class. In light of this situation, the authorities must intensify their efforts to facilitate the integration of physics teachers into this program.

Keywords: Teacher, CAI, Interaction, Physics-Chemistry.

1. INTRODUCTION

Information and communication technologies (ICT) are a good way to learn abstract concepts in physics and chemistry. Computer-assisted instruction is the most requested of these techniques. Indeed, the use of audiovisual equipment to present effective teaching is now indispensable during the teaching period [1]. The increasing availability of software and equipment in schools makes them easily accessible [2, 3]. Teachers who prepare themselves and their students for the information age need to get used to the ICT-supported school culture as soon as possible [4]. Teachers can quickly obtain and convey new information to their students using educational techniques. According to many types of research, computers are not specifically used by most teachers, although they are readily available [5]. Lack of information and insufficient education are important problems in use of computers in education [6, 7].

According to [8], computer-aided materials for electrostatic physics have facilitated student success. Around the world, some governments are seeking to integrate CAI programs into their education policies [9]. Many teachers in the United States are not adequately trained to use computers in the classroom [10], teachers need more time and support from school leadership to integrate technology into education and develop new educational plans, advanced applications, and conferences [11, 12]. In Japan, the level of success has increased in classes equipped with "multimedia" facilities. In Israel, the success rate of mathematics courses has increased from 42% to 99% due to the development of medium-column software and its application through computer-assisted instruction [13]. Schools in the U.S. have been embracing technology for years in the hope that students and teachers will use it to increase their success and effectiveness. However, in Morocco, there are constraints to the integration of CAI, mainly the lack of infrastructure and equipment, as well as the unavailability of trainers specializing in this technique, a fairly high number of learners per class, and a more complicated curriculum content [14]. This study aims to evaluate the contribution of the computer on the assimilation of the course (C), tutorials (T), and practical work (PW) in the teaching of physics chemistry to public secondary schools in the region Rabat Sale Kenitra.

2. METHODOLOGY

2.1. The Population of the Study

This is a prospective and cross-sectional study of 48 physics teachers working in public high schools in the region of Rabat Sale Kenitra during April and May 2022.

2.2. Development of the Questionnaire

First, better documentation of the scientific advances in the field was necessary to identify the main elements of our study beforehand. The questionnaire included a part describing the socio-demographic and scientific profile of physics educators and the other part describing the factors determining use of computers in their teaching as Table 1.

Table 1. The survey items

Item	Label
1	Did you take computer courses during your university years?
2	Have you taken further training in computer learning?
3	Have you improved your skills?
4	Does your institution have a room equipped with computer tools?
5	Do you have a personal computer?
6	Do you have an internet connection?
7	Did you use CAI in lessons (L)?
8	Did you use CAI in Tutorials (T)?
9	Did you use CAI in Practical work (PW)?
10	How do students interact with the CAI in lessons (L)?
11	How do students interact with the CAI in Tutorials (T)?
12	How do students interact with the CAI in Practical work (PW)?
13	What difficulties have you encountered in using CAI?
14	Did you feel a change in learner performance after using CAI?
15	Propose suggestions?

2.3. Statistical Analyses

The collected data were entered into Excel after filtration and coding were transferred to SPSS (trial version). The results of the qualitative variables were expressed as percentages and those of the quantitative variables as mean± standard deviation. Joint analyses, such as PCA (principal component analysis), were performed to an error of 5% (Pearson correlation; chi2 test of independence, Z score method).

3. RESULTS

3.1. Socio-Demographic Characteristics

The results of the distribution of the teachers surveyed according to age, gender, number of years in the position, and province of practice are illustrated in Table 2. Indeed, 68% of the teachers surveyed are between 30 and 50 years old, 27% of whom are women. However, 54% have been in their position for between 5 and 15 years, 46% have a bachelor's degree and 38% have a master's degree.

Table 2. Socio-demographic characteristics of the sample

Variable	Modality	ni	%
Age	Under 30 years	2	4%
	30 to 40 years	16	33%
	40 to 50 years	17	35%
	Over 50 years	13	27%
Gendre	Male	35	73%
	Female	13	27%
Seniority	Under 5	1	2%
	5 to 10 years	9	19%
	10 to 15 years	17	35%
	Over 15 years	21	44%
Province	Kenitra	23	48%
	Rabat	8	17%
	Sale	5	10%
	Tamara	3	6%
	Sidi Slimane	3	6%
	Sidi Kassem	2	4%
	Khemeissat	4	8%
Last university degree	License	22	46%
	Master	18	38%
	Doctorate	8	17%

Ni: absolute frequency

3.2. Validity and Reliability of the Questionnaire

This section aims to minimize systematic errors (validity) and random errors (reliability). The Cronbach's alpha coefficient calculated for the whole questionnaire is equal to 0.762, with an eigenvalue of 3.462 and an inertia of 0.231. This coefficient is higher than 0.7. It corresponds to the acceptance criteria of a questionnaire (a good global coherence of the questionnaire items). Cronbach's alpha decreased if the item was deleted, Table 3.

Table 3. Partial Cronbach alpha coefficient for item deletion

I	*a*	*R*	*P*
1. computer training	0.502	0.094	0.609
2. continuing training	0.489	0.171	0.351
3. Improved	0.481	0.317	0.05**
4. equipped room	0.528	-0.112	0.542
5. personal computer	0.459	0.345	0.05*
6. internet connection	0.470	0.271	0.133
7. CAI in Courses	0.453	0.376*	0.034*
8. CAI in Tutorial	0.461	0.336	0.050*
9. CAI in Practice work	0.462	0.329	0.05*
10. difficulties encountered in using CAI	0.551	0.275	0.127
11. students interact with the CAI course	0.381	0.619**	0.000***
12. students interact with the CAI Directed work	0.381	0.622**	0.000***
13. students interact with ' CAI Practical work	0.360	0.661**	0.000***
14. learner performance after using CAI	0.433	0.504**	0.003**
15. propose suggestions	0.504	0.280	0.121

*** very highly significant difference; ** highly significant difference; * significant difference; ns: no significant difference;
I: Items, *a*: Cronbach Alpha in case of element deletion, *r*: Correlation with the total score, *P*: p-value

This section provides the teacher's responses to each item on the questionnaire about factors that influence the teaching of concepts-physics/chemistry through the use of computer-assisted work.

- 60.4% of the respondents reported having computer training, 62.5% did not have any continuing education, 40.6% reported that the training improved their practice, 34.4% improved their skills, and 25% of their knowledge.
- Regarding educational equipment, 68.8% responded that their school has a well-equipped room. 85.4% and 81.3% of teachers reported having a computer and an Internet connection, respectively.
- In addition, the frequency with which teachers use the (CAI for teaching, Course, T, and PW is 33.3%, 16.7%, and 50%, respectively).
- In terms of difficulties encountered, I did not receive enough training (43.8%); lack of time (18.8%), (16.7%), lack of equipment, and (20.8%) a high number of students.
- The teachers state that students have a moderate level of interaction with the course, T, and PW, while 66.7% confirmed that students' performance improved after the implementation of CAI.
- In terms of suggestions, respondents suggest good practices in training and room equipment.

3.3. Principal Component Analysis

To reduce the number of variables and to look for possible correlations we used PCA (Figure 1). This projection identified two distinct groups.

➢ The first group is located on the positive side of axis 1. This group includes items 10, 11 and 12. Indeed, the teachers in this group declare that they find it difficult to interact with the students in class and class because of lack of equipment and time as well as high number of students.

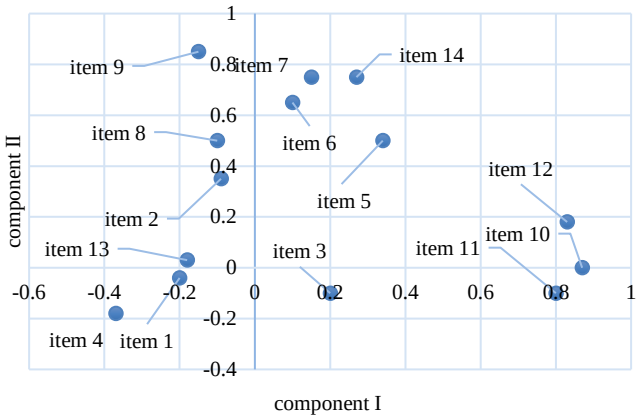

Figure 1. Presentation ACP of items

➢ Group 2 is located on the positive side of axis 2. It includes items 6, 7, 8, 9, and 14. Indeed, the teachers interviewed in this category stated that they had an Internet connection and admitted to using this CAI method to teach C, T, and P. These teachers confirmed that the students had learned more about this method.

3.4. Search for Determining Factors

To break down the different categories, we transformed the scores (sum of item scores) into a reduced cantered value (z-score method), according to the following recommendations:

- Less than -1 z: person strongly disagrees;
- Between -1 and 1 z: person to watch out for;
- More than 1z: person strongly agrees

The results of this Z-score classification show that 21.9% of the teachers do not agree with this type of computer-assisted instruction compared to 15.6% of the respondents who strongly agree, but more than 62.5% are in a risk zone, so they should be monitored.

Table 4. Chi2 test between category and some socio-demographic variables

Item	Modality	Category			T	*p*-value
		Not Ag	M	All Ag		
learner performance after using the CAI	Non	5	2	0	7	13,11** (p<0,001)
	Yes	2	18	5	25	
Students interact with 'CAI in Pw	Weakly	5	1	0	6	21,10** (p<0,002)
	Moderately	2	8	2	12	
	Well to every	0	11	3	14	
personal computer	Non	3	3	0	6	3,69* (p<0,05)
	Yes	4	17	5	26	

* Significant difference, ** Highly significant difference
Ag: Agree, M: Monitor, T: Total

Table 4 presents the results of the chi-square test of independence between the categories and certain associated variables. Indeed, the chi2 test shows a significant association with the variables indicated in the table (p<0.05). Moreover, the teachers who declared having a laptop and an internet connection confirm that the students interacted well with CAI, especially for PW.

4. DISCUSSION

In Morocco, the education sector has opened its doors to digital technology, and despite the efforts undertaken by national education officials in terms of generalizing ICT, current Moroccan teaching practices remain classical. In addition, several programs have interested sector leaders such as NAFIDA (initiated by the Mohammed 6 Foundation, internet + pc; 2008), INJAZ (2009-2012) and GENIE (2008), have been able to make available to teachers and students a service for access and use of ICT to ultimately improve the quality of education and training. According to [15, 16] research teachers generally have a positive attitude towards the use of ICT in solving differential equations and quantum mechanics. Therefore, the main objective of our study carried out on 48 teachers, is to evaluate the use of the computer as a technological tool. Our results show that 33.3%, 16.7%, and 50% declare to apply the CAE system, respectively, in the teaching of courses (C), (TD), and (TP).

Also, [17] confirmed in his study that teachers were able to develop pedagogical content knowledge of technology to teach science and mathematics using computers. According to [18], his work shows that the methodological bases of the development and implementation of computer technologies in education have improved teaching methods. On the other hand [19] confirmed that teachers of Biology and Chemistry find it difficult to use the computer as a teaching tool in their classes. In our sample, the results regarding computer-based self-study, show that 60.4% of the respondents had received training. A rate is described as important because, since 2012, the CRMEF (Regional Center for Education and Training Professions) has received teacher training [19, 20]. To ensure good computer training, managers have thought of implementing quality computer training that requires real teacher training [22].

Nevertheless, our respondents admitted that students interact positively with the hands-on sessions. [23] confirmed that most teacher candidates feel competent in using educational technologies. However, [24] show in their research that the application of computer-assisted instructional methods in elementary school mathematics classes increased student achievement and a positive path to mathematics. A criterion most often considered to contribute to the effectiveness of CAI sessions is the interaction between teacher and student. As was indicated by [25], computers and other technologies are essential tools for innovative teaching and play an important role in the interactions between teachers and learners. Although this technique is very reliable, it has some advantages as well as disadvantages such as very fast and cheap access to information, risk of computer breakdown or lack of Internet speed, which will make it impossible for students to follow the course.

In his research, [26] showed that most teachers would prefer to make better use of technology in their classes and [27] reported in his research that teachers believed that using computers in teaching would improve the quality of education and would not increase the workload.

The present study reveals that the level of application of computers to course teaching, tutorials, and practical work remains below the desired level. In addition, and according to our results, the difficulties that hinder the use of computers and educational technologies are the lack of time, lack of equipment and the high number of students per class as well as these teachers said they did not have sufficient training on this concept, these results are consistent with those obtained by [25, 26]. Socioeconomic status and access to digital tools thus represent an obstacle to the diversity of uses [28]. A study conducted by [29] on the integration of flipped classrooms in the teaching of life and earth sciences showed a positive effect on the improvement of learners' performance. According to the study of [30] the impact of the e-learning method on improving the quality of teaching showed that the success rate increased during the year of using the platform. However, the new technologies based on the use of artificial intelligence allow the educational system to progress [31]. The studies of [32] highlight that a virtual laboratory allowed high school students to improve their critical thinking and creative skills.

5. CONCLUSION

The subject we have addressed concerns the use of computers in the teaching of secondary school students in the Kenitra Sale Rabat region. Thus, the results obtained show that the level of application of this CAE method remains well below the will of the authorities responsible for national education. Therefore, it is necessary to adapt this technique to the Moroccan educational programs, while insisting on quality, richness, and flexibility. However, the most important point to check is the accompaniment of the pedagogical action while providing the technological tools at the disposal of the actors of education. Moreover, the application of technological media does not give a guaranteed guarantee of the effectiveness of teaching. Nevertheless, it is the adequate strategy of systematic planning of the subject, and the methods and techniques of teaching that guarantee a better teaching.

In addition, to improve the degree of integration of CAI into the curriculum, the teachers surveyed suggested;

- The provision of adequate technical support to use computers for practical purposes in the classroom
- In-service training for teachers in the use of CAI
- An incentive to include instructional materials

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REFERENCES

[1] M. Mastafi, "Roles and Impacts of ICT in the Teaching and Learning of Mathematics: Perceptions of Secondary School Teachers", Formation-Profession, Vol. 28, No. 2, p. 60, 2020.

[2] Z.M.A. Abu Laila, "Teaching French Grammar in FLE Class: What Methods Should be Adopted?", Journal of Arts and Humanities, Vol. 8, No. 3, pp. 12-24, 2019.

[3] B.S. Bloom, D.R. Krathwohl, "Taxonomy of Educational Objectives: The Classification of Educational Goals". Book 1, Cognitive Domain, pp. 15-27, Longman, New York, USA, 2020.

[4] H. Knoerr, "ICT and Motivation in Language Learning/Teaching - A Canadian Perspective", Research and Pedagogical Practices in Specialized Languages, Notebooks of the Apliut, Vol. XXIV, No. 2, pp. 53-73, June 2005.

[5] J. Njiku, J.F. Maniraho, V. Mutarutinya, "Understanding Teachers' Attitude Towards Computer Technology Integration in Education: A Review of Literature", Education and Information Technologies, Vol. 24, pp. 3041-3052, 2019.

[6] S.L. Mason, P.J. Rich, "Preparing Elementary School Teachers to Teach Computing, Coding, and Computational Thinking", Contemporary Issues in Technology and Teacher Education, Vol. 19, No. 4, pp. 790-824, 2019.

[7] Z. Yilmaz, A. Sahin, "An Analysis of Elementary Schools Teachers' Classroom Control Levels", Universal Journal of Educational Research, Vol. 4, No. 6, pp. 1387 - 1394, 2016.

[8] D.H. Guzel, "Factors Affecting the Computer Usage of Physics Teachers Working at Private Training Centers", The Turkish Online Journal of Educational Technology, Vol. 10, pp. 122-132, 2011.

[9] N.P. Hunt, R.M. Bohlin, "Teacher Education Students' Attitudes Toward Using Computers", Journal of Research on Computing in Education, Vol. 25, No. 4, pp. 487-497, 1993.

[10] P. Hallinger, "Methodologies for Studying School Leadership: A Review of 25 Years of Research Using the Principal Instructional Management Rating Scale", Annual Meeting of the American Educational Research Association, p. 48, New York, USA, 2008.

[11] M. Honey, A. Henriquez, "Telecommunications and K-12 Educators: Findings from a National Survey", Center for Technology in Education, New York, Office of Educational Research and Improvement (ED), Washington DC, Reports Descriptive (141), Reports Research/Technical (143), p. 28, USA, 1993.

[12] N.J. Mothobi, "A Cross-Country Comparison of Mathematics Teachers' Beliefs about Technology Pedagogy and Content Knowledge", PhD Thesis, University of Pretoria, p. 62, Pretoria, South Africa, 2018.

[13] M. Honey, B. Moeller, "Teachers' Beliefs and Technology Integration: Different Values, Different Understandings. Technical-Report No. 6", Sponsor: Office of Educational Research and Improvement (ED), Washington, DC, Authoring Institution: Center for Technology in Education, p. 16 New York, NY, USA, 1990.

[14] M. Ben Ouahi, D. Lamri, T. Hassouni, A. Ibrahmi, E. Mehdi, "Science Teachers' Views on the Use and

Effectiveness of Interactive Simulations in Science Teaching and Learning", International Journal of Instruction, Vol. 15, No. 1, pp. 277-292, 2022.
[15] S. Dachraoui, K.A. Bentaleb, T. Hassouni, E.M. Al Ibrahmi, A. Taqi, "Interaction between Physical Sciences and Mathematics - Case of Differential Equations in the Curricula of Final Science Classes", International Journal on Technical and Physical Problems of Engineering (IJTPE), Issue 51, Vol. 14, No. 2, pp. 167-175, June 2022.
[16] K.A. Bentaleb, S. Dachraoui, T. Hassouni, E.A. Ibrahmi, A. Belboukhari, M. Cherkaoui, "Effectiveness of Integration of new ICTS in Teaching/Learning of Quantum Concepts", International Journal on Technical and Physical Problems of Engineering (IJTPE), Issue 51, Vol. 14, No. 2, pp. 314-321, June 2022.
[17] A. Bostancıoglu, Z. Handley, "Developing and Validating a Questionnaire for Evaluating the EFL 'Total PACKage': Technological Pedagogical Content Knowledge (TPACK) for English as a Foreign Language (EFL)", Computer Assisted Language Learning, Vol. 31, No. 5-6, pp. 572-598, July 2018.
[18] S. Medetbayeva, N. Akhmetov, "Psychological and Pedagogical Problems of Computer-aided Teaching of Natural Sciences", International Journal of Emerging Technologies in Learning (IJET), Vol. 16, No. 20, pp. 208-222, 2021.
[19] J. Batistella, "The Computer as a Tool in the Teaching/Learning of Biology and Chemistry: Concepts and Perspectives of Teachers and Students in a Public School of Sinop-MT", Multidisciplinary Scientific Journal Nucleus of Knowledge, Vol. 4, No. 6, pp. 52-67, June 2018. www.nucleodoconhecimento.com.br/quimica-en/computer-as-tool-in-teaching
[20] M. Lahchimi, "The Reform of Teacher Training in Morocco", Sevres International Review of Education, No. 69, pp. 21-26, 2015.
[21] R. Iqdour, O. Serrar, O. El kheir Abra, "Training of Computer Science Teachers in Morocco: A Critical Look", in ITM Web of Conferences, EDP Sciences, p. 03009, 2021.
[22] I.S. Agbo, "Factors Influencing the Use of Information and Communication Technology (ICT) in Teaching and Learning Computer Studies in Ohaukwu Local Government area of Ebonyi state-Nigeria", Journal of Education and Practice, Vol. 6, No. 7, pp. 71-86, 2015.
[23] R. Bibeau, "Information and Communication Technologies Can Help Improve Students Academic Results", Association Education Public of Informatic (EPI), EpiNet, No. 94, 2009.
[24] K. Asenso Okyere, D.A. Mekonnen, "The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa", African Human Development Report", The UNDP Sponsored Research Series, 2012.
[25] R. Brent, C.E. Brawner, P. van Dyk, "Factors Influencing Student Teachers' use of Technology", Journal of Computing in Teacher Education, Vol. 19, No. 2, pp. 61-68, 2002.
[26] S. Baroudi, N. Shaya, "Exploring Predictors of Teachers' Self-Efficacy for Online Teaching in the Arab World Amid COVID-19", Educ. Inf. Technol., Vol. 27, No. 6, pp. 8093-8110, July 2022.
[27] Q. Liu, S. Geertshuis, R. Grainger, "Understanding Academics' Adoption of Learning Technologies: A Systematic Review", Computers and Education, Vol. 151, p. 103857, July 2020.
[28] M. Payn, L. Derrac, L. Alvarez, "The Transfer of Digital User Skills", Interfaces Digital, Vol. 11, 2022, https://folia.unifr.ch/global/documents/322601
[29] S. Boubih, A. Aidoun, M. El Alaoui, R.J. Idrissi, "The Effectiveness of the Flipped Classroom in a Teacher Training Context", Universal Journal of Educational Research, Vol. 8, No. 11B, pp. 6061-6071, 2020.
[30] I. El Khalkhali, "Role of E-Learning in Improving the Quality of Education at the National School of Commerce and Management of Tangier", The Journal of Quality in Education, Vol. 5, No. 5BIS, p. 9, 2014.
[31] R. Baker, "Artificial Intelligence in Education: Bringing it all Together", Digital Education Outlook: Pushing the Frontiers with AI, Blockchain, and Robots, OECD, pp. 43-54, Paris, France, 2021. www.upenn.edu/learninganalytics/ryanbaker/oecd-baker.pdf.
[32] S. Sapriadil, et al., "Effect of Higher Order Thinking Virtual Laboratory (HOTVL) in Electric Circuit on Students' Creative Thinking Skills", J. Phys.: Conf. Ser., Vol. 1204, No. 1, p. 012025, April 2019.

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