Learning with Tablets in the Primary School: Learners' Perceptions and Impact on Motivation and Academic Performance

E. A. Rahali*, A. Chikhaoui, K. E. Khattabi, and F. Ouzennou

***Abstract*—This article aims to evaluate the influence of using tablets for learning in the Moroccan educational context on learners' motivation and academic performance. To do this, we conducted research in primary school, consisting of two stages: the first is based on a questionnaire, which we used to probe the perceptions of learners towards learning with tablets, and the influence of this practice on their motivations; And the second is an experimentation with tablets in classroom to assess the impact on academic performance. Two groups, respectively of 30 and 35 learners, participated in this second part of the study, in which we used student's t statistic to compare two independent samples. The results showed, on the one hand, a strong motivational power of the use of the tablets on the learning process; and on the other hand, a positive impact on the learners' academic performance.**

***Index Terms*—Digital tablets, learner perception, motivation, perceived self-efficacy, academic performance**

I. Introduction

Technology has become ubiquitous in our society, which is increasingly dependent on information and knowledge [1, 2]. It has influenced and transformed the way we work and think in almost all areas of daily life. Educational world is not exempt from this influence. Since the arrival of information and communication technologies (ICT) on the market, educational leaders are constantly finding their place in teaching practices. Thus, technology is seen as a catalyst that can reorganize the teaching and learning process [3, 4]. It is no longer a question of refusing or accepting the integration of ICT into teaching practice, but of evaluating its impact on the teaching and learning process in order to exploit its advantages [5–7].

Nowadays, technology is becoming more and more mobile. This technological advancement is considered one of the new paradigms of high-quality education [3] cited in [8]. Studies have pointed out that K-12 schools are recognizing mobile devices as important learning tools with a wide range of classroom applications. In particular, the digital tablet appears to have strong pedagogical potential, presenting itself as the most suitable tool for this kind of practice [9–13]. It is light, mobile, tactile and connected, combining computer capabilities with smartphone ergonomics and operability. For this reason, it has become a central point of research and discussion in educational communities [14] cited by [15]. Several studies have highlighted the benefits of the digital tablet in school practice [10, 16–21]. A study conducted in the United Kingdom found that "touch screen technologies are an intuitive and engaging source of sensory and cognitive stimulation for young children" [22]. Other research has shown that digital tablets are likely to boost students' academic motivation [12, 23–27]. In a study conducted in Quebec, Supper *et al*. [28] highlighted the link mediated by self-determined motivation of learners, between tablet use and academic performance. Thus, it appears that learning with tablets stimulates learners' motivation, which translates into greater commitment to the assigned tasks, and consequently good academic performance [12, 24, 29, 30].

It is in this perspective that this study is conducted. Its objectives are to evaluate the influence of using tablets for learning on learners' motivation in a Moroccan context; and subsequently the evaluation of the impact on academic performance. The study was conducted in a primary education context where the tablet has been tested since 2017-2018 school year.

This article is structured as follows: after an introduction that contextualizes the objectives of the study, we present research questions. Then, we present the methodology used and the results obtained. Next, we discuss the results, and we end by identifying the limitations of the study and a conclusion.

II. Research Questions

To achieve the above objectives, this study aims to answer the following research questions:

- What are learners' perceptions of learning with digital tablets?
- What is the impact of using tablets for learning on learners' motivation?
- What is the impact of using tablets for learning on learners' academic performance?

III. Methodology

A. Study Site

To answer the above questions, we investigated the primary schools in the region of Beni Mellal-Khenifra in Morrocco, to find schools that are equipped with digital tablets and use them in the classroom. We found 13 schools spread over the 5 provinces of the region at a rate of 2 to 3 schools per province. This endowment was made within the

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framework of a project called "Samsung Smart School", between the Ministry of National Education and Samsung Maghreb Arab company. Each school has benefited from a case containing 11 to 16 tablets during the 2017-2018 and 2018-2019 school years. This means that these schools have been using the tablets for three to four years. We felt that this period of time was sufficient for students to have a clear perception of learning with this tool. We note that Moroccan primary education consists of six grades.

B. Participants and Data Collection

This study is developed in two stages as follows:

1) Stage 1

In the first stage, we chose one of the 13 schools mentioned above. This school is one of the 3 large schools benefiting from the tablets, and has the advantage of being more accessible given the restrictions dictated by the Covid-19 pandemic. A questionnaire survey was administered to students using tablets two to three times a week for classroom learning. This anonymous questionnaire is an adaptation of the one developed by Karsenty, Goyer, and Villeneuve *et al.* [31]. It consists of 18 items, addressing aspects of learning related to using tablets. To validate the content of this questionnaire, three experts in the field of information and communication technology (ICT) reviewed all items and made necessary corrections. A pre-test of the survey was conducted one week prior to the study to ensure clarity of questions asked.

There were 96 respondents. We discarded 15 returns because they contained incomplete answers or multiple answers for the same question. The number of valid responses was 81 (male: 43.2% and female: 56.8%). Their ages range from 8 to 14 years with an average of 11.52 years. The majority of respondents are in the 6th grade of primary school. The following Fig. 1 shows the distribution of respondents by gender and school level.

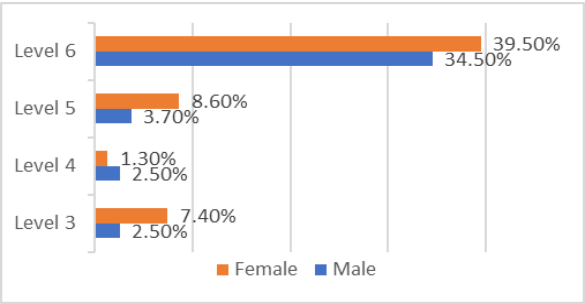

Fig. 1. Distribution of respondents by gender and grade.

2) Stage 2

In the second stage, we experimented with tablet-based learning in the second school level. This experimentation covered two weeks of “listening and conversation” learning unit of an Arabic language course. The pedagogical scenario is explained in the table in the appendix. During this stage, we administered the same course to two classes with same teacher. One class of 35 learners used tablets (and its accessories: headphones and speaker), and a control class of 30, used traditional tools (Pictures, textbook, board, pens... etc.). The experiment lasted two weeks. The average of the last two grades obtained in the tests given in the same learning unit was used as a pre-test to evaluate learners’ levels before the experimentation.

C. Data Collection

Two types of data were collected:

1) Data from the questionnaire: in addition to demographic data, it includes 18 items covering 4 aspects: perception of usefulness of tablets for learning, perception of affective feeling induced by using tablets, perception of feeling of self-efficacy related to tablets and perception of feeling of success related to using tablets. The 18 items are in the form of a 5-point Likert scale (1 for "not at all" and 5 for "very strongly").
2) Quantitative data from the classroom experiment: these are the learners’ learning assessment scores, before and after the experiment.

D. Analysis of Results

Data collected from both stages of this research were analyzed by SPSS version 28 software. In the first stage, we used descriptive statistics; and we checked the reliability of the questionnaire items by Cronbach’s alpha coefficient [32] [33]. In the second stage, we used inferential statistics, where student’s t-test for comparison of two independent samples was used. The normality of data was checked by analyzing the kurtosis and skewness coefficients supported by Q-Q plots. Homoscedasticity was checked by Levene’s F test, and failing that by Welch’s correction. And the measure of effect size was demonstrated by Cohen’s d statistic [34].

IV. Results

A. Results of the First Stage

1) Reliability of the questionnaire

The internal reliability of the questionnaire constructs is calculated by Cronbach’s alpha. We removed two items (5 and 13) from the first dimension “perceived usefulness of tablets for learning” to ensure the required reliability. The alpha value for the entire questionnaire is 0.801. The Table I shows the results for each group of items.

TABLE I: Reliability of Items Measured by Cronbach’s Alpha

Dimension	Number of items	Cronbach’s Alpha
perceived usefulness of tablets for learning	7	0.710
Perception of the affective feeling induced by using tablets	3	0.754
Perceived sense of self-efficacy related to tablet use	3	0.714
Perceived sense of accomplishment related to tablet use	3	0.703

All these values are above the required value of 0.7 [35, 36]. This assured the reliability of all groups of items in the questionnaire.

TABLE II: Coding of Responses

Does not correspond at all	Corresponds weakly	Corresponds moderately	corresponds Strongly	Corresponds very strongly
1	**2**	**3**	**4**	**5**

2) Response coding and descriptive statistics results

Table II shows the coding of participants' responses. The coding in original questionnaire is 7 points. In the questionnaire of this study, we used a 5-point scale to facilitate decision making by learners. Table III below shows the results obtained. Answers marked with a star (*) are reverse coded.

Results show that all responses range from 1 (Does not correspond at all) to 5 (corresponds very strongly), with means ranging from 3.63 to 4.17. The average of responses for the aspect "usefulness of tablets" is 3.79. The mean for the "emotional feeling of using the tablets" is 4.13. The mean for "sense of self-efficacy related to the use of tablets" is 4.20. And the value for "sense of success related to the use of tablets" is 3.75. All of these values have responses around "strongly matches".

TABLE III: RESULTS OF DESCRIPTIVE STATISTICS OF THE QUESTIONNAIRE

When I use digital tablet at school,	N	Min	Max	Mean	Standard error	Standard deviation
Usefulness of tablets						
Q2- I do it because I must *	81	1	5	3.74	0.165	1.481
Q4- I feel like I'm wasting my time with tablets *	81	1	5	3.72	0.142	1.277
Q7- I do it because I have no choice. It is the teacher who forces us to use tablets *	81	1	5	3.81	0.146	1.314
Q8- I do it because it is important to know about using tablets	81	1	5	4.15	0.137	1.236
Q12- I do not see why to use tablet *	81	1	5	3.74	0.135	1.212
Q16- I don't know what I can use tablets for *	81	1	5	3.63	0.154	1.382
Q17- I do it because everyone uses tablets *	81	1	5	3.74	0.146	1.311
Emotional aspect induced by the use of tablets						
Q1- I do it with pleasure	81	1	5	4.17	0.154	1.386
Q6- I like using the tablet	81	1	5	4.15	0.123	1.108
Q14- I do it because I enjoy doing work with tablets	81	1	5	4.06	0.141	1.268
Self-efficacy related to tablet use						
Q9- I feel confident when I use the tablet	81	1	5	4.05	0.143	1.284
Q10- I find that the tablets make me excited for learning	81	1	5	4.15	0.142	1.276
Q18- I do it because learning with tablets is pleasant	81	1	5	4.41	0.114	1.022
Sense of accomplishment related to tablet use						
Q3- I do this. knowing that the tablet will help me succeed in school	81	1	5	3.75	0.166	1.496
Q11- I do this. knowing that I will be best prepared for high school	81	1	5	3.78	0.159	1.432
Q15- I do this. because I get better scores in school when I use tablets	81	1	5	3.73	0.138	1.245

B. Results of the Second Stage

To investigate the influence of the use of tablets on learners' learning, we used the student t-statistic for two independent samples. This statistic requires normality of the data distributions. In social sciences, a distribution can be considered normal if the kurtosis value is between -1.5 and +1.5, the skewness value is between -1 and +1, and the standard errors are between -2 and +2 [37].

1) Normality of data

Measures of normality of the data collected before and after the test are elucidated in the following Table IV. Confidence interval is set at 95%.

TABLE IV: RESULT OF THE DESCRIPTIVE STATISTICS, PRE-TEST AND POST-TEST

Type of classroom		Pre-test score	Post-test score
Without tablets	N	30	30
	Mean	5.9500	5.7667
	Standard deviation	1.67306	1.16511
	Skewness	0.679	0.069
	Skewness standard error	0.427	0.427
	Kurtosis	−0.635	−0.695
	kurtosis Standard error	0.833	0.833
With tablets	N	35	35
	Mean	5.9429	6.8000
	Standard deviation	1.49397	1.671
	Skewness	0.664	0.114
	Skewness standard error	0.398	0.398
	Kurtosis	−0.447	−0.393
	kurtosis Standard error	0.778	0.778

The pre-test and post-test score averages for the class that didn't use tablets show a minor difference that we considered irrelevant. But those of the class that did use tablets are clearly different. Results show that this average increased from 5.94 to 6.80 proving that learners scored significantly higher in the post-test than the pretest in addition, all values of kurtosis, skewness, and standard errors, both pre- and post-test, satisfy the normality conditions of the data required in the social sciences. Q-Q plots for both groups before and after the test confirm these results.

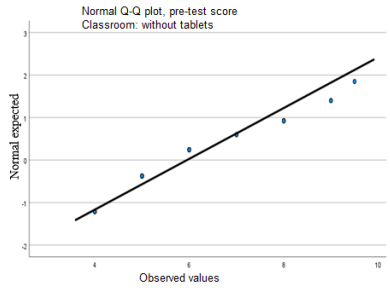

Fig. 2. Normal Q-Q plot, pre-test score (classroom without tablets).

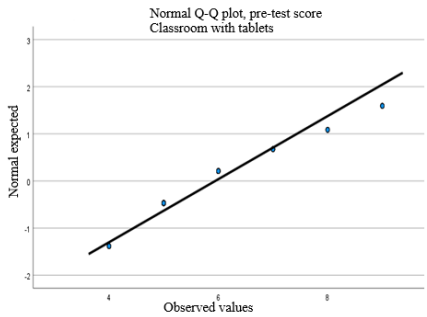

Fig. 3. Normal Q-Q plot, pre-test score (classroom with tablets).

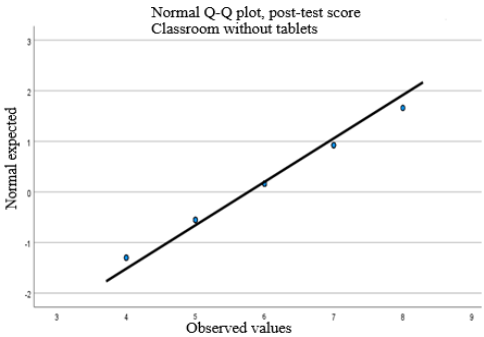

Fig. 4. Normal Q-Q plot, post-test score (classroom without tablets).

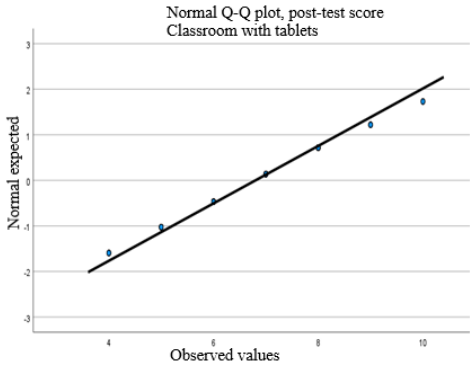

Fig. 5. Normal Q-Q plot, post-test score (classroom with tablets).

2) *Sample homogeneity and student's t statistic*

The homogeneity of variances is a condition for using the student's t test, especially if numbers in the two samples are not equal. This condition is verified by Levene's F test. Table V shows values of F and t before and after the use of tablets.

TABLE V: RESULT OF THE STUDENT'S T STATISTIC

	F-statistic		t-statistic		
	F	Sig.	t	df	Sig
Pre-test score	0.432	0.513	0.018	63	0.986
Post-test score	2.294	0.135	-2.949	63	0.004**

Sig * : < 5 % Sig ** : < 1 %

Results highlight the homoscedasticity of the two groups of learners. This allows us to validate the homogeneity of variances of the two groups before and after experimentation. Furthermore, these results show that:

- Before using tablets, t-statistic is not significant. This proves that there are no significant differences between the two groups of learners.
- But after using tablets, t becomes significant, which shows a difference between the two groups. Therefore, using tablets for learning had a discriminating effect on learners' academic performance.

The size of this effect measured by Cohen's d statistic gives the value (0.734). This value highlights a strong effect size measured [34]. The class that used the tablets for learning appears to have significantly higher scores than the one that did not use them.

V. DISCUSSION

This study confirms the motivational power of tablet use on the learning process. Results highlight the two main and complementary constructs of the most adopted theory of motivation in education (expectancy-value theory) [38–41]. According to this view, two main indicators reveal the motivation of learners: expectation of success and value assigned to the learning task [38–40, 42–45]. Thus, the dimensions "interest" and "usefulness" - allowing the measurement of the value of the task - are well highlighted by the results with an average score of 4.12 and 3.79 respectively; which corresponds to around "strongly corresponds": *"I like using the tablet*", score = 4.15; *"I do it because I enjoy doing work with the tablets"*, score = 4.06; *"I do it because it is important to know how to use the tablets"*, score = 4.15. Thus, learners express their pleasure in learning via tablets, having the conviction that this tool is very useful in the process of their learning [38, 42, 46]. This result confirms those of other studies that highlight the satisfaction of learners towards the use of tablets [12, 24, 26, 47, 48].

Also, the value of the task is clearly evident in the results obtained: *"I do it knowing that the tablet will help me succeed in school"*, score = 3.75. Learners perceive the importance of using tablets in a school setting, which demonstrates their positive perceptions of the relevance of the task to the achievement of their personal goals.

In addition, the results show that learners who have used the tablets, have a strong perception of their self-efficacy with a mean score of 4.2, which corresponds to "strongly corresponds." *"I do it because learning with tablets is enjoyable,"* score = 4.41. *"I find that tablets make me interested in learning,"* score = 4.15. This finding shows that learners who use tablets believe that this tool helps them learn better, and feel more successful in their learning by using this tool.

In addition, this study aligns with those that have shown that the use of information and communication technologies (ICT) in general, and tablets in particular, has a positive impact on academic performance [12, 24, 28, 30, 49, 50]. The results show that learners who used tablets in the classroom, scored significantly higher than those who used conventional tools. This finding can be explained by the mediating effect of perceived motivation when using tablets for learning. Several research studies have highlighted the influence of learners' motivation and self-efficacy levels on their academic performance. Motivation is considered a strong predictor of achievement [26, 29, 51, 52].

It appears that the use of digital tablets for learning leads to increased motivation in learners, which makes them more committed to accomplishing the tasks assigned. And this is reflected in good academic performance. Nevertheless, a research conducted in Quebec nuanced this result: in this study, Dauphin [53] pointed out that using iPad was accompanied by a decrease in results. This study was conducted in a secondary school where 158 learners divided into 5 groups used the iPad to learn during a school year. Each learner had his or her own tablet and used it freely at home. However, in our study, tablets are only used in class and under teacher supervision, which minimizes learner distraction through electronic games, messaging service or social networks. Karsenti and Fievez [23] present the distractibility of the tablet as the main disadvantage of this tool. We believe that this finding can explain in large part,

different results between the two studies.

VI. Limits of the Study

Results of this study are based on rigorous research procedures involving descriptive and inferential statistics using tools that are considered robust. Nevertheless, there are some limitations: first, the sample sizes are rather small (81 valid responses to the questionnaire, and 65 learners were used to study the influence of tablet use on academic performance); and second, the study was limited in time and space and covered only one discipline: language learning. Therefore, the results should be interpreted with caution. Future research can expand the study to cover several schools in different regions of the country, involving social and economic factors of the target population. Such research can also use a methodology that allows for study over a longer period of time to explore the influence of tablet use on learners' motivation and academic performance in different contexts and subject areas.

VII. Conclusion

The purpose of this study is to investigate the motivational effect of using digital tablets in a classroom setting on learning, and subsequently on learners' academic performance. To do so, we focused on the learners' perception of the two main constructs of motivation: expectation of success and value of the task; and this, with reference to four aspects: usefulness, affective feeling, feeling of success and feeling of self-efficacy. Then, we conducted an experiment on a sample of 65 learners divided into two groups: one group used the tablets during their learning and a control group. The results obtained, analyzed by SPSS 28 software, showed that the use of tablets in school practice induces a strong motivation in learners. They are attracted to the new technology and enjoy using it, while experiencing a high sense of self-efficacy and a belief that the tablets help them learn better. This translates into a high level of engagement that positively influences learners' academic performance.

Appendix

TABLE VI: Pedagogical Scenario

	Day / session	Duration	Educational objectives	Content of session		Teaching aids	
				Classroom using tablets	Classrooms not using tablets	Classrooms using tablets	Classrooms without tablets
Week 1	Day 1 / session 1	45 min	To understand the content of the story in its general outline.	- Classroom organization - Distribution of tablets and headphones - Ask learners to view and listen to the story - Have the learners understand the main lines of the story. - Have the learners identify the elements of the story (people, time, place, etc.) - Evaluate their comprehension by oral questions	- Classroom organization. - The teacher reads the story loudly with the help of pictures (school book) - Help the learners to understand the main lines of the story - Encourage the learners to identify the elements of the story (persons, time, place, etc.) - Evaluate their understanding by asking oral questions.	- Tablets containing the story in video form, quizzes and the text of the story - Headphones - Speaker - Notebooks and pens - Learners work in pairs.	- Images - School book - Chalkboard - Notebooks and pens
	Day 2 / session 2	45 min	To understand the narrative structure of the story and identify its elements.	- Ask learners to listen to the story again - Get the learners to understand the content by asking simple questions (beginning, problem, solution .... End) - Evaluation by Quiz on tablet and oral questions	- Teacher rereads the story loudly - Get the learners to understand the content by asking simple and oriented questions (beginning, problem, solution .... End) - Evaluation by oral questions, and written quiz.		
	Day 3 / session 3	45 min	Use the story dictionary to produce oral sentences and identify story structure orally.	- Replay the video. - Identify the key words of the story and explain them. - Replay the video to identify them, identify them on the written story, use them to produce oral sentences and then replay the video for further assimilation. - Evaluation through a quiz and oral questions	- The teacher rereads the story and asks a few learners to read it again. - Identify the key words in the story and explain them. - Get the learners to use them in oral sentences. - Evaluation by oral questions and written quiz.		
	Day 4 / session 4	45 min	Exploit styles and syntax of the story and understand their meanings.	- Review -and listen- the video - Get the learners to understand and assimilate the meanings and syntax - Evaluation through oral questions.	- Learners reread the story - Lead learners to understand and assimilate the meanings and syntax - Evaluation by oral questions and written quiz.		

	Day 5 / session 5	45 min	Exploit the values transmitted through a communicative situation.	- Replay the story on speaker for the whole class while following the video on the tablets. - Tell the story (in whole or in part) - Act out the story.	- Reread the story - Telling the story (in whole or in part) - Act out the story.		
Week 2	Day 6 / session 6	45 min	Exploit the values transmitted through communicative situations.	- Listen to the story again - Bring out the values conveyed by the story - Evaluation through oral questions	- Reread the story - Bring out the values transmitted by the story - Evaluation by oral questions		
	Day 7 / session 7	45 min	Staging the story	- Review the video - Act out the story by playing the roles of the actors.	- Reread the story. - Play the story.		
	Day 8 / session 8	45 min	Production of a new story.	- Produce a new story using the structure and elements of the original story	- Produce a new story using the structure and elements of the original story.		
	Day 9 / session 9	45 in	Assimilate linguistic phenomena.	- Finalize the production of the new story and write and read it.	- Finalize the production of the new story and write and read it.		
	Day 10 /session 10	45 min	Communicative situation	- Read the new story and play it in class. - Evaluation through quizzes and oral questions.	- Read the new story and play it in class. - Evaluation through oral questions and exercises on the board.		
Week 3	Day 11 /session 11	45 min	Final evaluation (post-test)	A standardized written test is administered to both classes at the same time		- Paper - Pens - Pencils	

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

El Ayachi Rahali participated in all phases of development of the article: elaboration of questionnaire and test, collection and interpretation of results, and final writing. Ahmida Chikhaoui and Fatima Ouzennou participated in developing the questionnaire and interpreting its results. Khalid El Khattabi contributed to the elaboration of the test, and interpretation of its results, and to editing the final draft of the manuscript.

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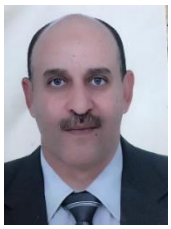

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