Flipping a Scientific English Writing Course: An Experimental Study at Annaba University

التعليم العكسي في أقسام التعبير الكتابي في اللغة الإنجليزية العلمية : دراسة تجريبية في جامعة عنابة

Classe inversée d'un cours d'expression écrite en anglais scientifique : une étude expérimentale à l'université d'Annaba

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Introduction

This article is a research and action report on a scientific English writing course at Annaba University using the flipped learning model. It was performed in partial fulfilment of Cambridge Delta (Diploma in Teaching English to Speakers of Other Languages). Following the needs analysis based on observation, questionnaire, interview, and diagnostic test, a flipped learning course was designed to blend face-to-face instruction with online interaction, relying on user-friendly multimodal resources on scientific English writing. Two groups were introduced to the same scientific writing lessons under different conditions. The objective was to measure the differences in writing attainment between learners in an experimental group using the flipped learning model, and learners in a control group using a traditional classroom model. In addition to a better writing attainment in the experimental group, the results highlight that the flipped learning model allows flexibility, learning anywhere and anytime, at the learners' own pace, which increases their engagement in the tasks. They also show that technology-enhanced teacher assessment, peer assessment, and self-assessment provide a wide range of diagnostic and remedial procedures that are conducive to better classroom outcomes.

1. Flipped Learning, the Genesis of an Innovative Practice :

Flipped learning is a sub-category of blended learning, also called hybrid, mixed-mode, or flexible learning, which started in the 1990s alongside other initiatives in technology-enhanced education. Blended learning is mainly based on Piagetian and Vygotskyan constructivist theory which argues that human beings learn by actively constructing their own knowledge, interacting with the environment, asking questions, solving problems, and negotiating with oth-

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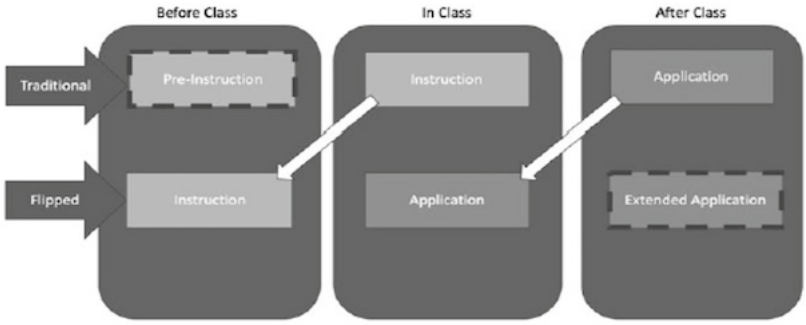
ers (Harasim, 2011 : 11-12). An important concept related to blended learning is Lev Vygotsky's "Zone of Proximal Development" (ZPD) ; he assumes that "learning takes place when learners solve problems beyond their actual developmental level -but within their level of potential development- under adult guidance or in collaboration with more capable peers" (qtd in Harasim, 2011 : 67). His scaffolding metaphor is also important in blended learning as it illustrates the support tutors and more experienced peers provide to learners during knowledge construction. Blended learning students are generally educated adults who know what they need and are responsible for their learning. They learn at their own pace whenever and wherever they want ; they learn in autonomy and collaboration ; they are active participants rather than passive recipients, and they are capable of self-assessment and peer assessment. They can be "the major agent in their own learning, which occurs as a result of personal experiences" (Hase & Kenyon, 2007 : 112). Building on these perspectives, Harasim (2011) formulates her conception of online collaborative learning by which she argues that in today's education, knowledge is no longer taught by an all-knowing teacher, but it emerges through ubiquitous discourse tools (search engines, emails, wikis, etc.).

In 2007, Jonathan Bergmann and Aaron Sams wanted to find a solution to their students' absenteeism. They created videos of their lessons for these students to watch outside the classroom, but those who were not absent also watched the videos in order to review and reinforce some aspects of the lessons. This practice proved useful for many students because it allowed them to pause, rewind, and reflect, which is impossible in the classroom. It also allowed differentiation because every student followed his/her own pace. When learners subsequently met their teacher and peers in the classroom, they actively practiced, learned by doing, asked questions, and focused on more cognitively demanding tasks.

Bergmann & Sams define flipped learning as "that which is traditionally done in class is now done at home, and that which is traditionally done as homework is now completed in class" (2012 : 13). They explain that in traditional classrooms, the teacher presents content in the class. Students listen and take notes ; some of them understand the content relatively well while others might struggle with it, and others might be absent and miss it completely. After the class, the teacher gives homework to allow them to practice the content ; some of them can easily do it while others might struggle and wait until the next class to seek help. Flipped learning attempts to address these issues by shifting the steps of the process as illustrated in figure 1 :

Figure N° 1. Flipped learning diagram

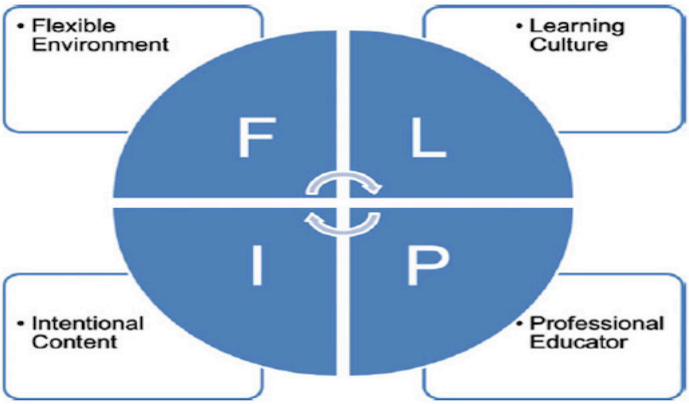


Source : Voss and Kostka, 2019 : 3

One major flipped learning procedure lies in the teacher's choice of materials, usually his/her own or open access multimodal materials, mainly videos, which learners are supposed to read or watch before face-to-face sessions. Class time, unburdened of much teacher-talk, is free for more engaging learner-centred and problem-solving tasks. With this in mind, the teacher moves flexibly from a "sage on the stage" to a "guide on the side" (Brinks Lockwood, 2014 : 3) ; he/she becomes a facilitator who ensures a classroom atmosphere that is conducive to learning.

The Flipped Learning Network (2014) proposes four F.L.I.P. pillars (Figure N° 2) to help teachers implement the approach effectively :

Figure N° 2. The four pillars of the F.L.I.P. approach

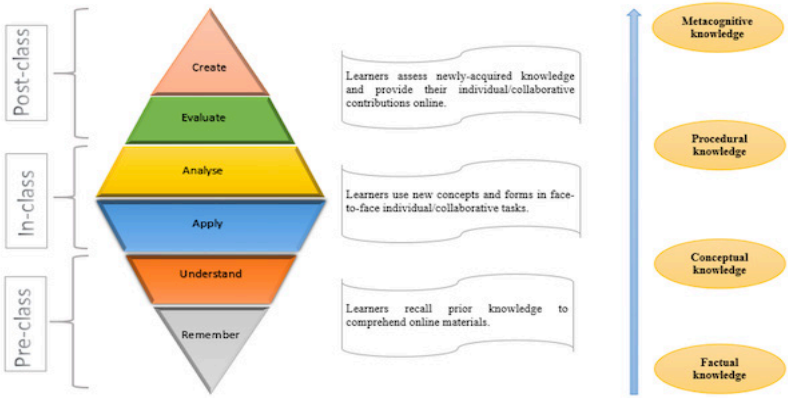


Source : Voss and Kostka, 2019 : 11

According to the Flipped Learning Network (2014), the first pillar of the F.L.I.P. approach, *Flexible Environment*, refers to the classroom as a physical space that fosters a fluid learning experience. It consists in physically arranging spaces to accommodate the objectives of the lesson and students' learning styles, as well as choosing between individual or group work. There is no teacher at the "front of the room, and physical configurations of the classroom change regularly" (Kostka & Marshall, 2017 : 226). The second pillar, *Learning Culture*, focuses on the shift from a teacher-centred to a learner-centred model in which the teacher is no longer a provider of information but a provider of learning opportunities. Consequently, learners are actively involved in meaningful knowledge construction. The following pillar, *Intentional Content*, refers to the teacher's ability to set objectives, choose materials that are both accessible and challenging for students to explore on their own before class. The *Professional Educator* pillar depicts the role of the teacher in the flipped classroom, which is more demanding than in a traditional classroom, such as designing pre-class learning materials, observing students during class time, providing relevant and timely feedback, and assessing performance formatively. It also involves reflective practice, peer observation and collaboration.

Because it "speaks the language of today's students" (Bergmann & Sams, 2012 : 20) who are digital natives, therefore, flipped learning is hailed by teachers for its potential in increasing motivation, engagement, autonomy, and collaboration. It allows students to have more control over their learning and be "metacognitively engaged" to think "about their learning, their strategies for learning, and their mastery of the material" (Kostka & Marshall, 2017 : 230). In so doing, the tasks students do before class activate skills from the lowest stages of Bloom's taxonomy (Figure N° 3), such as remembering prior knowledge and understanding the content of a video. Once in the classroom, they activate higher skills in this taxonomy, such as analysis and application. After class, they activate even higher skills like evaluation and creation. Hence, four knowledge dimensions are actually into play. The factual dimension requires learners to activate prior knowledge and know the basic terminology. The conceptual dimension requires them to consider factual items in a system of interrelationships through classifications, models, and theories. The procedural dimension urges them to use subject-specific skills, techniques, and methodologies. The metacognitive dimension allows them to think about their own thinking for the sake of improvement (Anderson & Krathwohl, 2001 : 28-29).

Figure N° 3. Flipped classroom objectives



Source : Personal diagram, adapted from Anderson & Krathwohl (2001)

Research on flipped learning in English Language Teaching is developing slowly compared to other disciplines in science and technology. Most of it highlights English teachers' and students' positive attitudes towards the flipped classroom (Voss & Fang, 2016 ; Hung, 2017), positive learning outcomes (Doman & Webb, 2016 ; Fethi & Marshall, 2018), as well as students' autonomy and collaboration (Han, 2015). Writing is regarded by many students as one of the hardest skills to acquire, and by many teachers as one of the hardest skills to teach. Even native speakers might fail to produce a correct piece of writing for lack of vocabulary, grammar, mechanics, etc. Teachers constantly try to find new methods to facilitate the acquisition of this productive skill and technology is presently offering new promising solutions like the flipped learning model.

2. Experimental Study

2.1. Needs Analysis

Needs analysis places learners at the centre of course design (Munby, 1978). To design this flipped learning course, a mixed research method was employed to gather quantitative and qualitative data related to target learners' needs, using tools like observation, questionnaire, interview, and diagnostic test. The observation of Algerian physicians, the target group, reveals their frustration regarding English. Many of them use the word "handicap" to depict their incompetence in English. Some of them who aspire for higher ranks in medical hierarchy believe they should "Publish (in English) or Perish" (Bitetti & Ferre-

ras, 2017 : 121). Hence, I taught medical English to three groups from 2016 to 2018, in a face-to-face traditional model (50 hours for each group at the Centre of Intensive Language Teaching, Annaba University). I kept an informal observation notepad, reporting learners' weaknesses, sometimes with their own feedback to set up a form of participatory assessment. When they reached B2 level (CECRL, 2001), I decided to design an innovative experience to teach them scientific English writing through the flipped learning approach.

I distributed an online questionnaire that included factual questions on their demographic profile, as well as behavioural and attitudinal questions on blended learning and scientific English writing. The results show that none of the respondents has poor computer skills that would hinder online assignments. Almost half of them have already used an e-learning platform, which they describe as "interesting." More than 73 % are in favour of blended learning to study at their rhythm, almost 47 % to increase motivation and 30 % to improve classroom interaction. Yet, about 30 % also prefer traditional learning owing to face-to-face interaction, and 10 % admit their difficulty to read on screens. Almost 77 % prefer individual work while only 30 % and 33 % accept pair/group work respectively. This attitudinal analysis is very important to manage traditional/online proportions and reduce abandonment rates. More than 93 % agree, or strongly agree, that learning a foreign language is easier with technology because of motivation, learning rhythm, and digital tools. Only 26 % believe their writing skills are good while almost 67 % consider them as average or insufficient. The majority set articles, presentations, and abstracts as priorities with, in decrescendo, paragraph and essay structure, grammar, vocabulary, spelling, punctuation, and capitalisation.

The semi-structured interviews complemented the questions left unanswered in the questionnaire and deepened the comprehension of some answers, mainly in relation to motivation and attitude towards English, blended learning, and collaborative work. Phone interviews with two physicians who, despite age disparity, revealed the same motivations : reading and publishing articles in English. They also agree that collaboration is necessary but difficult ; they suggest strict assessment strategies to enhance it. They differ, however, in their attitudes regarding blended learning ; while the older medical professor is an advocate, the younger physician considers that distance learning dampens his enthusiasm. These answers are unexpected because usually, the younger generations are more comfortable with technologies. Yet, in this case, the professor's experience has probably showed him the importance of English in his career, and hence, he is more motived to learn it despite difficulties.

A diagnostic test was used to check what learners "already know or can do (and so do not need to be taught) as well as any potential and unexpected gaps in their language abilities that do need to be addressed" (Hinkel, 2005 : 499). A short writing task was used to diagnose their errors in the scientific writing skill, from "macro skills such as understanding, processing and selecting relevant information, structuring texts appropriately and developing and supporting an argument, to micro skills of cohesion and grammatical accuracy at the paragraph and sentence level" (Bonanno, 2002 : 2). This writing test revealed an average scientific vocabulary range, logic and clarity of ideas, relevance of examples, acceptable paragraph organisation, with average coherence and transitions. Yet, it highlighted the learners' weaknesses in capitalisation, punctuation, sentence structure, tense, mode, and voice.

The needs analysis highlights major assets like learners' positive attitude and instrumental motivation (Gardner & Lambert, 1972) towards English : getting knowledge and international visibility. Their major need is to read and write medical articles in English. It also shows that they have adequate digital skills, as well as access to computers and average-speed Internet at home. The means analysis – that collects "information about the environment in which the course will be run" (Dudley-Evans & St. John, 1998 : 125) - is important to identify the factors that influence blended learning implementation. The needs analysis equally reveals, however, major constraints like some learners' reticence towards distance learning and collaboration, thus requiring a compromise. Most of them are not ready to devote more than 2 hours per week for online assignments. Regarding their negative attitude towards collaboration, motivating tasks, clearly defined instructions and assessment criteria can help in satisfying their different preferences. The results of the diagnostic test highlight lacks or gaps between learners' actual and target proficiency (Hutchinson & Waters, 1987). The test reveals that their scientific vocabulary is up to the standard mainly because of many similarities with French terminology. Nevertheless, they still commit errors related to spelling, capitalisation, punctuation, sentence structure, tenses, pronouns, prepositions, passive and active voice. These results are helpful in setting remedial objectives to help learners write more effectively in the target situation.

2.2. Research Design and Sample Selection

This study is based on the pre-test/post-test control group design, in which an experimental group is given a pre-test, followed by the experiment in a flipped learning model, then a post-test. The control group is also given the same pre-test, followed by the same lessons in a traditional classroom setting,

and then the same post-test. The aim is not only to find whether participants in the experimental group have improved their writing or not, but also if they have improved more than the participants in the control group (Dugard & Todman, 1995). Following homogenous sampling (Palys, 2008), 20 physicians at Annaba hospital (Algeria), of different ranks and ages, registered to the course : 10 in the traditional class and 10 in the flipped learning class. The following research questions were formulated :

- Is there a difference between the scientific writing achievements of students in a flipped classroom and others in a traditional classroom ?
- Does flipped learning improve students' written productions ?
- Does flipped learning enhance students' autonomy ?
- Does flipped learning enhance students' collaboration ?
- What are students' attitudes towards flipped learning ?

The major objective was set, honing the learners' scientific writing skills, and learning priorities were tailored on their needs and wants : building scientific vocabulary, identifying the grammatical and stylistic specificities of scientific English writing ; summarising and paraphrasing, constructing well-structured sentences, paragraphs and essays, writing reports, abstracts, and journal articles. Learners were informed about these objectives and the procedure of the flipped learning model ; they were also informed about data collection confidentiality.

3. Flipped Learning Procedure

A pre-test was given to the experimental and control groups in order to assess their written production before the experiment. A post-test was given to them at the end of the experiment to see the differences in achievement. The same pre-test and post-test were used, and under similar testing conditions. A rubric was employed to assess the students' written production using the following criteria (based on the IELTS rubric) : task response or achievement, coherence and cohesion, lexical resource, grammatical range and accuracy.

The experimental group and control groups followed the same lessons in parallel. The control group, on the one hand, received a traditional teacher-centred instruction, with homework after the class. On the other hand, the experimental group was learner-centred, and the content was presented in a video on PowerPoint every week before the lesson with supplementary activities, leaving time for learners to study at their own rhythm, and be more active in the classroom. The flipped learning course covered 20 hours of in-class sessions and 20-30 hours of pre-class/post-class online assignments, depending on every

learner's pace. Weekly in-class sessions comprised two 40-minute periods with 10-minute breaks (Figure N° 4).

Figure N° 4. Flipped learning scenario

Source : Personal diagram, with royalty-free classroom cliparts

For pre-class assignments, texts and videos were uploaded on Moodle with embedded quizzes to check the learners' comprehension. They were supposed to use their lower-level cognitive skills at home to understand and recall the content teachers traditionally transmit in the classroom. Together, they were later supposed to activate their higher-level skills in the classroom, with the teacher as a facilitator (Brinks Lockwood, 2014). In post-class assignments, process writing was chosen because it involves "a cyclical approach rather than a single-shot approach" in which learners go "through stages of drafting and receiving feedback on their drafts, be it from peers and/or from the teacher, followed by revision of their evolving texts" (Kroll, 2001 : 220-221). Moodle wiki, based on the socio-constructivist principle of collaboration in "communities of practice" (Dougiamas, 2003), allowed tracking their collaborative writing process. Moodle platform - created by Dougiamas in 2003 - has now become a popular platform among tech-savvy ELT practitioners. It is particularly relevant for a writing class because of its integrated tools like wiki, glossary, etc. Studies on the use of wikis in writing classes particularly show an increased engagement in group collaboration, peer feedback, and content organisation (Kesler, 2009 ; Wang, 2014). However, as wikis can cause socio-cognitive conflicts related to the quantity and quality of contributions, all versions are stored so that users can return to previous ones looking for every user's contribution.

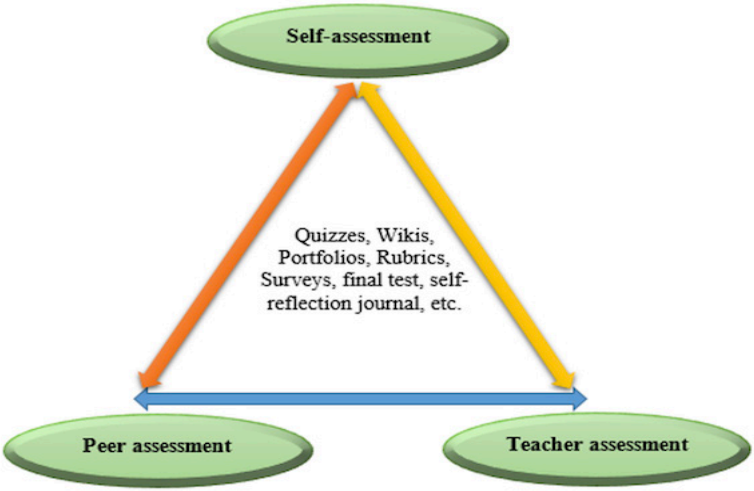
This scenario rests on "the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies" (Garrison & Vaughan, 2008 : 148). It follows the socio-constructivist premise that

individuals do not learn in isolation, but through active interaction with others. Effective scaffolding (Vygotsky, 1978) and collaborative negotiation of meaning help learners construct knowledge in a manner they probably cannot do in traditional classes.

4. Traditional Vs Technology-enhanced Assessment

In the control group, traditional formative and summative assessments were used in the classroom. However, the flipped classroom required "fit-for-purpose" (Brown, 2004) assessment procedures that suit course design principles and learners' needs. As ubiquitous "technology offers new ways for practicing language and assessing performance" (Dudeney & Hockly, 2007 : 8), this entails not only the "assessment of learning," but also "assessment FOR learning" (Stiggins, 2005 : 324). Hence, with the experimental group, formative assessment was used in face-to-face and online tasks, and summative assessment in the face-to-face post-test. While summative assessment remained the prerogative of the teacher, formative assessment followed a triadic approach (Vaughan, 2015 : 176), with self-assessment at the top of the triangle, and peer and teacher assessment at the base (Figure N° 5). Self-assessment, in particular, can help learners become self-reflective life-long learners.

Figure N° 5. Triadic formative assessment



Source : Personal diagram, adapted from Vaughan (2015)

Formative assessment was provided both in the classroom and online. As learners are emotional beings whose affective filter determines the information they get (Krashen, 1982), objective and constructive feedback was necessary. It was related to course objectives and assessment criteria rather than peer performance. Online feedback, however, lacks nonverbal clues, and can hence reduce the reliability of assessment. I hence provided voice feedback to limit the risk of misinterpretation (Bakerson et al., 2015). Peer assessment, in which learners are both "assessors" and "assessees" (Casey, 2015), is an innovative aspect that characterises blended and flipped learning. After the in-class sessions, as homework, I asked my learners to create online collaborative texts on Moodle wiki. This task stimulated them to negotiate meaning by scaffolding (Vygotsky, 1978). However, they complained about collaborative work because they did not devote the same effort to it, and they felt frustrated when they received similar grades. It is hence crucial for the sake of face validity to design tasks and assessment criteria that foster balanced contribution and fair grading (Hew & Brush, 2007). I used a rubric for collaborative writing assignments not only to provide specific criteria for peer feedback, but also to ensure objective grading. Self-assessment is also an important aspect of formative assessment. "To become lifelong learners," OECD states, "they need to be able to assess their own progress, make adjustments to their understandings and take control of their own learning" (2013 : 220). A rubric for individual writing assignments was also helpful. Summative assessment, the post-test at the end of the course, helped in pinpointing the difficulties that learners still had at that stage. Like formative assessment, it showed the degree of success in reaching the course objectives.

5. Results and Discussion

The post-test shows that students in the experimental group had better scores than the students in the control group. They made better improvements in their scientific writing skills through the flipped model, which also enhanced their motivation and engagement. It boosted their self-confidence as they became responsible for their own learning through active pre-class, in-class, and post-class activities ; they were equally able to perform classroom tasks more effectively. Class time was also beneficial for peer check and feedback ; each student tried to edit another student's writing. It helped them exchange their ideas and pinpoint their errors.

At the end of the course, a focus group was organised with the experimental group to listen to the learners' attitudes towards the flipped learning model. Most of them expressed their satisfaction for getting ready before the class by understanding the lesson on video at their own pace. One of them said, "to

understand each lesson, I had to view the videos at least twice. I sometimes needed to go some minutes backwards to repeat difficult aspects of the lesson." Another one affirmed, "I am usually a shy person, and when I don't understand something in the lesson, I don't ask the teacher to repeat. This method allowed me to repeat difficult things as often as I want." Yet, all of them complained about the time-consuming aspect of this model.

Despite numerous benefits, there are limitations to this flipped learning model. The major one lies in the lack of ICT resources ; my learners and I relied on our own laptops, smartphones, and Internet access. Besides, it was difficult for some students to change their learning method because they have for long been accustomed to receive information from an all-knowing teacher. Another limitation lies in the risk of online cheating, like identity misrepresentation and plagiarism. Hence, Moodle tools, plagiarism software, and proctored tests are helpful. Yet, self-directed learners in this experimental study would not cheat because they are learning English for fluency, not for good marks. Their busy schedule was sometimes an issue, but Moodle asynchronous tools helped them check missed work. Collaboration, though, caused socio-cognitive conflicts ; some learners felt frustrated towards their peers' absence. The designed assessment rubrics and Moodle tracking tools equally permitted a better accountability in collaboration. The small number of students in the experimental group was also a limitation because the sample size is not representative enough to reach more accurate outcomes ; a longitudinal study on a larger sample will hence be useful.

Conclusion

This experimental flipped learning course on scientific English writing blended face-to-face instruction with online interaction. It involved two groups, an experimental and a control one, to which the same scientific writing lessons were given under different conditions, a flipped and a traditional model respectively. The aim was to find out differences in writing attainment between students of the two groups. Designing and implementing this course was time-consuming because it required continuous monitoring. It was not only a matter of selecting the best from a plethora of online materials, but also having a positive attitude and readiness to help learners outside the classroom. Hence, while insisting on the importance of technology, this experimental study also emphasises the role of the teacher. In Warschauer & Meskill's words, "the key to successful use of technology in language teaching lies not in hardware or software but in 'humanware' – our human capacity as teachers to plan, de-

sign and implement effective educational activity" (2000 : 316). The flipped learning model is potentially an interesting option in future educational policy to improve English language teaching in Algerian universities. Because most students today are digital natives, their learning styles are adaptable with the use of technology, and videos are more attractive for them than textbooks or handouts. Yet, the necessary environment and tools should be provided because the flipped learning model can fail in achieving desired goals when the subject matter is too complex for self-study, when teachers or learners lack technical knowledge, study skills, autonomy, motivation, or time.

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Abstract

This article is an experimental study report on a scientific English writing course, following the flipped learning approach, conducted at Annaba University. The needs analysis based on observation, questionnaire, interview, and diagnostic test, served as a basis for designing a flipped learning course that blends face-to-face instruction with online interaction. The experimental group received pre-class instructional videos and practice tasks in the class whereas the control group studied the same lessons in a traditional classroom setting. Both groups answered the same pre-test and post-test, and the post-test showed a considerably improved writing performance in the experimental group that can be attributed to the flipped learning model. Students in this experimental group equally expressed positive attitudes towards this model. .

Keywords

Flipped classroom, blended learning, scientific writing, pre-test/post-test design, experimental/control groups

الملخص

يقدم هذا المقال تقريراً عن دراسة تجريبية أجريت في جامعة عنابة تتعلق بصف مقلوب حول الكتابة العلمية باللغة الإنجليزية. كان تحليل الاحتياجات بناءً على الملاحظة، الاستبيان، المقابلة والاختبار التشخيصي بمثابة أساس لتصميم دورة تعليمية مقلوبة تمزج بين التفاعل وجهاً لوجه والتفاعل عبر الإنترنت. تلقت المجموعة التجريبية مقاطع فيديو تعليمية قبل الفصول الدراسية متبوعة بتمارين في القسم، بينما درست المجموعة الضابطة نفس الدروس في قسم دراسي تقليدي. أجابت كلا المجموعتين على نفس الاختبار القبلي والبعدي، وأظهر الاختبار أداءً محسّنًا للكتابة في المجموعة التجريبية يمكن أن يعزى إلى نموذج التعلم المقلوب. كما عبر الطلاب في هذه المجموعة التجريبية عن مواقف إيجابية تجاه هذا النموذج.

مفتاحية

الصف المقلوب ، التعليم المدمج ، الكتابة العلمية ،تصميم الاختبار القبلي/ البعدي ، مجموعة تجريبية / مجموعة ضابطة

Résumé

Cet article est une étude expérimentale d'un cours inversé, sur l'écriture scientifique en langue anglaise, conduite à l'université d'Annaba. L'analyse des besoins basée sur l'observation, le questionnaire, l'entretien et le test de diagnostic a servi de base pour la conception d'un cours inversé qui allie le présentiel et le distanciel. Le groupe expérimental a reçu des vidéos pédagogiques avant le cours, suivies de tâches pratiques en classe, tandis que le groupe témoin a étudié les mêmes leçons dans une classe traditionnelle. Les deux groupes ont répondu au même pré-test et post-test, et ce dernier a montré une écriture considérablement améliorée dans le groupe expérimental qui peut être attribuée au modèle d'apprentissage inversé. Les étudiants de ce groupe expérimental ont également exprimé des attitudes positives envers ce modèle.

Mots-clés

Classe inversée, apprentissage mixte, rédaction scientifique, modèle pré-test/post-test, groupes expérimental/témoin