Scaffolding the Lebanese EFL Cycle 3 in Science Report Writing

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Abstract

Some Lebanese university science instructors complain that students face difficulty in writing reports. The same problem was detected at Harvard University; where professors have also traced a similar problem. Little attention was paid to the scientific report writing process since high-school days. Usually, secondary schools focus on the content, rather than on the process writing itself. The aim of this study was to help cycle 3 Lebanese learners become proficient in science report writing. An action research was carried on a group of Lebanese grade 8 science class learners (n=10). The theoretical framework followed the Technological Pedagogical Content Knowledge (Koehler & Mishra, 2009), to investigate the impact of integrating: the web tool, Google+ platform (Cavazza, 2012), known for its instructional, collaborative and motivating features, the procedural scaffolding (Constructivist theory), and authentic content, in science report writing. Data collection instruments used in this study were: (a) samples from the students' reports written pre, during, and post intervention; (b) the students' class performance scores; (c) interviews with the students (pre/post intervention) and their science teacher. The results revealed that the focus group outperformed the passive significantly by fifteen points. Suggestions and recommendations for further research were shared.

Keywords: science report writing, integration theory, web-based learning, authentic content, procedural scaffolding

Introduction

Many Lebanese university instructors complain that their students in science classes face difficulty in writing reports. Since their high-school days, the focus has been usually on science content, but not on the process writing itself. Similarly, professors at Harvard University (Morris et al., 2007) realized that there were loads of writing assignments in their undergraduate classes; however, little attention was paid to the scientific report writing process. They pointed out that a good scientist is someone

who knows how to "keep an accurate and current record of all experimental procedures, observations, and results" (p.10). Fortunately, EFL pedagogy nowadays is leaning towards integration of Internet technology and authenticity of content material in language instruction. Mishra & Koehler (2006), who introduced Technological Pedagogical Content Knowledge (TPACK), drew that integration of the 3 elements: thoughtful technology, authentic content materials, and pedagogical methods of teaching, requires an understanding of cognitive, social, and developmental theories of learning, as well as supports the learning goals and outcomes of an instructional plan. So, an action research was conducted to investigate the practical science report writing problems and to take future actions, as discussed by Norton (2009) and Abbott (2014). Thus, the aim of this research was to help cycle 3 Lebanese learners become proficient in writing scientific reports through implementing writing as a process on an Internet platform (Google+). Contemporary pedagogical theories were applied and authentic scientific materials were used. TPACK was adopted from Koehler & Mishra (2009). The Google+ platform was employed to benefit from its large set of functionalities, and to instruct and motivate the learners, as discussed by Cavazza (2012). Vygotskian constructivist approach was adopted to help the learners collaborate working in groups on this platform on one hand; while on the other, to apply procedural scaffolding approach (e.g. modelling, sharing, rehearsing, applying), implementing the writing-process techniques from prewriting to final posting. Moreover, learners were exposed to online authentic material, which can supply learners with up-to-date valuable information, develop their own strategies for dealing with real language, and make the task more interesting and motivating, as stated by Lowe (2010).

2. Literature Review and Theoretical framework

Science Report Writing

Harvard University professors, Morris et al. (2007) focused on writing in the sciences and discussed that it is no different from writing in other fields. It requires a clear argument or development of a hypothesis, careful use of evidence and sources, organization, and attention to grammar and wording. Although science report writing follows additional conventions and step-by-step process format, but its outline comprises of title, abstract, problem, hypothesis, introduction, method (safety, material, procedure), results, analysis, conclusion, and references (pp.5-10) (see Appendix B). To develop learners' report writing, educators may benefit from TPACK framework.

Integration Theory

Many Integration theories supported employment of technology to develop language skills, such as, Mishra & Koehler's (2006) TPACK theory. They considered that the thoughtful interplay of the three domains: technology, pedagogy (the methods of teaching), and content (the subject matter), "support the learning goals and outcomes

of the instructional plan" (p.15). Specially, when access to class content is extended beyond the actual instructional period, it could make a big difference for students, who require additional processing time. Opportunities to access online tools and tutorials enhance integration of new information. The ability to repeatedly review material like video tutorials, demonstrations, and archived lecture recordings outside of class can aid students' comprehension and provide invaluable access to instructional materials for their tutors or parents (ibid, p.15). Similarly, González-Lloret & Ortega (2014) realized that developing pedagogic tasks requires taking full advantage of technology and doing what cannot be done in the classroom with paper and pencil. For example, one can integrate multimedia for rich and authentic input (i.e. video, simulations, gaming environments) and engage in learning that allow students use the language and the technology in productive and creative ways. Finally, they considered the Internet as a rich database of authentic material (p.8), which exposes learners to unlimited sources.

Authentic Content

Authentic content material has gained momentum in educational pedagogy nowadays. Nunan (2004) described authenticity as "the use of spoken and written material that has been produced for purposes of communication not for purposes of language teaching" (p.49). What concerned him was not whether authentic materials were used or not, but how the combination of authentic, simulated and specially written materials provided learners with optimal learning opportunities (p.49). Moreover, to Vaičiūnienė & Užpalienė (2010) authentic materials come from unlimited sources: photographs, business cards, computer-based information, as, news, journals, TV and radio broadcast, films, documentaries, internet websites, general or special literature and easily accessible websites (e.g. authentic specialist publications in the field, statistics, reports, surveys, etc.). They pointed that when these materials were derived from the real world and brought into the classroom they made the task more interesting and motivating and led the learners develop strategies for dealing with real language (p.94). Referring to Berardo (2006), Vaičiūnienė & Užpalienė (2010) discussed that when teachers search for sites on a specific topic, prepare questions, and post them online, they can successfully replace authentic printed materials brought into the classroom and make the ESL classroom significantly livelier (p.94). While hard-copied material may date very quickly, online authentic material is continuously updated. At last, exposing learners to contemporary information from a real text in a target language definitely motivates the learners (p.94).

Web-based learning

Research revealed that Internet technology and web-based learning offer a valuable source of language input. It is significant in enhancing learning outcomes, reinforcing the direct relationship between the language classroom and outside world, developing language skills and promoting different types of interaction increasing

students' motivation in the subject matter and language proficiency (Vaičiūnienė & Užpalienė, 2010, p.97). Bloch (2013) drew that the development of technological applications has offered tools for language learning and for creating a communicative space. This space can be asynchronous (different time, different place), where users interact using any of these modes of discourse, e.g. email, listservs, blogs, discussion boards, social networking sites. It can as well include synchronous modes of discourse (same time, different place), where participants interact in the same time frame, (e.g. chats, video conferencing, e-learning systems or virtual learning environments) (c.i. Lesiak-Bielawska, 2015). In addition, students can benefit from features of word processing software as Microsoft Word, in writing and processing, for instance: spell check, autocorrect, grammar check for awkward grammatical constructions (e.g. passive sentences, text-to-speech add-ins that support auditory proofing before students submit their work) (Mishra & Koehler, 2006, p.15). Moreover, the platform used for this study was Google+. Cavazza (2012) considered it a major player similar to Facebook and Twitter. Google+ comprises of large set of functionalities that enables the users to share, publish, play and network on its platform. In addition, the administrator can: (a) form a private group by sending numerous membership invitations, (b) post instructional material easily in rich-text posts as, fonts, colors, images, PPT and videos. Furthermore, to reinforce collective communication among learners, members can like the posts and hold peer-peer/peer-instructor discussions on the dashboard.

Vygotskian Constructivism

Procedural scaffolding of Vygotskyan constructivism builds students' independent knowledge of concepts and language and moves beyond explicit teaching to modeling, sharing, rehearsing, and applying. Such practices include grouping of students into teams to build skills and increase independence (Echevarria, et al., 2002). Moreover, as Dennen (2004) drew, scaffolded learning activities come up with adequate challenges based on the learner's current knowledge. The instructor is expected to model and scaffold a certain context for learning decision-making process, talk aloud about the considerations and explain the rationale for the end result. Then, the learners can use similar strategies to build content and genre knowledge, related to the topic they can draw on authentic life experiences, lab experiments, books, and Internet resources (p. 815). Likewise, one always should keep in mind the metacognitive strategies Brown (2007) discussed, such as, self-questioning, reflecting and inferring that raise awareness of one's own cognition.

3. Methodology

Participants

When the problem of science report writing in Lebanese EFL classrooms was pinpointed, an action research was carried in one Lebanese private high school, on one class (n=10) as a pilot study, to find out the impact of integration of the web tool,

Google+, procedural scaffolding, and authentic content, on the development of science report writing process, which was neglected for lack of time. Grade 8 was chosen as a basic level, as Grade 9 learners have the Lebanese official exams (Brevet). For the purpose of sampling, participation on the platform was left optional, but observed. The focus group were the participants who interacted actively on the platform for more than 10 times; the passive group were those who just listened and participated less than 9 times on the platform. For ethical purposes names were unrevealed. Thereafter, random sampling of these learners was performed and their results were compared. Captures (screen shots) of the participation on the platform were taken and presented.

Data Collection Instruments

Reports

Pre-intervention reports on 3 different scientific themes written by the 10 participants were collected (No. 30). One from each theme was randomly chosen for qualitative content analysis (see Appendix E). Post-intervention reports on a new theme written by the 2 groups were randomly chosen for analysis and comparison of pre/post-intervention results, to find out how each of the students from the different categories developed their report writing at the higher order concern (HOC) and lower order concern (LOC) levels. This evaluation was based on a science report writing rubric (see Appendix C) and accordingly it was assessed by 2 instructors; for reliability purpose, a 3rd was assigned in case of discrepancy in results were revealed. Tables were formed to display the results (see Appendix F).

Scores

The pre/post-intervention class performance scores were analyzed employing Microsoft Excel and displayed in charts, bar graphs and tables. The aim of selecting these instruments was to compare how the students developed in report writing at the post-intervention stage.

Interviews

As Mackey & Gass (2005) drew, an interview is a research tool that can test a hypothesis (p.179). An interview with the participants was designed, to get their opinion at the end of this intervention. Another interview with the participants' school science teacher was designed to find out how she integrates the use of Internet technology, contemporary pedagogical theories and authentic scientific materials in the science class, in order to motivate and develop report writing through instruction of process-writing techniques.

4. The findings, Interpretation and Discussion

Content Analysis of Pre-intervention Reports

Content analysis of science reports written by the two groups at the pre-intervention stage was conducted. As Cohen (2005) stated that content analysis requires auditing communication content against standards, taking a verbal and non-quantitative document and transforming it into quantitative data (pp.164-165), so this analysis was based on an Outline of Science Report (see Appendix B) and Report Writing Rubric (see Appendix C). Based on Hewett's (2012) description of HOC and LOC, the researcher mapped and analyzed the elements of HOCs at content-based level: title, thesis statement, content development, introduction and conclusion, organization, use of outside sources and appropriate quotation; as well as, she mapped and analyzed the elements of LOCs at sentence level: transitional words, word-level mistakes, grammar and mechanics errors, and citation style issues.

Pre-intervention reports were collected from the website of the school (see Appendix D), examined and the following was revealed.

The title: Titles should be written in informative and neutral form; instead, learners wrote them in interrogative form, as, "How is my blood type determined?"

The Abstract: An abstract is comprised of the purpose, method and results of the experiment; however, all the reports missed this part (In the mid/post-intervention the abstract was included).

The Problem: The problem was clearly stated, but it was displaced.

The Hypothesis: The investigated problem and results were clear.

The Introduction: The Introduction should include the aim of performing the experiment, background information (outside sources) and in-text citation. The learners missed the aim, didn't maintain a paragraph form, but copy-pasted info in bullets and missed to cite the background information. The form should be written in a paragraph-like form, but at times they wrote it in bullets and at others they mixed the paragraph with the bullets, such as,

"Plants need to take in a number of elements to stay alive. The most important are:

carbon

hydrogen

oxygen."

The Method: The Method section comprises of 3 parts written in bullets, and addressed in the passive voice and the past tense (see next).

- Safety: the steps taken to keep safe from hazardous material were missing.

- Material: materials, instruments and steps used were written but in a paragraph form.

Procedure: Instead of describing how the experiment was performed step by step, the learners copy-pasted it, and used the imperative case as, "Follow the virtual lab on the following website: http://www.kscience.co.uk/animations/minerals.htm",

"Fill the test tubes with water. Place the plants in the water." At other times, instead of using the passive voice, they employed the pronoun "we" in the present tense, such as, "First we choose a finger… we embrocate so that the blood will we inject our finger..." as if it was read in an instruction book!

The Results: to illustrate the results, data is set in tables, graphs, charts and figures, descriptive captions and numbers are seen in the order they appear in the text (e.g. Figure 1/Table 1). However, in these reports, data were floating and were not set in tables.

The Figures and graphs: These were employed, but descriptive titles and numbers were missing.

The Analysis: This part involves an explanation of what the results mean, e.g. "as seen in Figure1/Graph 2 …" in a paragraph form. At times, the learners explained what the results meant, without referring to the expression "as seen in Figure1/Graph 2 …", but at others, they just skipped this part.

The Conclusion: This part involves writing 1 or 2 sentences about data analysis and whether or not the results support the experimental hypothesis. In these reports, the conclusion supported the experimental hypothesis, but at other times it didn't, such as, the conclusion of "How is my blood type determined?" came as, "My blood type is AB+".

The References: References are the citation of outside sources used in the report according to the requirements of the APA format. However, in-text-citation for outside sources in the introduction section was missing, so references following the APA format did totally not exist.

Given that errors at HOCs (content-based level) and at LOCs (grammar and mechanics level) were traced, an intervention was required.

The intervention phase

The intervention started with the formation of a private group of Lebanese EFL grade 8 learners on Google+, which aroused curiosity and interest to integrate constructing knowledge with using Google+. The aim and objective of the study was to develop the report-writing skills. Then, Procedural scaffolding was implemented to serve this purpose. The first component of Procedural scaffolding was realized through modeling and sharing of an authentic science report. The "Boiling Water" report (see the link in Appendix A) was posted on the Google+ platform, its context was in line

with the theme of the month, on the syllabus of the learners. They were asked to read it and meet the next day by 8:00 p.m., for a synchronic group discussion session. When they met, online Think Aloud strategy was used to raise awareness of their own cognition and build knowledge on the frame. So, the purpose and the context of science report writing at the HOC and LOC levels were addressed. First, the HOC questions, related to the structure of the report (boiling water) (see Figure 1), discussed the content of each section laying the stress on their weakness, based on the corrected reports, as: When you read this report what did you realize? What was the abstract about? What did the thesis statement prove? What did the introduction include? What were the main parts of the Method? Where was the data set? What was the most important issue about the conclusion? What were the references used for?

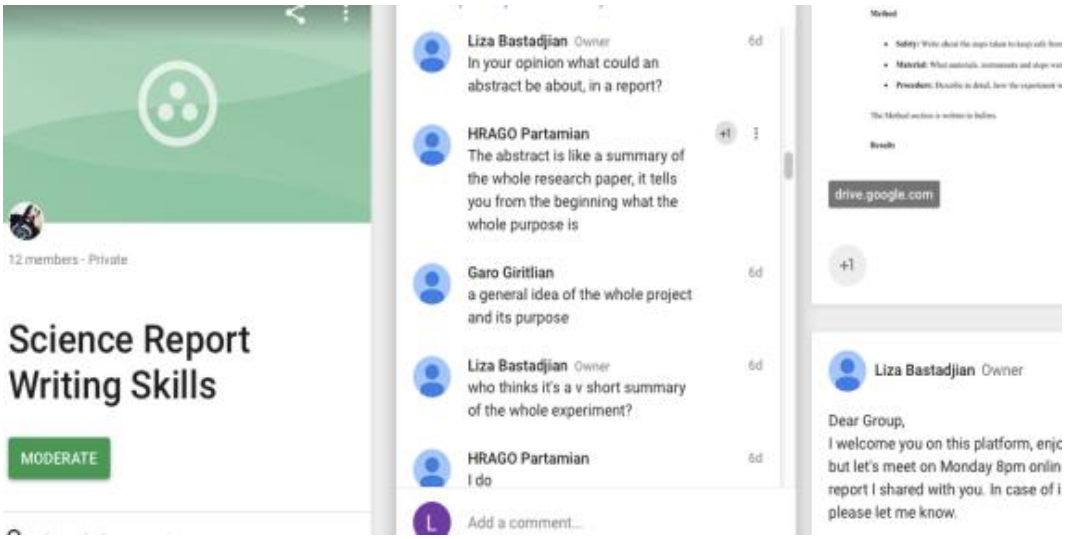


Figure 1. Discussion of HOCs on Google+

As seen in Fig. 1, the focus group students were highly motivated; they were interacting on the platform and answering all the questions related to HOC. For example, one student said that the abstract looks like "a summary of the whole research paper…"; another said, "it includes the aim, the purpose…". The main idea behind asking all these questions was to trigger their own metacognition about the parts they were skipping in their reports. Afterwards, LOC questions, concerning the language features of that report (see Figure 2) were addressed: What was the tense used here (past tense)? Why? Did the researcher use 1st or 3rd person when writing the report (third person)? Can you show me where? Did the writer focus on issues, information, processes rather than the subject or doer of the action? What do we call this form, active or passive (passive voice)?

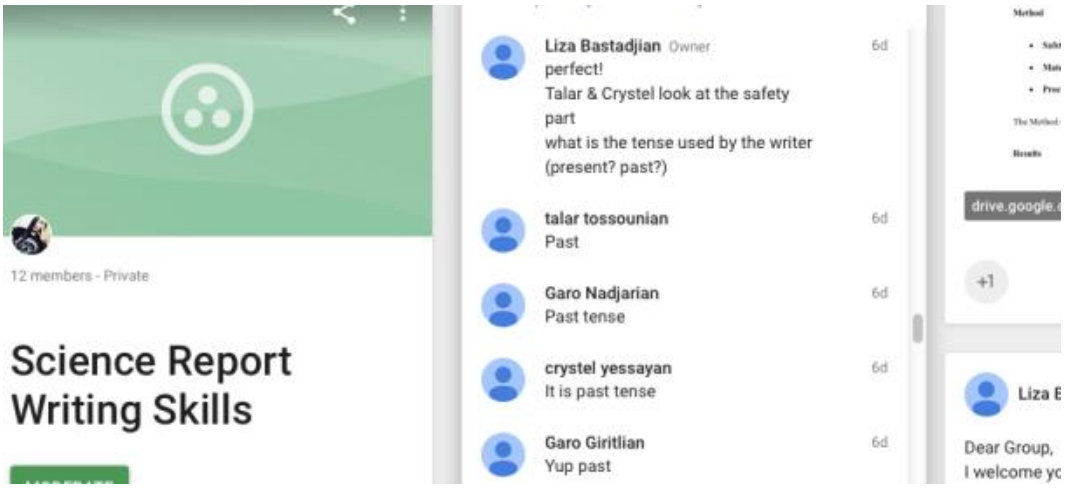


Figure 2. Discussion of LOCs on Google+

The same strategy was used in discussing the LOC. As seen in Fig. 2, the focus group interacted and gave correct answers to all the questions raised here. For example, they all realized that the tense used in the model was the past, not the imperative mood they were using. These questions made them realize the mistakes they were committing in their reports.

The second step of procedural scaffolding was realized through Rehearsing. At the end of the session, the learners were given guidelines related to writing scientific reports. The intervention period started when their 1st reports were already written, the implemented writing-process techniques comprised of revising, editing, rewriting, and final posting on Google+ platform. They were asked to reread a recent science report on "Blood Typing" (not written for this study rather as an assignment for their science course), to revise and edit it based on the given guidelines and then post it on the platform, in one-week time. They wrote their first draft, the teacher gave them feedback, focusing primarily on the errors that were observed in their texts. Finally, they wrote their final drafts. When they posted the revised drafts, they were led to coach each other on the platform and discuss the mistakes through peer-peer and instructor-learner discussion and commentary. Peer review and clear guidelines motivated them. Following the online discussion, she scaffolded their production, and led them to reread their own work more than once, to revise and do the necessary changes of their draft. They edited their reports at the HOC and LOC levels with the help of the instructor. When they started rewriting, she led the students to incorporate changes and post the final drafts.

The third step of procedural scaffolding was achieved through Applying. Finally, the learners applied the constructed knowledge and wrote a new authentic science report about “Natural Antibiotics” independently and shared it with their peers by posting it on the Google+ platform. The role of the instructor was to coach and gradually

withdraw from the process when independent work was attained. This intervention lasted for four weeks, two times per week. To sum up, Procedural scaffolding was successfully implemented, to develop the learners' report-writing skills.

Pre/post intervention report scores

The mean score of pre-intervention reports written by the two groups was 50/100 = F; no statistically significant differences were found; they wrote in the same pattern. The mean score of post-intervention reports of the passive group was 65/100= D; whereas, the mean score of post-intervention reports of the focus group was 80/100= B (see Figure 10). The focus group outperformed the control significantly by 15 points.

Qualitative Results

Content Analysis of Post-intervention Reports

Online instruction of report writing skills, which applied procedural scaffolding approach (e.g. modeling, sharing, rehearsing, applying), and the writing-process techniques from prewriting to final posting, had brought about encouraging results on some of the features of science reports. Content analysis of science reports written by the two groups at pre/post-intervention was conducted, based on Report Writing Rubric and Outline of Science Report. As Cohen (2005) stated, content analysis is auditing communication content against standards; its basic goal is to take a verbal, non-quantitative document and transform it into quantitative data (pp.164-165). HOC at content-based level (title, thesis statement, content development, introduction and conclusion, organization, using outside sources and appropriate quotation) was mapped. In addition, LOCs at sentence level (transitional words, word-level mistakes, grammar and mechanics errors, citation style issues) was mapped.

Title: Titles written in interrogative form were successfully changed to declarative, as, "Natural antibiotics from plants".

The Abstract section requires a summary of the entire report without including specific details, where the purpose, the method and the results of the experiment are included (see Figure 3 and 4).

Natural Antibiotics from Plants

Summary:What is the best natural antibiotics in plants? My hypothesis was that the olive oil and garlic have better antimicrobial properties. We conducted an experiment using culture plates where we used germs from our hands and sterile disks which contain the 4 natural antibiotics: solution of thyme, solution of lemon, honey and olive oil the has been soaked by garlic. The zone of inhibition of garlic and olive oil were larger than those of the other. Therefore, olive oil and garlic is the best natural antibiotic.

Figure 3: A sample of the passive group's abstract

Natural Antibiotics From Plants

Abstract

Some natural antibiotics inhibit the growth of bacteria. This project was performed to measure the effectiveness of different antimicrobial agents by measuring zones of inhibition on bacterial culture plates, using the Kirby-Bauer disk-diffusion method and I tested the most effective one on bacteria found on human feet. Four different natural antibiotics were used- lemon, olive oil and garlic solution, thyme and honey, where it was found that an olive oil and garlic solution was the most effective at fighting against bacteria found on human feet.

Figure 4: A sample of the focus group's abstract

As seen in Figure 3 the passive group learner used another title for "Abstract", he opened up with a question, and wrote the hypothesis, however, gave a detailed info on the experiment and the results. The focus group in figure 4 discussed concisely the purpose, the method and the results of the experiment.

The Introduction section requires that one clarifies the aim, and supplies related background information (outside sources) and in-text citation (see samples of the 2 groups here).

Research:Here is a list of 8 of the best natural antibiotics to help beat infections.

Echinacea:Echinacea was very popular in the United States during the 18th and 19th centuries, but its use began to decline after pharmaceutical antibiotics were developed. Studies have since show that it can be very effective for treating many strains of bacteria. Note: Echinacea can slow your body's metabolism of coffee and certain medications.

Goldenseal:Berberine, an alkaloid found in goldenseal, has demonstrated activity against Gram-positive bacteria, including MRSA. There are additional compounds in goldenseal that may enhance the antibiotic effects of berberine, so it may be prudent to supplement with goldenseal rather than its berberine extract. Note: Berberine may cause brain damage in infants and children. Do not consume if you are pregnant or nursing.

Garlic:The active component of garlic, called allicin, successfully targets many strains of bacteria. Garlic cloves can have beneficial effects but are not as potent as its supplement form. Note: Garlic as a supplement may prolong bleeding and can have major interactions with certain medications. It may be unsafe for children.

Figure 5: A sample of the passive group's introduction

Introduction

Nature has provided thousands of natural medicines and natural antibiotics over millennia. Most people are unaware, but virtually all pharmaceutical medications originally came from the plants of the Earth. After they were proven effective in treating various ailments, the pharmaceutical industry then created synthetic variants, which they could patent. In this way, they retained the exclusive rights to earn revenues from their patents over a specific period of time. The aim of this experiment was to find a natural antibiotic to fight against bacteria found on human feet.

The point is that every medicine under the sun originated as an herb or a spice, a tree leaf or shrub root, a berry or a fruit. Fortunately, some of these same medicinal function as very efficacious natural antibiotics. Especially when they are prepared properly, these potent medicines can produce the desired effects without many of the adverse side effects associated with pharmaceutical-grade antibiotics.

High-powered pharmaceutical antibiotics certainly have their place in today's society.

Figure 6: A sample of the focus group's introduction

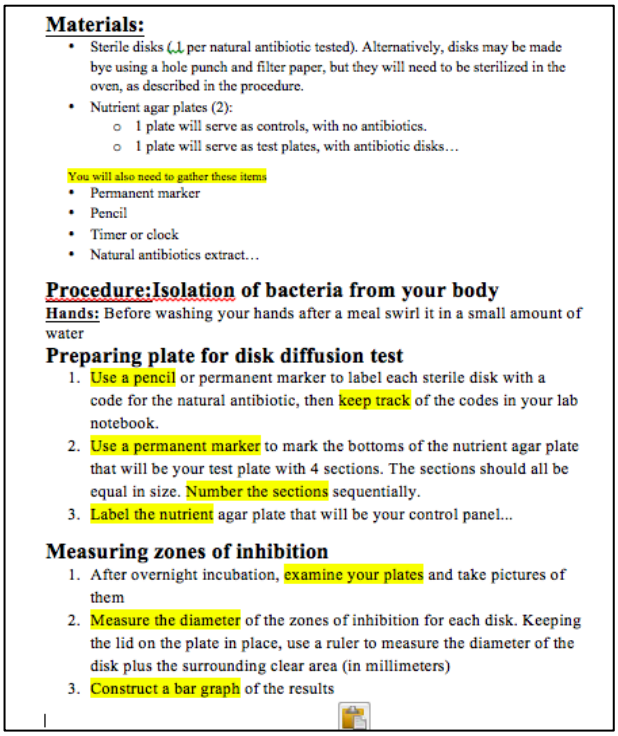
As seen in Figure 5, the passive group learner used another title for "Introduction", missed the aim, didn't maintain a paragraph form, but copy-pasted info in bullets and missed to cite background information. Whereas the focus group learner in Figure 6 included the aim, maintained the paragraph form, summarized and paraphrased info, but missed to cite background information.

The Method section requires 3 parts

Safety: This part is about the steps taken to keep safe from hazardous material.

Material: All the materials, instruments and steps used in the experiment are mentioned here.

Procedure: Description of conducting the experiment in details step by step are mentioned here (see samples of the 2 groups next).



Materials:

- Sterile disks (1 per natural antibiotic tested). Alternatively, disks may be made bye using a hole punch and filter paper, but they will need to be sterilized in the oven, as described in the procedure.
- Nutrient agar plates (2):
  - 1 plate will serve as controls, with no antibiotics.
  - 1 plate will serve as test plates, with antibiotic disks…

You will also need to gather these items

- Permanent marker
- Pencil
- Timer or clock
- Natural antibiotics extract…

Procedure:Isolation of bacteria from your body

Hands: Before washing your hands after a meal swirl it in a small amount of water

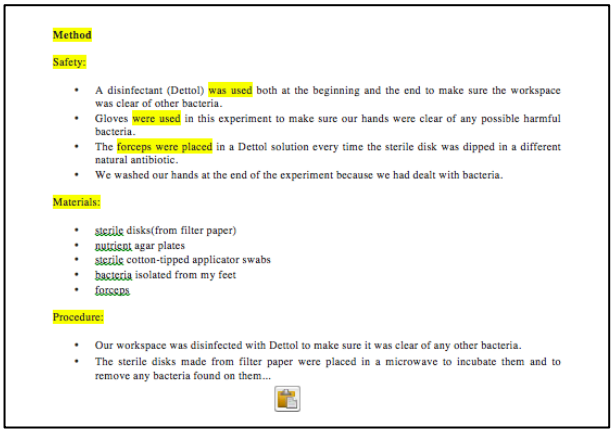
Preparing plate for disk diffusion test

1. Use a pencil or permanent marker to label each sterile disk with a code for the natural antibiotic, then keep track of the codes in your lab notebook.
2. Use a permanent marker to mark the bottoms of the nutrient agar plate that will be your test plate with 4 sections. The sections should all be equal in size. Number the sections sequentially.
3. Label the nutrient agar plate that will be your control panel...

Measuring zones of inhibition

1. After overnight incubation, examine your plates and take pictures of them
2. Measure the diameter of the zones of inhibition for each disk. Keeping the lid on the plate in place, use a ruler to measure the diameter of the disk plus the surrounding clear area (in millimeters)
3. Construct a bar graph of the results

Figure 7: A sample of the passive group's method



Method

Safety:

- A disinfectant (Dettol) was used both at the beginning and the end to make sure the workspace was clear of other bacteria.
- Gloves were used in this experiment to make sure our hands were clear of any possible harmful bacteria.
- The forceps were placed in a Dettol solution every time the sterile disk was dipped in a different natural antibiotic.
- We washed our hands at the end of the experiment because we had dealt with bacteria.

Materials:

- sterile disks(from filter paper)
- nutrient agar plates
- sterile cotton-tipped applicator swabs
- bacteria isolated from my feet
- forceps

Procedure:

- Our workspace was disinfected with Dettol to make sure it was clear of any other bacteria.
- The sterile disks made from filter paper were placed in a microwave to incubate them and to remove any bacteria found on them...

Figure 8: A sample of the focus group's method

As seen in Figure 7, the passive group learner missed the title "Method" and missed the "safety section" but copy-pasted instructions as these appear in the imperative form but not in the past tense. The focus group learner, as seen in Figure 8, followed the proper structure of the Method section and titles; he included the safety section

using the appropriate language, the passive past tense as "Gloves were used in this experiment".

Results: The results were not set in tables in the pre-intervention phase; however, in the post-intervention phase these were included, but missing the titles (see Fig. 9).

Antibiotic	Thyme	Honey	Lemon	Garlic & olive oil
zone of inhibition (in mm)	9	9	17	20

Figure 9: A sample of the focus group's results

Analysis: all learners explained what the results meant, but without adding the expression "referring to …" or "as

seen in Figure1/Graph 2 …"

Conclusion: the conclusion supported the experimental hypothesis, e.g. "therefore, the solution of olive oil and garlic is the best natural antibiotic."

References: the 2 groups included the references, such as,

Passive group

http://www.chopra.com/articles/8-effective-natural-antibiotics-to-help-beat-infections#sm.0001oede7o9x8dzssww2jri2qo24l

Focus group

http://naturalsociety.com/what-are-the-most-effective-natural-antibiotics

https://www.google.com.lb

Mechanics: although the checklist instructions said that "12 point Times New Roman" font should be used, the passive group learner used font 18 for his titles, whereas, the focus group abided to the checklist.

Language: synthesized language is favored, the passive learner copy-pasted word for word from another source; whereas, the focus group learner summarized and paraphrased the gathered info.

Quantitative Results: Pre/Post-intervention Scores

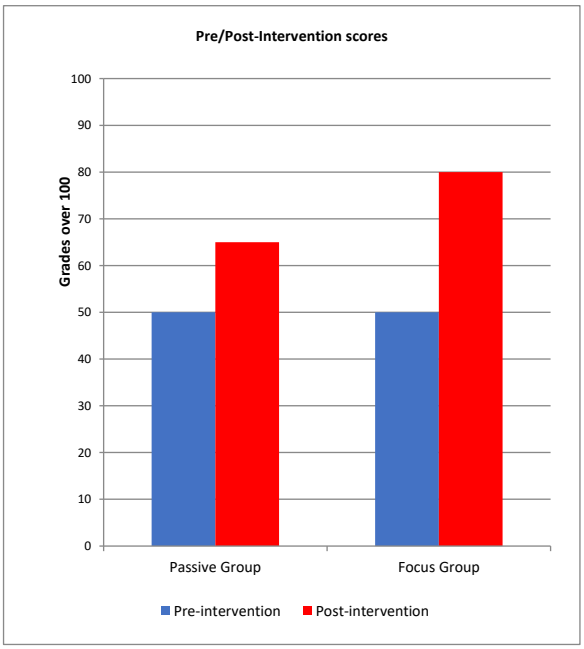


Figure 10: pre/post-intervention scores of the 2 groups

As seen in Figure 10, the score of the passive group shifted from 50.0 to 65; whereas, the focus group shifted from 50 to 80. This means that the focus group, who participated in online instructions and in procedural scaffolding approach, implemented the writing-process techniques, outperformed the passive at school significantly by 15 points. This validates the hypothesis that the integration of technology, Google+, pedagogy, Vygotskyan constructivism, and exposure to authentic material led the learners to improve in Science Report writing.

The Interviews

At the end of the intervention, the participants were asked their opinion about the intervention, "How did you benefit from the study?" "Do you think it could help in other courses? How?" Learners from the focus group responded (see the snapshot in Appendix G), one learner said, "This was very helpful …we may benefit at the university…", another said "I enjoyed it, it was helpful, it can help in our upcoming research papers as well." These learners realized that instruction on this platform was effective and applicable to other studies and in higher education in the future. Moreover, an Interview with their science instructor was conducted, following each question (Q) she answered (A), as seen here:

Q1-Do you integrate Internet technology and authentic contents in science classroom? (Internet sources) How?

A1-Yes, I do. Science fair projects are assigned to students where they research about the scientific problem in hand on the Internet using reliable sources to come up with a hypothesis, which is then verified experimentally. Students' science reports, ideas, opinions and collected information are shared in the school-blog. Virtual field trips are done to different ecosystems; tours inside cells or living organisms' different systems are visited, next to virtual labs and simulations. Our future plans include arranging meetings in class, via Skype with scientists, NASA researchers, and astronauts...

Q2-Do you usually integrate science and EFL teaching? When teaching science do you correct their English? How?

A2- I correct their grammatical and spelling mistakes without having to deduct any grades. My target is their scientific literacy. I focus on the scientific content in my evaluations rather than their English language.

Q3-What is the rubric you follow to instruct science report writing? (free writing? the book? other?)

A3- I evaluate each part according to the scientific content.

Q4-Do they work individually, in pairs or in groups? How?

A4- They work individually applying their knowledge i.e solving the exercises or answering the questions in class or writing reports. They work in pairs in visible thinking routines such as think, pair, and share... They work in groups in science fair projects, activities in class and experiments.

As seen in this interview she employs Internet for research purposes, as virtual labs and other, which expands their knowledge horizons and moves beyond the textbook; however, her focus is on the scientific content. As for science report writing rubric, she doesn't abide by any format, this validates the pre-intervention report content analysis. For their science projects, they work in pairs but procedural scaffolding is not applied.

Conclusion

In conclusion, the results validate the hypothesis that employment of TPACK framework, namely integration of Google+ (Cavazza, 2012), the instructional, collaborative and motivating platform, procedural scaffolding (Constructivist theory), and exposure to authentic content developed cycle 3 Lebanese learners in science report writing. The perception of the learners, reflected through the interviews, was positive. Similarly, their science class instructor implemented all the skills, related to science report writing, practiced in this study, on the rest of her cycle 3 classrooms. The significance of this study is in line with timely studies involving Web-based learning. At last, the Quantitative and the Qualitative results contributed to the field of integration of technology in EFL learning. It is recommended that authorities adopt: a unified form of science report writing for the science classes in the Curriculum of

cycle 3, and integrate Pedagogic theories and Authentic Content in various school courses to instruct the learners while motivating them.

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Appendices

Appendix A: A sample of science report "Boiling Water"

Retrieved on February 4, 2017, and adapted from http://studylib.net/doc/8430705/how-to-write-a-scientific-report

Appendix B: The outline of science report

Retrieved on February 12, 2017, and adapted from: https://unilearning.uow.edu.au/report/2b.html

Appendix C: Report Writing Rubric

Report Writing Rubric

NAME: _____

	Advanced/Exemplary	Proficient	Needs Improvement	Failing	Score
Title/Introduction/Hypothesis	Title is informative and clear. Introduces the topic clearly, previewing what is to follow. Clearly explains the purpose of the lab. Includes background information, vocabulary, question(s) or problem(s) to study, and a hypothesis with a full explanation. (Variables fully and clearly identified.) Provides a link between the background information and hypothesis.	Title is mostly informative and clear. Introduces the topic clearly, previewing what is to follow. Adequately explains the purpose of the lab. Includes some background information, vocabulary, a question or problem to study and a hypothesis with some explanation (Variables clearly identified.)	Title is mostly clear but not informative. Intro. somewhat explains the purpose of the lab. Includes some background information, vocabulary, a question or problem to study and a hypothesis with no explanation. (Some variables identified.)	Title information is not clear or not relevant to lab. Intro, does not explain purpose of lab. Includes no background information. The problem or question is unclear. Hypothesis is not testable.	
Safety / Materials / Procedure	Fully explores all relevant safety considerations. Effectively describes, in detail, how the experiment was performed. Includes all materials used and the procedure followed. Written in a manner that allows the experiment to be repeated. (Optional) Designs a detailed procedure that effectively addresses the question being studied. Generates data relevant to the variable(s) being studied and provides for adequate controls.	Explores relevant safety considerations. Adequately describes how the experiment was performed. Includes important materials used and the procedure followed. Mostly written so that the experiment can be repeated. (Optional) Designs a procedure that addresses the question being studied. Generates data mostly relevant to the variable(s) being studied and provides for adequate controls.	Explores some relevant safety considerations. Somewhat describes how the experiment was performed. Includes some materials used and a skeletal procedure. Somewhat written so that the experiment to be repeated. (Optional) Designs a procedure that barely addresses the question being studied. Lacks ability to collect important data. Variable are not clear and/or lacks adequate controls.	Explores irrelevant safety considerations or safety missing. Does not adequately describe how the experiment was performed. Lacks most materials. Experiment cannot be repeated. (Optional) Procedure design is completely inadequate to study question. Lacks variables and data collection methods.	
Data & Results / Calculations	Fully, clearly, and effectively organizes and reports all data collected during the experiment, including all raw data (without interpretation). All data and results organized in clear and fully labeled tables, charts, and graphs. All calculations shown, with units.	Clearly and effectively reports most data collected during the experiment with adequate organization. Data and results organized in clear tables, charts, and graphs. Most calculations shown, with units.	Reports most data collected during the experiment with some organization. Missing some data. Some data and results in tables, charts, and graphs. Some calculations shown, with some units.	Report is missing large amounts of data and is very unorganized. Tables, charts, and graphs do not show data and results. Calculations not shown.	
Conclusion / Discussion / Sources of Error	Claims a precise and well-Supported conclusion that responds to the purpose of the lab. Distinguishes the claim from an alternative or opposing claim. Supports claim with logical reasoning and many examples of relevant, accurate data and evidence that demonstrate an understanding of the topic. Fully summarizes and explains the meaning of data and results, with some examples. Explains relationship to hypothesis. Identifies important sources of error and explains effects on results.	Claims a conclusion based on data and results that ties to the purpose of the lab. Distinguishes the claim from an alternative or opposing claim. Supports claim with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic. Adequately summarizes and explains the meaning of the data and results. Hypothesis tied to results. Identifies some important sources of error and an effect of a source of error.	Makes claims and reaches conclusions minimally based on data and results. Somewhat supports claim with logical reasoning and relevant, accurate data and evidence that somewhat demonstrate an understanding of the topic. Somewhat summarizes and explains the meaning of the data and results with no concrete examples. Indirectly or barely refers to hypothesis. Inappropriately or minimally identifies sources of error.	Conclusion and claims do not relate to data and results. Does not support claim with logical reasoning. Uses little relevant, accurate data or evidence. Does not demonstrate an understanding of the topic. Does not summarize and/or explain data and results. Does not use examples of observations; generalizes without support. Fails to identify sources of error.	
Format	Meets all requirements given by your instructor.	Meets most requirements given by your instructor.	Meets some requirements given by your instructor.	Does not meet requirements given by instructor.	

Retrieved on March 4, 2017, from Formal Lab Report Writing Toolkit for Grades 6-8, Dr. Robert G. O'Donnell Middle School. Revised in Summer 2013.

Appendix D: Pre-intervention Science Report samples

Sample 1 - Biology Research Paper: Chlorophyllic Plants

Sample 2 - The Scientific Method: Can we fold A4 paper equally more than seven times?

Sample 3 - How is my blood type determined? https://agbuschools.edublogs.org/2017/01/19/how-is-my-blood-type-determined/#.XVe0erj7I6g

Appendix E: Results of 3 random pre-intervention reports

Criteria	Sample 1	Sample 2	Sample 3
Title	✔ Too general	✔ Interrogative form	✔ Interrogative form
Abstract	x	x	x
Problem	✔ mis-ordered	✔ mis-ordered	✔ mis-ordered
Hypothesis	✔	✔	✔
Introduction	✔ Wrong title	✔ Wrong title	✔ Wrong title
Aim	x	x	x
Background information & Citation	✔ not paraphrased nor cited	✔ not cited	✔ not paraphrased nor cited
Form (paragraph)	✔	✔	Bulleted
Method	Title: Experiment	Title: Experiment	Title: Experiment
Safety	x	x	✔ (not bulleted)
Material (bulleted)	✔ (not bulleted)	✔ (not bulleted)	✔ (not bulleted)
Procedure (bulleted)	✔ (not bulleted)	✔ (not bulleted)	
Results	✔	✔	✔
Table	x	x	x
Graph	✔ (not labeled)	x	x
Chart	x	x	x
Figure (Labelled)	x	x	✔ (not labeled)
Analysis	✔	✔	x
Conclusion	✔	✔	✔ insufficient no transition
References	x	x	x

Formal Style	✔	✔	✔
Grammar: Past tense Passive voice	Use of imperative and passive forms	Use of imperative Passive not used Use of pronoun We	Use of present tense and pronoun Passive not used Use of pronoun We

Notes. Abbreviated symbols mean: ✔ Present, x Absent

Appendix F: Results of pre/post-intervention reports

Criteria	Pre-intervention 2 groups	Post-interv Focus group	Post-interv Passive group
Title	✔ Interrogative	✔ Declarative	✔ Declarative
Abstract	X Totally absent	✔	✔ needs restructuring
Problem	✔ mis-ordered	✔	✔ Titled as "Question"
Hypothesis	✔	✔	✔
Introduction	✔ Wrong title	✔	Wrong title
Aim	x	✔	x
Background information & Citation	✔	✔	✔
Form (paragraph)	not paraphrased nor cited	not cited	not cited not paraphrased
	Bulleted	✔	Bulleted
Method	Title: Experiment	✔	Title: Experiment
Safety	X (Totally absent)	✔	x
Material (bulleted)	✔ (not bulleted)	(bulleted)	✔ (bulleted)
Procedure (bulleted)	✔ (not bulleted)	✔ (bulleted)	✔ (bulleted)
		✔ (bulleted)	
Results	✔	✔	✔
Table	x	✔	✔
Graph	x	✔ (not	✔
Chart	x	labeled)	x
Figure (Labelled)	✔ (not labeled)	x	x
		x	
Analysis	x	✔	✔
Conclusion	✔	✔	✔

	insufficient no transition		
References	x	✔	✔
Formal Style	✔	✔	✔
Grammar: Past tense Passive voice	Use of imperative, present tense and pronoun Passive not used Use of pronoun We.	Use of and passive forms in the past	Use of imperative Passive not used Use of pronoun We

Notes. Abbreviated symbols mean: ✔ Present, x Absent

Appendix G: The learners' interview answers