The effects of a digital learning environment on the workflow of students and teacher in a language-based learning difference science classroom

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Background & Questions

There are numerous methods out there for students to complete work in a classroom. With the approaching digital Renaissance, I wanted to see how the implementation of various digital solutions effected the way my population of students completed their coursework. I defined a general workflow; *Distribute -> Store -> Retrieve -> Produce -> Submit -> Generate Feedback -> Return Feedback*, and attempted to measure how well students (and myself) completed tasks within each stage of the workflow.

Primary question:

How will a completely digital learning environment affect the workflow of the students in a language based LD classroom?

Secondary questions:

A) What are the pros and cons of the digital solutions in each step of the workflow?

B) How will the treatment affect me as the classroom teacher?.

Sample

The student population I work with is very unique. All students at Middlebridge High School (MBS) have a primary diagnosis of a language based learning disability. There are a myriad of diagnoses that exist within the student body, but mostly include Autism Spectrum Disorder, Dyslexia, Dysgraphia, Auditory Processing Disorder, Expressive Language Disorder, and Executive Dysfunction. Again, that is only a small sampling of potential diagnoses. The class sizes remain very small at MBS. Because of all the individualized attention that the students need, class sizes range from four to seven, averaging about six. Students range in age from 13-18.

In the 2015-2016 school year, I taught four sections of chemistry; three sections with six students and one section with seven students. This total of 27 students comprised my sample. Of the entire sample,12 out of 27 were female (44%), while 15 were male (56%).

Treatment

- The treatment I designed involved four periods which alternated between treatment and non-treatment phases
- The treatment period had students using digital solutions to move through a work flow
- Some of these solutions included Google Classroom, DocHub, and Goodreader. These software platforms allow students to complete all steps in the workflow, including submitting assignments digitally
- The software programs also allowed the teacher to generate and return feedback and grades to students
- Non-treatment phases had students completing work with pencil/pen and paper unless the student needed an accommodation for handwriting, in which case they typed assignments, and turned them in per usual.

Data Collection Methods

AR Questions	**Primary:** How will a completely digital learning environment affect the workflow of the students in a language based LD classroom?	**Secondary:** What are the pros and cons of the digital solutions in each step of the workflow?	**Secondary:** How will the treatment affect me as the classroom teacher?
Data Source 1 (Observational)	Field notes and checklists	Where are students getting frustrated, having issues (how well are the students interacting with, responding to the technology solutions?)	Logs kept of time required to grade
Data Source 2 (Artifacts)	Completed, submitted on-time, sections of labs or worksheets	Timing of the retrieval of handouts that had previously been distributed to students	Periodical compare/contrast journaling of my experiences
Data Source 3 (Inquiry)	Student surveys (Do you feel you worked more efficiently thanks to the technology?)	Student interviews, Likert, attitude scales (How did you feel about this step or that step?)	Self reflection/journaling

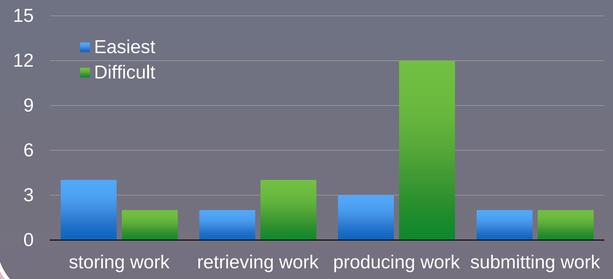
Methodology

This research will be conducted over the course of approximately 20 school weeks starting on Wednesday, September 16th and ending Friday, March 11th.

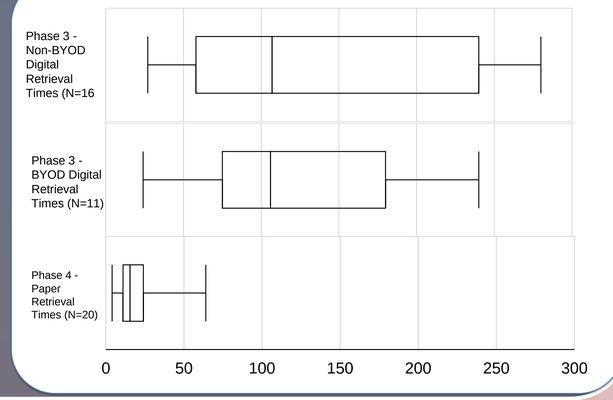
Research Phase	Treatment Applied?	Lessons and Assignments Included	Measurement Instruments Utilized
Phase 1: Sept. 16 - Oct. 14	Treatment	- Science Fair lab - Various HW assignments	- Observational journaling - Technology Utilization Survey - One-on-one student interviews
Phase 2: Oct. 27 - Dec. 4	Non-treatment	- Separating a mixture lab - Various HW and class work assignments	- Observational journaling - Logs kept of time required to grade - Timing of artifact retrieval - Completed, submitted, on-time artifacts
Phase 3: Jan. 4 - Jan. 22	Treatment	- Periodic table (research project) - Various HW and class work assignments	- Completed and submitted on-time artifacts - Timing of artifact retrieval - Student surveys/interviews
Phase 4: Feb. 1 - Mar. 11	Non-treatment	- Measurements and Units unit - Various HW and class work assignments	- Observational journaling by the teacher - Logs kept of time required to grade - Student surveys/interviews

Data Analysis

The results of the one-on-one interviews from Phase 1 clearly show that students had the most difficult time with technology solutions implemented during the *Produce output* stage of the workflow.



The results from the artifact retrieval timing sheet (at right) from through out the research are clear. When students completed assignments using pencil and paper during Phase 4 their retrieval rates were significantly higher. This was true even when controlling for the fact that some students had to spend extra time retrieving a computer from a computer cart. In addition, the rate at which students lost their homework went down significantly; paper methods were much more efficient than digital.



Conclusion

After distributing the Technology Utilization Survey during Phase 1, the data reported that students mostly felt neutral about the digital solutions implemented to produce output. However, after conducting the one-on-one interviews, students reported that DocHub, which was used to complete PDF versions of distributed worksheets, was not easy to use. Students had to place text boxes on the PDF worksheets before they could type on them, which they reported as being the most frustrating. Students were also not able to retrieve artifacts as efficiently using digital methods as measured by how often they were able to retrieve artifacts and how quickly they could retrieve them.

Implications to Teaching

Dochub was a major stumbling block for many students. This was revealed in the one-on-one interviews performed in phase 1. Students frequently cited the creation of text boxes on the PDF worksheets to be frustrating. Many wanted the text box to be, “Just perfect” and found that to be difficult. Dochub would not be a solution I would use in the future. In addition, the artifact retrieval timing sheet illustrated that students have a more difficult time with the “store” and “retrieve” phases of the workflow when compared to working with pencil and paper methods. Despite the fact that it may make it easier for me as the teacher to grade an organize digital assignments, a more seamless solution needs to be created before a completely digital workflow can be implemented and have the students see a benefit to how they complete work in the classroom.

References

- Middlebridge School logo provided courtesy of Middlebridge School
- MSU MSSE logo provided by MSSE program
- Additional references will be added as necessary