Experimenting with Flipped Classroom Teaching Method in Advanced Excel Classroom

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Abstract

The Flipped Classroom (FC) method is one of many teaching strategies. FC reverses the conventional educational sequence. In FC, students come to class prepared and work on projects, practical, and application-oriented challenges. FC requests that the learning process be flipped so that students read the concepts at home using the information provided by the instructor and then apply it in class. FC changes the way different stages of Bloom's Taxonomy implemented.

Researchers have experimented Flipped Classroom methodology in one of the Advanced Excel classrooms. The paper presents the experiment, overall perception of the students towards FC and whether perception changes with any Characters like Gender, Graduation Stream (Faculty), Work Experience and Competency in Excel.

Keywords- Teaching-Learning Methods, Flipped Classroom, Perception, Pedagogy, digitization of education, Microsoft Excel

Introduction

Pedagogical approaches have been studied by many researchers (Dr Babar Ali Khan, 2017), (Carol Evans, Camille Kandiko Howson, Alex Forsythe, & Corony Edwards, 2020), (S. Vaidheeswaran, 2021). Different pedagogical approaches were tried and tested in the Pandemic period also where Countries were forced to adopt digitization in education and India was not an exception.

The Flipped Classroom (FC) method is one of many teaching strategies. FC reverses the conventional educational sequence. In FC, students come to class prepared and work on projects, practical, and application-oriented challenges during class. FC was founded by two Colorado high school teachers named Jonathan Bergmann and Aaron Sams. FC requests that the learning process be flipped so that students read the concepts at home using the information provided by the instructor and then apply it in class. FC changes the way different stages of

Bloom's Taxonomy implemented. In traditional teaching, students mainly Understand and Remember in the classroom sessions. The other four goals (Applying, Analysing, Evaluating and Creating) of a topic are done "Outside the Classroom" (Flipped Learning Network, 2014).

However, in FC, the process goes reverse as Understand and Remember "Outside the classroom" and other four goals mainly in classroom activities.
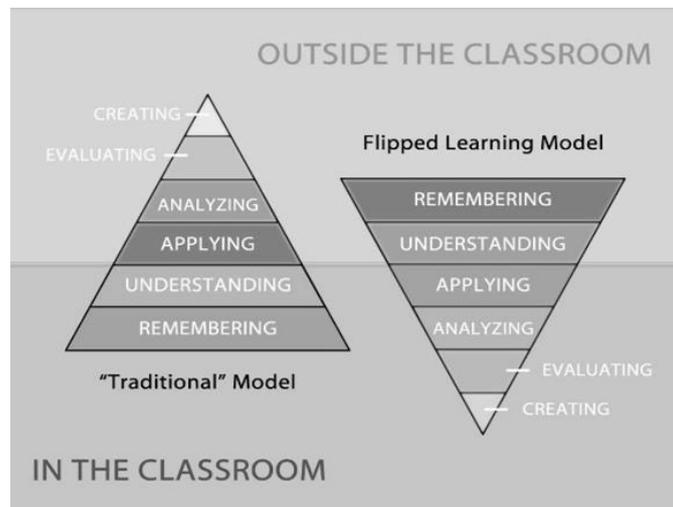

Figure 1: FC changes the way Bloom's Taxonomy is implemented.

Source: Flipped Learning Guide- College of Education and Human Development- Digital Education and Innovation Department

The definition given is "Flipped Learning is a framework that enables educators to reach every student. The Flipped approach inverts the traditional classroom model by introducing course concepts before class, allowing educators to use class time to guide each student through active, practical, innovative applications of the course principles." (Wagoner, Nechodomu, Falldin, & Hoover, 2016)

Higher education in the pandemic saw a greater usage of the FC (Blaženka Divjak, Bart

Rienties, Francisco Inie, Petra Vondra, & Mirza Žižak, 2022), and India was no exception. India was observed with another significant NEP (National Education Policy) event during the Pandemic. For India, the pandemic was a "blessings in disguise," (Dr. Mayank Dhaundiyal, 2020) and the NEP encouraged adoption of digitisation which eased the way FC is implemented as FC calls for digital infrastructure. Therefore, with the developments in digitalization, this pedagogy has emerged as a viable approach. Due to digitization, students have independent access to knowledge, especially higher education students. Students become more independent when they are in Post Graduate and have come with some work experience. When we talk about any Pedagogy, student perception of teaching pedagogy is an important factor in the overall success of a course and the development of both students and teachers (Connie Chuyun Hu, 2020) (Scott Freeman, et al., 2014). Student perceptions of teaching can impact their overall satisfaction with the course and their likelihood. When we talk about the perception of the students, it may vary from demographic characters like Gender (Beatty, I. D & Gerace W. J., 2009), academic variables like Graduation Stream (Beatty, I. D & Gerace W. J., 2009), (Bergmann J. & Sams A., 2012) (Andrew J. Cavanagh, et al., 2016), work experience of student (Mary Beth Gilboy, Scott Heinerichs, & Gina Pazzaglia, 2015) (Richard Pierce & Jeremy Fox, 2012) and Competency in

the course (Bishop J. L. & Verleger M. A. , 2013) (Maureen J. Lage, Glenn J. Platt , & Michael Treglia, 2000).

After doing Literature Survey, it was found that though some researchers say that Gender, Stream of Graduation, Work Experience and Competency in the course, the relationship is likely to be complex (Yousef Aljaraideh , 2019) and is not so clear.

Literature Survey

Refa and co-authors have studied the impact of demographic characters- Gender, college and status of the student on academic performance of the student. It is a comparative study of Faceto-Face and Distance Learning (Ghaleb A. El Refa, Abdoulaye Kaba, & Shorouq Eletter, 2021) Stephen Larson and Co-Authors have compared effectiveness of Flipped Pedagogy against Traditional in a MS Excel class. Their study failed to say that there is difference in these two methods, however, competency of the student in the subject have mediated the relation
(Stephen Larson & Junko Yamamoto, 2013)

The effect of Gender on perception flipped class was studied by Yousef Aljaraideh (Yousef Aljaraideh , 2019). The study concludes that Male students have more positive perception about FC. The study also focusses on other two variables that is Study Year and University Type.

Mark Frydenberg has experimented flipped class in MS excel with three classes. The students learnt more through the flipped class as per his study (Mark Frydenberg, 2013).

A comparative study is done by Dr. Fatimah Mohammed Ahmed Burayk in his research work. He has compared perception and satisfaction of students towards traditional teaching and flipped teaching (Dr. Fatimah Mohammed Ahmed Burayk, 2022). The study showed higher inclination towards flipped than traditional.

The study on Flipping the College Spreadsheet Skills is an experimental study which studies the score of 20 assignments given to students and conclude that students with prior knowledge have more good perception than others (Stephen Larson & Junko Yamamoto, 2013) (Dr Sunita Sreegiri, Dr. B Devi Madhavi, & Dr Lakshmi Kumari, 2018) have studied perception of MBBS students about flipped class and they found out that these students perceive flipped classes as more learning and happy classes.

The literature survey done by four authors gives mediating variable for the perception of flipped classrooms like academic domain (graduation stream), educational level, FC class design characters, (David C.D. van Alten, Chris Phielix, Jeroen Janssen, & Liesbeth Kester, 2019).

Study on effect of Gender and country in done in 2020 where researcher has worked on data of Gulf Region Countries and Jordanian Students (Emad Ahmed Abu-Shanab, 2020). The study concludes that "It is important to address gender-based needs, as it is a significant moderator."

Table 1 shows the presentation of Literature Survey and Research gap

Studies	Type	Teaching Pedagogy		Instructional Method		Variables studied			
		Tradi tional	Flip ped	Face to Face	Onli ne	Gend er	Graduation Stream	Work Experience	Competency in the Subject
Ghaleb A. El Refa 2021	Survey	Y	N	Y	Y	Y	N	N	N

Stephen Larson and Junko Yamamoto 2013	Survey	N	Y	Y	N	N	N	N	Y
Yousef Aljaraideh 2019	Survey	N	Y	N	N	Y	N	N	N
Mark Frydenberg 2013	Experimental	N	Y	N	N	N	N	N	N
Dr. Fatimah Mohammed Ahmed Burayk 2022	Survey	Y	N	Y	N	N	N	N	N
Stephen Larson and Junko Yamamoto 2013	Experimental	Y	N	Y	N	N	N	N	Y
Dr Sunita Sreegiri, Dr. B Devi Madhavi and Dr Lakshmi Kumari 2018	Experimental	N	Y	Y	N	N	N	N	N
David C.D. van Alten, et al. 2019	Literature Survey	N	Y	Y	N	N	Y	N	N
Emad Ahmed Abu-Shanab 2020	Experimental	N	Y	Y	N	Y	N	N	N
Current Study	Experimental Survey	N	Y	Y	N	Y	Y	Y	Y

Table 1 : Systematic Presentation of Literature Survey and Research Gap

Research Gap

The Literature Survey shows that there is very few research which has focused on effect of Gender, Graduation Stream, Work Experience of the student and Competency in the subject. The effect of these variables on perception may help to design the groups / teams for conducting FC.

Problem Statement

FC is an emerging pedagogy and more experimental pedagogy. Though there is research work done on FC, effect of demographic variables studied is not significant. It is mentioned that Design considerations play a role in success of FC (Emad Ahmed Abu-Shanab, 2020). So, it is evident to check that whether Gender, Graduation Stream, Work Experience of the Student and Competency in the course affects perception of Students about FC

Objectives

1. To check the perception of the students of the Excel class about Flipped Classroom 2. To check whether Gender, Graduation Faculty and Work experience affect Perception.
3. To check whether competency level of student in Excel affects Perception.

Tool

The research paper is a representation of an experiment where a FC is conducted in PGDMRBA (Post Graduate Diploma in Management- Research and Business Analytics) program for the course "Excel with Macros". The class was conducted with 5 steps out of 6 steps of implementing FC- Plan, Record, Share, Change, Group and Regroup. For last step that is Regrouping, perception and parameters affecting perception was important. PGDM-RBA is a Post Graduate program in Management faculty where students come with work experience also. Such students demand more experimental learning and FC is a way to give them more experimental learning.
Plan- FC was conducted for PGDM-RBA batch of 63 students for two units of the course

"Excel with Macros". The course consists of programming concepts of Macros in Excel using Visual Basic Application (VBA) language. The units that were selected for FC consist of

"Decision Making and Looping statement of Excel VBA". For conducting FC, Instructor / Researcher decided to give two practical problems of Excel Macros to each group to solve from total 16 practical problems.

Record- Instructor recorded her sessions (pre-recorded lecture) on both the units. While recording the session, document camera is being used effectively to explain the concepts that needs pen and paper.

Share- The material consisting of Reading Material, Videos made by instructor and some practice problems was shared with students using MS-Stream and Ms-Teams eight days before the class.

Pre-Class study- Students started to view the recording and read material. They were allowed to contact instructor if they have any query.

Group- The groups of students were made considering their Competency in Excel as major parameter. The other variables considered were Undergraduate Stream and Work Experience. Gender was not being considered for grouping.

Conduction of the class- In Actual class, instructor asked students to sit in group, elaborated the concept and motive of FC, distributed the problems among the groups and asked the group to solve the problems. Wherever required the instructor was guiding the group and resolving the queries of the students. The time span of the class was 2 hours. In last 20 minutes, instructor checked the problems solved and recorded the status. The class ended with feedback by students which was basically their perception about the class.

Research Design

Sample Size- 52 students of PGDM-RBA

Data Collection method- Online survey / questionnaire

Questionnaire- It contained the 36 items 4 point Likert scale on perception wrt Material Used, Environment in the class, Instructor and General perception of FC. Questionnaire also had three subjective questions to let students write their views explicitly.

Hypothesis- Objectives of the research are finding out the perception of the students towards FC. Objectives also tend to check whether the perception wrt Gender, Graduation Faculty, Work Experience and Competency in Excel (course for which FC is practiced). So the hypothesis is

1.	H0 :	The distribution of Gender, Graduation Faculty, Work Experience and Perception mode are the same.
	H1 :	The distribution of Gender, Graduation Faculty, Work Experience and Perception mode differ.
2.	H0 :	There is no difference between perception of students towards Flipped Classroom having different level of competency in that course.
	H1 :	There is difference between perception of students towards Flipped Classroom having different level of competency in that course

Data analysis and Interpretation-

Demographic- Four demographic characteristics were assessed – Gender, Graduation Faculty, Work Experience in years and Competency in Excel Table 2 shows the demographic analysis of the samples under study. Out of all 52 Samples, most were from commerce and engineering graduation (38.46% and 46.15%). Most were Intermediate User of excel (53.85%) and Novice Users (36.54%), very few did not know excel.

Characteristic	Factors	Frequency	Percentage
Gender	Male	38	73.1
	Female	14	26.9
Graduation Faculty	Arts	2	3.85
	Commerce or Management	20	38.46
	Engineering	24	46.15
	Science	6	11.54
Work Experience	1 Year	9	17.31
	2 years	5	9.66
	More than 2 years	6	11.54
	No	32	61.54
Competency in Excel	Don't Know	5	9.62
	Intermediate User --- using some advanced techniques of excel	28	53.85

	Novice user of Excel	19	36.54
	Total Samples	52	

Table 2 : Demographic

Normality test for the perception-

For testing normality, the perception variable is calculated by merging 36 item likert scale into one perception variable. The perception variable is checked for normality with the help of Histogram. Histogram clearly show that the data is not normal.
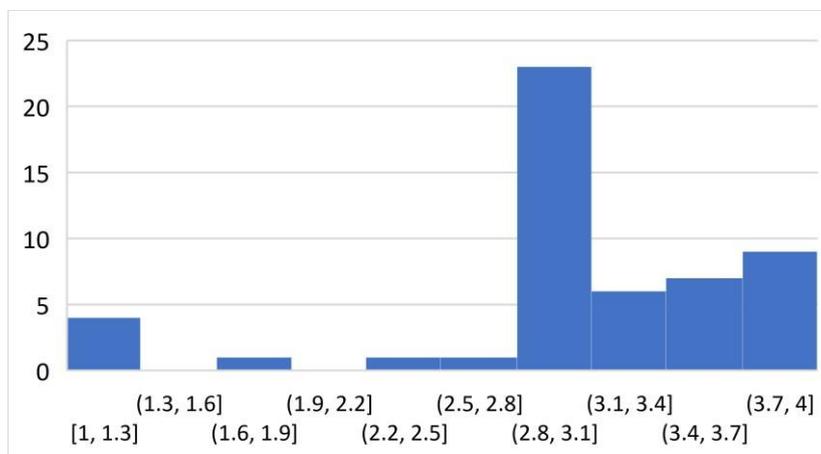
Graph 1:Histogram of Perception Data

So, it is decided to use non-parametric tests to test the hypothesis. For comparison of Gender group Mann Whitney test is used and for other hypothesis Kruskal Wallis is used to test sample having different values of Graduation Faculty, Work Experience and Competency in Excel.

Hypothesis Testing

For testing first Hypothesis, Friedman's Two-way Analysis of Variance by Ranks is used at 0.05 level of significance. And for second hypothesis, Spearman's Correlation test is run. The tests are run in SPSS and Excel.

Hypothesis 1-

1.	H0 :	The distribution of Gender, Graduation Faculty, Work Experience and Perception mode are the same.
	H1 :	The distribution of Gender, Graduation Faculty, Work Experience and Perception mode differ.

Figure 2 shows the result of Friedman test. The test shows that the value of test is less than 0.05. So, we fail to accept Null Hypothesis. It can be concluded that the distribution of Gender, Graduation Faculty, Work Experience and Perception differs. Hence, perception about FC differs with Gender, Graduation Faculty and Work Experience.

	Null Hypothesis	Test	Sig.	Decision
1.	The distribution of Gender, Graduation Faculty, Work Experience and Perception mode are the same.	Related Sample Friedman's Twoway Analysis of Variance by Ranks	.000	Reject the null hypothesis

Table 3:Hypothesis Test Summary

Hypothesis 2-

2.	H0 :	There is no difference between perception of students towards Flipped Classroom having different level of competency in that course.
	H1 :	There is difference between perception of students towards Flipped Classroom having different level of competency in that course

Table 3 shows the results of Spearman Correlation coefficient test at 5% level of significance. p-value (0.252962) is less than is less than Alpha value (0.05). So we fail to accept the null hypothesis. It can be concluded that there is difference between perception of students towards FC having different level of competency in the course.

Correlation Coefficients		Spearman's coefficient (test)	
Pearson	0.145469	Alpha	0.05
Spearman	0.161413	Tails	2
Kendall	0.151834	rho	0.161413
		t-stat	1.156526
		p-value	0.252962

Table 4 : Results of Spearman Correlation Test

Analysis of Anecdotal evidence

Four Subjective questions were analysed and the textual analysis is given below *Q- What are the advantages of the Flipped Classroom?*

Interactive and interesting: The flipped classroom provides an interactive and interesting learning experience that makes learning more enjoyable and engaging.

Better communication: The flipped classroom promotes better communication among students, which helps them to understand the concepts better.

Group work: The flipped classroom encourages group work, which allows students to learn from each other and gain a better understanding of the concepts.

Individual thinking: The flipped classroom promotes individual thinking, which helps students to develop their critical thinking and problem-solving skills.

Active learning: The flipped classroom encourages active learning, which helps students to stay engaged and interested in the subject.

Personalized learning: The flipped classroom provides a personalized learning experience, where students can learn at their own pace and in their own way.

Figure 2:Text Cloud

Q- What are the disadvantages / limitations of the Flipped Classroom?

Distractions: In a flipped classroom, some students may get distracted by others' conversations, which can negatively impact their learning experience.

Time-consuming: The flipped classroom requires students to invest time in learning the materials before class, which can be challenging for some students who have other commitments or responsibilities.

Group dynamics: Group work in a flipped classroom can be challenging if some team members are not contributing equally to the project or if there is a lack of effective communication and collaboration.

Less attention to individual students: In a flipped classroom, the teacher may have less time to give individual attention to each student, which can be a disadvantage for some students who need more guidance and support.

Misinterpretation of knowledge: Poor communication between students can lead to misinterpretation of knowledge, which can be a disadvantage of the Flipped Classroom. *Q- What improvements would you recommend to improve learning in the Flipped Classroom?* Better communication: There should be clear communication among students and teachers about tasks and expectations.

Group activities: More group activities can be done to enhance collaboration and peer-to-peer learning.

Seating arrangement: Proper seating arrangement can help in creating a better learning environment.

Disciplinary measures: Measures should be taken to control chaos and distractions in the classroom.

Academic backgrounds: Groups should be formed as per the academic backgrounds of students.

Combination of individual and group work: Students can be given practice sessions in class and individually before moving to group work.

Conclusion

The FC is conducted in the Advanced Excel class of RBA batch and their perception towards it was checked. Overall, students feel that FC is Interactive and Interesting pedagogy which facilitates better communication, group work and Individual thinking as well. Some Limitation are also mentioned by

students. The Class design and conduction can be improved by Designing group by academic background, improving seating arrangements, taking measures to control the chaos in the class.

It is found that perception of the FC changes as per Gender, Graduation Faculty, Work Experience and Competency in the course.

References

[1] Andrew J. Cavanagh, Oriana R. Aragón, Xinnian Chen, Mary F. Durham, Aiyana Bobrownicki, David I. Hanauer, & Mark J. Graham. (2016, Winter). Student Buy-In to Active Learning in a College Science Course. CBE—Life Sciences Education, pp. 1-9. Retrieved November 2022, from https://www.lifescied.org/doi/epdf/10.1187/cbe.16-070212

[2] Beatty, I. D, & Gerace W. J. (2009). Technology-enhanced formative assessment: A research-based pedagogy for teaching science with classroom response technology.
Journal of Science Education and Technology, 18(2), 146-162. doi:http://dx.doi.org/10.1007%2Fs10956-008-

[3] Bergmann J., & Sams A. (2012). Flip your classroom: Reach every student in every class every day. International Society for Technology in Education. Retrieved November 2022

[4] Bishop J. L., & Verleger M. A. . (2013). The flipped classroom: A survey of the research. 120th ASEE Annual Conference & Exposition. Retrieved November 2022, from https://www.researchgate.net/publication/285935974_The_flipped_classroom_A_survey_of_the_research

[5] Blaženka Divjak, Bart Rienties, Francisco Inie, Petra Vondra, & Mirza Žižak. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: findings and future research recommendations. International Journal of Educational Technology in Higher Education, 19(9), 24. doi:https://doi.org/10.1186/s41239-021-00316-4

[6] Carol Evans, Camille Kandiko Howson, Alex Forsythe, & Corony Edwards. (2020, August). What constitutes high quality higher education pedagogical research? Assessment & Evaluation in Higher Education, 46(4), 525-545. doi:https://doi.org/10.1080/02602938.2020.1790500

[7] Connie Chuyun Hu. (2020). Understanding College Students' Perceptions of Effective Teaching. International Journal of Teaching and Learning in Higher Education , 32(2), 318-328. Retrieved June 2022, from https://files.eric.ed.gov/fulltext

[8] David C.D. van Alten, Chris Phielix, Jeroen Janssen, & Liesbeth Kester. (2019). Effects of flipping the classroom on learning outcomes and satisfaction: A meta-analysis. Educational Research Review, 28, 18. doi:https://doi.org/10.1016/j.edurev.2019.05.003

[9] Dr Babar Ali Khan. (2017). Quality Improvement of Higher Education in India. International Journal of Science and Research, 6(8), 2167-2171. Retrieved June 2022, from www.ijsr.net

[10] Dr Sunita Sreegiri, Dr. B Devi Madhavi, & Dr Lakshmi Kumari. (2018, February). Student's Perception of Flipped Classroom Teaching Method in Andhra Medical College, Visakhapatnam. IOSR Journal of Dental and Medical Sciences, 17(2), 09-09. doi:10.9790/0853-1702010609

[11]   Dr. Fatimah Mohammed Ahmed Burayk. (2022). Students Perception and Satisfaction towards Flipped Classroom system over Traditional mode of Classroom system reference to Jazan University: A Comparative Study. Journal of Positive School Psychology, 5256 – 5266. Retrieved oct 2022, from http://journalppw.com

[12]   Dr. Mayank Dhaundiyal. (2020, May 7). Covid-19 pandemic: A blessing in disguise for India? The Time of India. Retrieved October 17, 2022, from https://timesofindia.indiatimes.com/blogs/strategos/covid-19-pandemic-a-blessing-indisguise-for-india/

[13]   Emad Ahmed Abu-Shanab. (2020, October-December). Students' Perceptions of Flipped Classrooms, Gender, and Country Difference. International Journal of Web-Based Learning and Teaching Technolog, 15(4), 36-56. doi:10.4018/IJWLTT.2020100103

[14]   Flipped Learning Network. (2014, March 12). Definition of Flipped Learning. Retrieved March 23, 2018, from Flipped Learning Network: https://flippedlearning.org/definitionof-flipped-learning/

[15]   Ghaleb A. El Refa, Abdoulaye Kaba, & Shorouq Eletter. (2021, February). The Impact of Demographic Characteristics on Academic Performance: Face-to-Face Learning Versus Distance Learning Implemented to Prevent the Spread of COVID-19. International Review of Research in Open and Distributed Learning, 22(1), 91-110. doi:https://doi.org/10.19173/irrodl.v22i1.5031

[16]   Mark Frydenberg. (2013). Flipping Excel. Information Systems Education Journal, 11(1), 63-73. Retrieved Jan 2022, from https://files.eric.ed.gov/fulltext/EJ1145027.pdf

[17]   Mary Beth Gilboy, Scott Heinerichs, & Gina Pazzaglia. (2015, Jan-Feb). Enhancing Student Engagement Using the Flipped Classroom. Journal of Nutrition Education and Behavior, 109-114. doi:https://doi.org/10.1016/j.jneb.2014.08.008

[18]   Maureen J. Lage, Glenn J. Platt , & Michael Treglia. (2000). Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment. The Journal of Economic Education, 31(1), 30-43. doi:https://doi.org/10.2307/1183338

[19]   Richard Pierce, & Jeremy Fox. (2012, December). Vodcasts and Active-Learning Exercises in a "Flipped Classroom" Model of a Renal Pharmacotherapy Module. American Journal of Pharmaceutical Education, 76(10). doi:https://doi.org/10.5688/ajpe7610196

[20]   S. Vaidheeswaran. (2021). THE NEED OF PEDAGOGICAL TRAINING TO HIGHER EDUCATION TEACHERS IN COLLEGES AND UNIVERSITIES IN INDIA. TEACHER EDUCATION PRACTICES, 1071-1078.

[21]   Scott Freeman, Sarah L. Eddy, Miles McDonough, Michelle K. Smith, Nnadozie Okoroafo, & Hannah Jordt. (2014). Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences (pp. 8410–8415). CrossMark. doi:10.1073/pnas.1319030111

[22]   Stephen Larson, & Junko Yamamoto. (2013, October 10). Flipping the College Spreadsheet Skills Classroom: Initial Empirical Results. Journal of Emerging Trends in Computing and Information Sciences, 4(10), 751-758. Retrieved March 2022, from http://www.cisjournal.org

[23]   Wagoner, T., Nechodomu, T., Falldin, M., & Hoover, S. (2016). CEHD Flipped Learning Guide. CHED Digital Education and Innovation. College of Education + Human Development.

[24]   Yousef Aljaraideh . (2019). STUDENTS' PERCEPTION OF FLIPPED CLASSROOM: A CASE STUDY FOR PRIVATE UNIVERSITIES IN JORDAN. Journal of Technology and Science Education , 368-377 . doi:https://doi.org/10.3926/jotse.648