FLIPPING THE ADVANCED EDUCATIONAL RESEARCH METHODOLOGY CLASSROOM

Author's name: [1]Omotunde,Christopher T., [2]Bada, Abiodun A., [3]Fagun, Kayode O.

[1]Ph.D., Department of Educational Technology, Adeyemi College of Education, Ondo, Nigeria

[2]Ph.D., Department of Educational Technology, Adeyemi College of Education, Ondo, Nigeria

[3]Ph.D., Department of Curriculum and Instruction, Adeyemi College of Education, Ondo, Nigeria, Department of Teacher Education, University of Ibadan, Oyo State, Nigeria

E-mail: omotundect@aceondo.edu.ng

Abstract	*A flipped classroom approach was implemented in an Advanced Educational Research Methodology course to encourage active student learning and enable the development of higher level learning skills. Students viewed written and/or audiovisual recordings of content materials prior to active face-to-face engagement where they then applied their learning through identification, analysis and interpretation of statistical data and results. Student outcomes for the flipped Advanced Educational Research Methodology course in 2019 were compared with student outcomes for the traditionally taught Advanced Educational Research Methodology course in 2018 which acted as control. Student evaluations of the course showed significantly stronger satisfaction with their learning experience by students in the innovative 2019 course compared to students in the traditional 2018 control (P=0.01).Although students in the 2019 group strongly agreed that flipping the classroom enabled them to apply their learning and that it had a positive effect on their learning, there was no significant difference in the major assessment results between the 2019 and 2018 groups.*
Keywords	*flipped classroom, student-centred learning, edmodo, advanced educational research methodolog*

INTRODUCTION

Research Statistics involves the application of statistical procedures to provide possible explanation for observed phenomena. The most vital proficiencies for learners to acquire in this field are the ability to identify the research problems; the requisite statistical tools which will adequately solve the problem and how to carry out such statistical procedures. This will strengthen and improve their ability to correctly apply statistical procedures in any given scenario or within a given research context.

Conventionally, the delivery of statistics in advanced educational research methodology has followed a lecture-based teaching approach, a teacher-centered approach in which learning content is defined, controlled and directed by the lecturer. This appears to limits high level mental aptitude of learners (Jones, Dyar&McKeever 2012) as they are not exposed to independently source and analyze information and are not adequately skilled in statistically analyzing research problems (Garside 1996). It has also been observed that due to the mathematical nature, learners tend to shy away from statistics. Learners need to be able to transfer learned statistical procedures from one research scenario to the other. Hence the traditional lecture-based teacher-oriented approach no longer suffices for research students.

The discourse of the teacher-centered approach to learning goes beyond the modest attainment of knowledge and comprehension and involves active involvement by learners in the learning process. Learner-centered learning enables higher levels of learning, comprising increased retention of information and critical thinking, analysis, synthesis and evaluation of information (Garside 1996; Weaver & Jiang 2005). It is obvious that learners who participate actively in the learning process learn more than those who do not and they experience an increased retention of information and learning (Howard &Henney 1998; Fritschner 2000; Howard, James & Taylor 2002; Weaver & Jiang 2005).

The idea of re-arranging face-to-face contact time with learners from a teacher centered to a learner focused experience advanced with the idea of flipping the classroom (Bergmann

&Sams2012). In this method, learners are directed to view pre-recorded material in their own time, while the class time is used for active learner engagement, discussion and application of concepts with actual real life instances. Developments in technology make it possible for lecture materials to be prepared and presented in diverse ways to meet the needs of learners with different learning styles. The present day learners have been exposed to using computers, video games and other tools of the digital age to respond to learning using technology. According to Prensky (2001) 'digital natives' think and process information fundamentally differently from their predecessors and are used to getting information really fast. When learners are provided with materials in advance of class time, they can work with the materials at their own pace and be actively involved in the construction of their own knowledge, not as inactive recipients.

In a bid to encourage learners to take more responsibility for their own learning and to begin the development of higher level learning skills for life-long learning the advanced research methodology classroom was flipped with a learner-centered approach to learning using pre-recorded materials and actively engaging the learners in critical thinking, problem solving and the application of requisite statistical tools to carry out statistical procedures or test to solve research problems. This paper investigates learners' performance with flipping the classroom to learning advanced research methodology course compared to learners' performance with the teacher-centered approach of learning the previous year.

MATERIAL AND METHODS

Advanced educational research methodology at Adeyemi College of Education, Ondo is a three (3) unit prerequisite course for every 300 level students before they are allowed to write their dissertation. The course is offered over 12 weeks in the first semester of year 3. Conventionally, the teacher-centered, face-to-face section of the course comprised of 2 hours lecture each week for all students, followed by 1hour tutorials each week for groups of 40-50 students. In 2017, changes were made and a learner-centered approach to teaching and learning was developed using the flipped classroom model, with new content materials given to learners outside of class time followed by the integration of in-class discussions and problem solving. Hence, lecture materials were prerecorded as weekly modules and made accessible on-line via the learning management system, Edmodo, for independent learning. The materials were organized to accommodate individual differences in learning styles. The audio-visual presentations were created using camtasia for visual learners, while learners who prefer to learn by reading, written materials were produced using office word document and also uploaded onto Edmodo. Consequently students were able to view written and/or audio visual materials. In a bid to encourage learners to study these materials, a short quiz on the content was attached to each weekly module and the quizzes had to be concluded and submitted on-line at least 1-hour preceding the face-to-face in-class discussion sessions.

In the independent student learning, learners met in the prior lecture periods for class sessions to discuss and to appraise the work. In these sessions, the learners were given work sheets that identified the learning objectives for the session and set out a number of short-answer questions and multiple choice questions (MCQs) which enabled students to isolate any knotty areas to be addressed. The work sheets also included research problem scenarios and statistical procedures to solve them. The 1hour tutorial that followed exposed students to independent sourcing of research problems and analysis of information as well as analyzing the research problems statistically and to discuss this work with the other students.

The tutorial began with a fifteen minute synopsis which summarized the work covered that week, relating key points and concentrating student attention on the main concepts and approving that learners understood the more complex concepts. The presented research problems scenarios gave learners the opportunity to apply their knowledge to discuss the

information and statistically analyses it. Assessment was implemented with a weekly on-line quiz with questions that focused on the work that was being covered that week. The quiz was uploaded on to Edmodo and accessible for students to complete until 1 hour before the face-to-face review session. These quizzes concluded in the tutorial sessions made up the assessment items, comprising 10% of the total marks for the course. There were two major assessment items; one written exams for 60%, one mid semester test for 20% of the total marks, also one individual written assignment for the final 10% of the total marks.

To determine learners' satisfaction with this changed approach to learning, an independent teacher, not involved in the teaching of the 2019advanced educational research methodology course, observed learners actions in the appraisal and discussion periods as well as in tutorials and requested students to remark on their experiences with this changed way of learning. Then, at the end of the course, students provided feedback by completing an evaluation of the course using an online course evaluation survey. The survey comprised 15 questions each with a 4-point Likert-scale response option from "strongly agree" to "strongly disagree".

RESULTS

The independent teacher's observation was reported that there was an excellent group relationship with learners helping themselves with calculations and discussing methodologies to problem solving. Some students made comments about the difficulty of knowing what statistical tool to be used but reported no difficulties with the analysis as students were given plenty of opportunity, with support, to practise these. Learners made positive comments about the topic summary given in the weekly tutorial with some learners opining that the summaries were the best part of the tutorial since it consolidated their learning. The evaluation of the course through an online course evaluation survey by the 2019 student was equated with the responses from the 2018 which no innovations to learning were introduced and which was used as a control group. Significantly more students in 2019 recorded "strong agreement" to the positive statements about the course compared to students in 2018, while significantly more students in 2018 recorded "agreement" to the statement. The questions asked and the percentage responses are shown in Table 1.

Table 1: Comparison of Advanced Educational Research Methodology students' evaluation of course in 2019 and 2018

	2019 %		2018 %	
	SA	A	SA	A
Expectations: I was clearly informed about the learning objectives of this course	51	11	21	04
Structure: The various components of this course were linked in ways that supported my learning	50	29	23	07
Support: The teaching staff was available to help me with my learning	53	27	14	04
Learning activities: The activities of this course motivated me to learn	62	19	22	04
Teaching: The quality of teaching in this course helped me achieve the learning objectives	60	22	36	12
Organization: Overall the course was well organized	49	10	28	14
Resources: The resources for this course helped me achieve the learning objectives.	51	21	33	21
Outcomes: My knowledge and skills have developed as a result of studying this course	45	20	18	23
Challenge: This course challenged me in ways that extended my learning	50	19	26	18
Assessment: The assessment items were clearly related to the learning objectives	65	27	22	22
Criteria: The criteria for all assessment items were made clear	67.5	25	29	20
Feedback: I received feedback that was helpful to my learning	40	14	17	22
Relevance:: I am able to apply my learning from this course to my wider goals	51	17	15	18

Satisfaction: Overall, I am satisfied with the quality of this course	65	15	27	24
Self-evaluation: I made a consistent effort to succeed in this course	60	12	32	20

Assessment results for advancededucational research methodology course in 2019 were compared with those for the students who had studied this course in 2018. Student numbers in the course in the two different years were very similar, with 81 students completing this course in 2019 and 85 students completing the course in 2018. The value of the major assessments was the same for both years and the written assignment in 2019 was similar to that of 2018. Although the results for the major assessment items are slightly higher for the 2018 group, there is no significant difference in the results for the two groups (Table 2). However, the results for the minor assessment items are significantly higher for the 2019 group compared to the 2018 group (P=0.002) (Table 2).

**Table 2. Comparison of assessment results in 2019 and 2018**

	2019 N=81	2018 N=85	P
Minor assessments (10%)	81/10.62	85/8.58	0.002
Assignment (10%)	81/17.31	85/17.65	ns
Mid-semester Test (20%)	81/12.22	85/13.17	ns
Exam s (60%)	81/31.17	85/33.22	ns
Total (100%)	71.32	76.62	ns

DISCUSSION OF FINDINGS

By flipping the classroom in the advancededucational research methodology course, fresh material traditionally presented in face-to-face didactic lectures was moved outside of class to online access using technology to present the material for independent student learning. Face-to-face class time was then used to encourage deep learning through discussions, problem solving, the application of learning in different contexts and the opportunity to personalize the learning of the students. Thus by flipping the classroom we also flipped Bloom's Taxonomy of Learning, a pyramid of learning domains in a hierarchical framework from simple to complex. Traditionally, the emphasis is on 'remembering' which is represented at the base of the pyramid then progressing with less emphasis to the more complex levels of learning at the peak. It is understanding and application of knowledge that are the most important goals of education (Krathwohl 2002), thus by inverting Bloom's pyramid, there is less emphasis on 'remembering' and increasing emphasis is placed on the higher level learning skills of applying, evaluating and analyzing (Anderson, et.al. 2001). Model of the inverted pyramid for the progressive development and application of learning in the research methodology course is shown in Figure 1. The out of class, online, passive learning, comprised the reading of materials, watching recorded lectures, remembering definitions and equations and confirming the understanding of content and recall of information. This progressed to in-class, active learning, with quizzes to assess understanding and the analysis of data. As students progressed to higher levels of learning they applied their knowledge to evaluate and analyze different data scenarios. Students then demonstrated higher order thinking skills as they now interpret data analyzed. While these learning domains are presented as distinct and separate, there is overlap as they flow from one to the other.

Figure: Model for the flipped classroom. Adapted from Jennifer, S., Irene, M., Siva, K. (2014)

Flipping the classroom created an environment in tutorials where students worked together on case studies, problem solving to apply their newly acquired knowledge in analyzing different statistical data scenarios. These scenarios provided students with
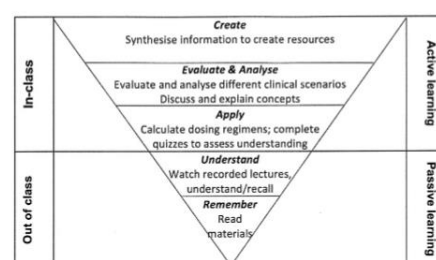
experiences they would encounter while carrying out their actual research. Students interacted with their peers, developing their communication skills while also learning from each other. This active learning experience encouraged the development of information and knowledge required in the future work environment. When the students in the 2018 control group had studied research methodology course they had worked on analysis from individual, structured workbooks in their tutorials. As these students worked independently, the need for collaboration did not occur and many of these students did not attend the tutorials but chose to work from home.

As this course was taught in the first semester, it was the first experience for these students working in the Flipped Classroom model. Student satisfaction with the course was significantly greater for the 2019 group compared with the 2018 control group and there was stronger agreement on the positive effects of teaching and learning from students in the 2019 innovation group compared to students in 2018. In particular, a greater proportion of students in the 2019 group strongly believed that their learning was motivated by the activities in the course, that the resources helped them to achieve the learning objectives, and that the various components of the course were linked in ways that supported their learning compared to the 2018 students. Also, a greater proportion of students in the 2019 group strongly believed that the course challenged them in ways that extended their learning and that they were able to apply their learning from the course to their wider goals compared to the 2018 students.

Although the majority of the 2019 student indicated that the course supported their learning which was motivated by the activities in the course, there was no significant difference in their assessment results apart from the minor assessment tasks. In fact, the results for the three major assessment tasks were slightly higher for the 2018 control group. A possible reason for the lower results for the 2019 group could be partly attributed to the lower marks for these students at the lower end of the range. Four students in the 2019 innovation group failed the course and their lower marks were recorded in the final results for the group, while the three students in the 2018 group who were failing the course withdrew from the course to avoid recording a 'fail' result and their marks were not included in the final assessment results. It is possible that the significantly higher minor assessment results for the 2019 group could be attributed to greater student involvement and active learning that occurred in the tutorials compared to the 2018 students who chose to work on their own, at home.

Previous studies have compared student satisfaction and student performance where the same course has been delivered to two groups of students in two different ways, as in a traditional classroom setting or by distance education, where distance education includes online courses, interactive videoconferencing, videotaped and audio-taped lectures. Reported student satisfaction with the different methods of delivery does vary. Significantly greater student satisfaction was reported for online compared to traditional delivery in a course in Clinical Pharmacokinetics (Kidd &Stamatakis 2006) which is similar to this finding. Lower satisfaction was reported among students for online videoconferencing compared to traditional delivery in Pharmacotherapy and Pharmacokinetics courses (Chisholm et al 2000).

Chisholm et al. suggest that the student dissatisfaction was confined to some instructors in the videoconferencing group. However, in a Business course, no differences in student satisfaction were reported between online and traditional delivery (McFarland & Hamilton, 2005). Student performance in these studies was also compared. No differences in performance were observed between online and traditional delivery in two of the studies (Chisholm et al 2000; McFarland & Hamilton, 2005) but there were significantly better results observed in the traditional classroom group compared to online in one of the studies (Kidd &Stamatakis 2006). Other studies that compared student performance only when using two different modes of delivery for the same course reported no differences in student performance. These include traditional

versus online videoconferencing in Pharmacy courses (Ried& McKenzie 2004), Pharmacokinetics (MacLaughlin, Supernaw& Howard 2004) and Pharmaceutics (Mobley 2002). These results are more consistent with our findings.

CONCLUSION

The Advanced Educational Research Methodology students in the 2019 flipped classroom indicated strong satisfaction with their learning environment where they were provided with multiple opportunities to apply their learning in 'actual research scenario', and strongly agreed that it had a positive effect on their learning. However, there was no significant difference in overall assessment outcomes compared to the 2018 control. Ideally, a larger sample size would strengthen the findings in this study but numbers are controlled by student enrolment in the course. Further research is needed using assessment tasks that will measure critical thinking, communication, problem solving and the application of learning in other research scenarios to determine the effectiveness of this model of learning.

REFERENCES

- Anderson, L.W., Krathwol, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R. E., Pintrich, P. R., Raths, J., &Wittrock, M.C. (2001). *A taxonomy for learning, teaching and assessing: A revision ofBloom's Taxonomy of Educational Objectives*, Longmans, New York, 2001.
- Bergmann, J. &Sams, A. (2012). Flip your classroom: Reach every student in every classroom every day. *International Society for Technology in Education*, Eugene, US.
- Chisholm, M.A., Miller, A.W., Spruill, W.J., Cobb, H.H., Reinhardt, B.O., Terry, A.V., Reese, L. R., &Wade, W.E. (2000).Influence of interactive videoconferencing on the performance of pharmacy students and instructors. *American Journal of Pharmaceutical Education*, 64
- Fritschner, L.M. (2000). Inside the undergraduate college classroom: faculty and students differ on the meaning of student participation. *The Journal of Higher Education*, 71(3) 79-82
- Garside, C. (1996). Look who's talking: A comparison of lecture and group discussion teaching strategies in developing critical thinking skills*. Communication Education*, 45(3) 25-31
- Jennifer, S., Irene, M., & Siva, K. (2014). Flipping the classroom for pharmacokinetics*. American Journal of Educational Research, 2*(12)
- Jones, C.E.,Dyar, S.C., &McKeever, A.L. (2012). Small-team active learning in an integratedpharmacokinetics course series. *American Journal of Pharmaceutical Education,* 76(8) 33-40
- Howard, J.R. &Henney, A.L. (1998). Student participation and instructor gender in the mixed-age college classroom. *The Journal of Higher Education*, 69(4)
- Howard, J.R., James III, G.H., & Taylor, D.R. (2002). The Consolidation of responsibility in the mixed- age college Classroom. *Teaching Sociology*, 30(2) 16-22
- Kidd, R.S.,&Stamatakis, M.K. (2006). Comparison of students' performance in and satisfaction with a clinical pharmacokinetics course delivered live and by interactive videoconferencing.*American Journal of Pharmaceutical Education*, 70(1) 8-13
- Krathwohl, D.R. (2002). A Revision of bloom's taxonomy: An overview*theory into practice*,41(4).
- MacLaughlin, E.J., Supernaw, R.B., & Howard, K.A. (2004). Impact of distance learning usingvideoconferencing technology on student performance. *American Journal ofPharmaceutical Education*, 68(3) 27-35
- McFarland, D. & Hamilton, D. (2005). Factors affecting student performance and

satisfaction online versus traditional course delivery. *The Journal of Computer Information Systems*, 46(2) 23-30

- Mobley, W.C. (2002). Adaptation of a hypertext pharmaceutics course for videoconference-baseddistance education. *American Journal of Pharmaceutical Education*, 66

- Prensky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the Horizon9*(5), 1-6.

- Ried, L.D. & McKenzie, M. (2004). A preliminary report on the academic performance of pharmacy students in a distance education program. *American Journal of Pharmaceutical Education,68*(3) 33-40

- Weaver, R.R. & Jiang, Q. (2005). Classroom organization and participation: college students' perception. *The Journal of Higher Education*, 76(5) 9-14