# Perceptions of a 'flipped classroom' approach to teaching and learning: a case study

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This paper reports the findings of a research inquiry into undergraduate student and teacher perceptions of a flipped classroom experience in the School of Education at Nottingham Trent University, United Kingdom. The purpose of the research was to identify whether this approach to learning, resulting in new pedagogy, is a positive experience for students and staff. The methodology used in this study was primarily questionnaires, observations and interviews. The findings indicate that although respondents (n=90) benefited from this approach and new pedagogy, particularly the collaborative learning environment and more individual experience of leaning, there are emerging challenges such as resourcing, support for tutors and transitioning students. This paper provides new knowledge relating to introducing flipped learning into Higher Education.

**Keywords**: flipped classrooms; technology; higher education; student engagement; pedagogy.

## Introduction

The term 'flipped classroom' is not new to Higher Education pedagogy, however adapting this practice is new to many Universities. Nottingham Trent University (NTU) in the United Kingdom (UK) has invested extensively in resources to develop staff expertise and appropriate technology to run a cross-University pilot of Flipped Classrooms. The model that NTU are using is that developed by Beichner (2007) working initially with Physics students, now adopted globally, entitled Student-Centred Activities for Large Enrolment Undergraduate Programs (SCALE-UP). Beichner's main goal in developing this model was to establish a highly collaborative, hands-on, computer-rich, interactive learning environment for large cohorts where students had the opportunity to 'interact with faculty, collaborate with peers on interesting tasks, and are actively engaged with the material they are learning' (2007, p3).

Bishop and Verleger (2013, p1) describe flipped learning as 'The flipped classroom is a new pedagogical method, which employs asynchronous video lectures and practice problems as homework, and active, group-based problem solving activities in the classroom'. The project across NTU has allowed staff freedom to decide how the classroom is flipped resulting in various approaches which reflect the needs of students across different disciplines.

This paper reports the perceptions of students and teachers who are using this flipped classroom pedagogical model for the first time at NTU. Data for this research was gathered by student researchers supported by an academic researcher as part of a Research Enquiry Module. Questionnaires, observations of flipped classroom sessions and interviews were used to gather data from both staff and students.

The research has identified some of the affordances and challenges of using flipped classroom pedagogy in higher education which are shared in this paper. This paper is presented at the end of the first year of the pilot phase.

## Background

The project started in 2012 when academic staff were invited to take part in the SCALE-UP project. From the School of Education three courses decided to take up this opportunity: BA(Hons) Childhood Studies, BA(Hons) Secondary Design and Technology Education and Post-Graduate Primary Education. Resources across the University were identified be appropriate to deliver the SCALE-UP model which is based on groups of students working collaboratively around circular tables, a tutor area in the centre of the room and whiteboards around the room; one per group. The School of Education is based at the Clifton campus, south of the main city of Nottingham where the main University campus is sited. A traditional workshop-type classroom was identified to be the Clifton SCALE-UP room and was converted prior to the start of the project. Figure 1 below shows the room prior to the conversion and Figure 2 shows the SCALE-UP room completed.

As indicated above the intention of SCALE-UP is to provide resource for large enrolment cohorts. The notion of large cohorts being able to access a SCALE-UP room resolves some of the economy of scale of large lectures which is discussed in the literature section below. However, due to estate constraints and a 5-year regeneration project the Clifton campus SCALE-UP room for the pilot was limited to 54 students; a successful pilot will impact on the development of this resource.

**Figure 1: Classroom prior to conversion**

**Figure 2: Classroom post conversion**

Following the flipped classroom pedagogical approach classes were set preparation materials addressing theoretical concepts to engage with prior to the in-class sessions which would take place in the Scale-Up room. Students were then put into groups and set group activities to apply the theory from the preparation stage to practice through problem-solving activities.

Each group were allocated to a circular table with one tablet. It was decided by central services to purchase MacBook tablets although staff had little or no experience of this technology, computers at the university traditionally being desktops with Microsoft software. Resource was therefore provided to train staff in using the tablets with all staff involved in the project being invited to two half day training sessions which focussed on the new technologies they would be using. Technical support was also identified to support the SCALE-UP sessions. It was planned that the MacBooks would be able to connect to Apple TV which was also provided in the SCALE-UP room with an intention that students would be able to link their own mobile technologies to the Apple TV as a planned future development.

The tutors who had volunteered for their module to be delivered as SCALE-UP sessions met in the summer term prior to the start of the pilot to discuss pedagogy. It was recognised that changes in delivery and pedagogy would require careful planning to ensure learning objectives were met. It was acknowledged by all tutors that existing materials would need to be revised to provide the flipped classroom pedagogy required. Assessment was also revisited to ensure that the new pedagogy would support both formative and summative assessment.

In September 2013 the first pilot groups commenced their SCALE-UP modules. Data has been collected from both staff and students involved in this pilot which is discussed below.

## Literature Review

A literature review on flipped learning suggests there are three key aspects: impact on student, impact on tutor, impact on university resources. This literature review will focus on each of these aspects.

Flipped classroom pedagogy is described by Bishop and Verleger as ‘a new pedagogical method, which employs asynchronous video lectures and practice problems as homework, and active, group-based problem solving activities in the classroom.’ (Bishop and Verleger, 2013, p.2). Bishop and Verleger therefore suggest tutors will provide the lecture, traditionally attended by students in large lecture theatres and often in large numbers, via an electronic learning platform which students will watch prior to meeting as a group in a seminar/workshop type environment where they will be presented with activities to put theory learnt in the video lecture into practice working collaboratively in groups. Berrett (2012) extends student preparation from video lecture to pre-session reading or podcasts. By providing access to pre-classroom preparation learning is extended beyond the classroom and can be accessed at a time to suit individual students. This may be seen as a positive development in a climate when the notion of traditional lectures resulting in deep learning, is being challenged by eminent professors. For example Mazur (2012) found that students’ brains are more asleep during lectures than when they are in bed suggesting that activity based problem-solving where students apply theory to practice, results in deeper learning and increased progression. Indeed Beichner and Saul (2013) identify key outcomes of the SCALE-UP pedagogy as resulting in increased ability to solve problems, increased conceptual understanding, increased attendance and satisfaction, reduced failure rates and increased success for ‘at risk’ students in subsequent modules.

The student academic experience is a key strategic focus at Nottingham Trent University. In introducing this initiative the student experience has therefore been core to this development.

Overall the literature indicates that the impact on the student experience is mainly positive with research indicating increased student engagement Berrett (2012) and Beichner and Saul (2013) and a higher level of enjoyment by students (Berrett, 2012). Fulton (2012, p.2) argues 'significant increases in student learning and achievement when flipping compared to baseline data on the same courses taught in the traditional classroom lecture mode, using the same assessments'. While Herreid and Schiller (2013) believe the increase is due to thinking being promoted inside as well as outside of classes thus engaging students more actively in their learning.

Students taking more control of their learning is identified in the emerging literature on flipped learning as being an impact of flipped classroom pedagogy. For example Lancaster (2013) state that the flipped classroom technique empowers students to take control of their own learning and Rutherfoord and Rutherfoord (2013) believe student engagement is due to increased freedom and control by students. Additionally, Berrett (2012) argues that flipped classrooms allow students to work at their own pace and engage their own learning strategies which results in a positive learning experience.

Several researchers find that increased confidence is often an impact of flipped learning (Sezer, 2011) while Gaffney et al (2008) argue that shy students cannot hide and are encouraged to contribute more thus gaining an enhanced classroom experience and report increased confidence.

As stated above flipped classroom pedagogy requires students to prepare more carefully for classroom experiences. This is met with mixed views in the literature, for example Fulton (2012) found that although time in class was used more effectively with flipped classroom techniques, students unfamiliar with this method could become resistant to it and as a consequence arrive unprepared for lessons. Berrett (2012) later contradicts his notions by disputing that this freedom may lead students to dislike flipped learning as they have to find the material for the lessons themselves, it is not 'spoon-fed' to them; they may look upon it too much like homework and instantly reject it.

Working collaboratively to apply theory to practice strengthens team based skills and is a key component of the flipped classroom pedagogy Miller (2012). Berrett (2012) also found that students benefitted from developing knowledge together while controlling their own learning and Shimamoto (2012) also found flipped classrooms promoted social interaction. However, the emphasis on working collaboratively can result in a reliance on other students and careful management by tutors is important to facilitate individual progression.

For tutors the flipped classroom pedagogy needs to be embraced with opportunity for increased exploration of knowledge resulting in a richer learning environment . Preparation of pre-session video, reading or podcasts can be an additional element of planning, assessment needs to be carefully aligned with the teaching and learning activities and learning outcomes, and tutors need to be confident in working in a different environment. With some subjects it can be challenging for teachers to explain difficult concepts in a format intended for an electronic learning platform rather than in front of the students in the traditional lecture theatre (Tucker 2012). However, the benefits to using flipped classroom techniques is increased opportunity for classroom discussion (Miller, 2012) and increased opportunity to help students progress and gain a deeper level of understanding through carefully planned classroom-based activities rather than from traditional lectures (Rutherfoord and Rutherfoord, 2013), thus creating a shift from teacher centred to student

centred learning (Arfstrom et al, 2013). Indeed Shimamoto (2012, p.2) reinforces student understanding and progression as a key benefit stating 'students in active learning environments show improved retention and better conceptual understanding of learned material'.

In flipped classrooms, while students are working collaboratively applying theory to practice through pre-planned activities the tutor is able to provide support through interacting with each group which is often lacking in traditional lecture style teaching and learning. Miller (2012) identified this increased opportunity to enhance the learning experience and increased understanding for students. Fulton (2012) believes this is because in flipped classrooms teachers are given a better insight into students' style of working and what they are finding particularly difficult. While Bergmann and Sams (2012) found that through identifying those struggling with understanding and providing flexible support during classes, students progressed more through working through challenging activities.

Flipped classrooms offer a powerful opportunity for embracing new technologies. As stated earlier the SCALE-UP classrooms followed the flipped classroom model of pedagogy with students working collaboratively in groups with access to tablet computers to support the activities. Fulton (2012) and Herreid and Schiller (2013) supports the use of technology in flipped classrooms and state that the extent of technology usage in flipped classrooms is extremely appropriate and fitting for 21st century learning (p.62). Moreover, Brooks (2011) indicates that the move away from the traditional classroom to a technology enhanced setting can have a significant positive impact on student learning and develop student and staff digital literacy skills. However, Tucker (2012) questions whether the flipped classroom approach runs the risk of being another front in a false battle between teachers and technology.

A challenge for moving to flipped classroom pedagogy rather than traditional lectures can be the cost of resources. Lectures can be a cost effective method of imparting knowledge to large numbers of students. Classroom learning however, tends to be with smaller groups of students. The SCALE-UP experience can provide a cost-effective alternative by using flipped classroom pedagogy with large cohorts of students. While many acknowledge that universities are unable to sustain increased contact time (Lancaster, 2013) Beichner (2013) does appear to have challenged traditional pedagogy and lectures by successfully developing flipped classrooms which are scaled up for large cohorts.

The literature therefore indicated that there are affordances such as greater engagement, a more student-centred learning environment, increased confidence in learning, the opportunity to work collaboratively, a richer learning environment, increased opportunity for individual support, increased digital literacy skills for staff and students and a deeper level of learning. However, there are also challenges such as resource cost, increased technical support, staff training, potential increased stress for students in pre-session engagement, and increased time for preparation of pre-session materials. These will be explored further through the collection of data.

## Methodology

A predominantly interpretive approach was taken for this study (Bogdan & Biklen, 1998). The research represents a small scale case study investigating perceptions of students and tutors during the pilot phase of the SCALE-UP initiative. Data was collected by the student

researchers via questionnaires and interviews from students and tutors, providing opportunity for triangulation thus giving validity to the findings. Observations of SCALE-UP sessions provided additional data. Key areas of focus for the data collection had been identified from the literature review such as preparation by students.

Student respondents who were involved in the research were aged 18-45. The researchers used an availability sample of ninety students in the School of Education and three staff involved in the delivery of the SCALE-UP project. The questionnaires were distributed in seminars where the purpose of the research was explained. British Educational Research Association ethics guidelines were followed and students and staff were assured of anonymity and able to withdraw at any time. Thirty-one questionnaires were distributed to first year students, forty two questionnaires to second year students, seventeen questionnaires to post-graduate students. In addition six students were interviewed: two from each group who had indicated that they were willing to be interviewed.

## Findings and discussion

Flipped classrooms require students to engage with learning prior to attending class. This was supported in the literature review. When students were asked if they engaged with the pre-session work to ensure they were fully prepared for their class the results indicated that post-graduate students were twice more likely to prepare than undergraduate students. One hundred percent of post-graduates always engaged with their preparation work, while eighty percent of first years engaged and ninety eight percent of second years engaged. The higher level of preparation by post-graduates may be due to their increased maturity in terms of study. While the engagement level could be classed as high the number of unprepared students results in challenges for tutors and members of their group. The lower level of engagement with first years may indicate that flipped classroom pedagogy is not appropriate for students in their first year. Arfstrom et al (2013) also questioned whether this pedagogical approach would be appropriate in an introductory course.

Engagement, identified as a positive element of flipped classrooms in the literature was explored in this research. Over eighty percent of respondents said that they were engaged during the classroom activities; of these seventy five percent said they would welcome more engaging activities by tutors.

> *"I felt that I understood more of the theory from working with the group."* (Student 12)

> *"I think that the SCALE-UP lessons are very beneficial because they provide a new approach to learning which is about students doing more independent research outside of the classroom and instead of being passive learners in the classroom listening to the lecture they're actually doing or finding out or problem solving."* (Teacher A)

At NTU students generally have one tablet per group which was identified as a potential problem by tutors who thought students not using the tablet may feel disengaged. The data indicated that thirty two percent of the students would prefer access to tablets for each student. While sixty five percent indicated that they were utilising their mobile phones to access information through the wifi, thus providing evidence of BOYD (bringing their own device and using it at University).

However, observation of SCALE-UP sessions indicated that students appeared to be easily distracted. Data collected from observations and questionnaires indicated that this could be one disadvantage of the SCALE-UP project and the way the classrooms are designed and used.

**Table 1: distraction**

| I am easily distracted in SCALE-UP lessons. | | | | | |
|---|---|---|---|---|---|
| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| Year One | 5 | 19 | 6 | 1 | 0 |
| Post Graduates | 0 | 1 | 11 | 5 | 0 |

The table above shows higher percentage of undergraduate students compared to postgraduate students were distracted in SCALE-UP sessions. Reasons for the distraction are given in the table below:

**Table 2: reasons for distraction**

| | Phones | Technology in the classroom | Group Work | Time of day | Class layout | Other |
|---|---|---|---|---|---|---|
| Year Ones | **17** | **7** | **0** | **4** | **2** | **7** |
| Post Graduates | **11** | **1** | **2** | **3** | **2** | **4** |
| Total | **28** | **8** | **2** | **7** | **4** | **11** |

For 'other' students listed noise, boredom with activities, too much time in the same room, repetitive content, work unchallenging and difficulties in hearing instructions as causing distractions. These suggest that larger classrooms with more students, which is the intention of the SCALE-UP model, may not facilitate engagement and that tutors need to consider timetabling and increasingly intellectually stimulating activities to reduce distraction.

Group work is an essential element of the SCALE-UP model, but this is not suited to all types of learners. Of the students taking part in this pilot twenty one strongly agreed that they enjoyed group work, forty three agreed that they enjoyed group work, thirty-five felt neutral about group work and eight students did not enjoy group work. We asked students if they felt they would learn more when working as a group. We found that twelve students strongly agreed, thirty eight agreed, twenty four were neutral and sixteen disagreed. This indicates that the majority of students enjoy group work and feel they learn more effectively when they are working as a member of a group. All staff who were interviewed were positive about group work;

> *"I think the SCALE-UP sessions are really beneficial because it means that the students work in a collaborative way. They are sharing their resources, their ideas, they're sharing their thinking and it gives them an opportunity to check out their understanding of things as well. So I think it's a really good way because it's active learning".* (Teacher B)

However responses from students indicate that tutors need to consider those who feel neutral to working in a group and those who do not think they will learn more through working as a group, and adjust the pedagogy to help them to engage and benefit from this model of teaching and learning.

Claims in the literature indicate that students achieve higher grades through flipped classroom pedagogy. In resourcing this project one of the aims was to improve progression and achievement. While tutors report increased grade marks in comparison to modules where students haven't received flipped classroom pedagogy students, when asked if they perceived their grades would improve less than three percent strongly agreed their grades would improve, thirty four percent agreed, thirty eight percent felt neutral, twenty percent disagreed and three percent strongly disagreed.

Attendance data indicated that there was a greater level of attendance for SCALE-UP sessions than more traditional sessions. When asked students believed they attended more regularly; the most cited reason was not letting their group down, thus providing evidence to support the findings of others that working collaboratively can impact on attendance. Other reasons frequently cited included increased enjoyment, increased confidence, linking to employability and a positive difference in the way the students actively engaged in learning collaboratively rather than 'being talked at' by the tutor.

Data collected from tutors involved in the SCALE-UP pilot indicated that they felt more confident with using technology and enhancement of their digital literacy skills, although all reported frustrations with technologies that did not work or were not repaired quickly and felt that the lack of student experience of using MacBooks may reduce levels of engagement.

> *"For those who struggle a little bit with technology because obviously they're relying on using the computers we have had a few issues whilst they have been getting used to using Macs rather than Windows, and the other issues I think are that we've had a few technical problems; this has resulted in frustration and lack of engagement."* (Teacher C)

Tutors supported student comments that their attendance was higher and reported increased module results which they attributed to this model of pedagogy. However, they had found increased pressure in the amount of time it took to prepare for the sessions and develop the pre-session materials; two saw this as an investment of time as resources could be re-used by future cohorts. Tutors had also found the students became more confident and all commented that students who were reluctant to work with others in more traditional teaching environments were keen to work collaboratively in the SCALE-UP sessions. Tutors also commented positively on being able to work more closely with students, and being able to intellectually challenge the more able while providing increased support for those struggling with concepts.

Overall the evidence is therefore indicating that the SCALE-UP initiative and flipped classroom pedagogy can be beneficial to students and staff but there are still aspects that need to be developed. This research supports the emerging literature around flipped classrooms and pedagogy in terms of student engagement, a more student-centred learning environment, increased confidence in working collaboratively and increased digital literacy skills for staff and students,. Emerging challenges are around technical support, identifying the number of tablets per group, training for staff and increased preparation time for staff and students.

## Conclusion

This case study provides further evidence to support the literature around flipped learning. There are positive outcomes from the pilot to support further development of the SCALE-UP model of learning, in particular the use of technology and the engagement and increased attendance of students in collaborative work. However, there are indications that there is some further development required in ensuring the infrastructure is developed further such as technical support and support in preparing students for this new model of learning, particularly in managing their time to ensure they engage with the preparation for sessions and in developing appropriate team-work skills. It is evident that many students enjoyed the process of active learning that the SCALE-UP sessions provide. It is evident the format and setting of the environment in which they learn impacts on their positive perceptions of the sessions. The layout of the classrooms creates a collaborative learning environment for all the students to work and engage in their learning. Whether students learn at a deeper level has not been evidenced through this research, although there is some anecdotal evidence from tutors and students to support this, however the enjoyment of this model of learning and the level of engagement signifies that this approach is appropriate for higher education. The increased flexibility of pedagogy developed by tutors, along with increased confidence with new technologies in teaching and learning and enhancement of digital literacy skills, are also evidenced through this research. Further research would focus on the motivation of students and progression, training for staff in both pedagogy and the use of new technologies, together with which activities engage students, which were not identified from this research.

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## References

Arfstrom, K. M., Hamdan, N., Mcknight, K. & Mcknight, P., 2013. *The Flipped Learning Model: A White Paper Based on the Literature Review Titled 'A Review of Flipped Learning*. (Online). (2013). Available via: FlippedLearning.Org [Accessed 17/10/13]

Beichner, R.J. et al, 2007, The Student –Centered Activities for Large Enrolment Undergraduate Programs (SCALE-UP) Project, Research-based Reform of University Physics (online) 1(1) p2-39. Available Via: Per central [Date Accessed: 6 March 2014]

Beichner, R.J., Saul, J.M., Abbott, D.S., Morse, J., Deardorff, D., Allain, R.J., Bonham, S.W., Dancy, M.H., and Risley, J.S., 2007. *The student-centered activities for large enrollment undergraduate programs (SCALE-UP) project*. Research-Based Reform of University Physics, 1 (1), 2-39.

Beichner, R. J. & Saul, J. M., 2013 *Introduction to the SCALE-UP (Student-Centered Activities for Large Enrolment Undergraduate Programs) Project*, Proceedings of the International School of Physics, (Online) Available Via: North Carolina State University [Date Accessed 11 October 2013]

Bergmann, J., and Sams, A., 2012. *Flip your classroom: reach every student in every class every day*. International Society for Technology in Education Eugene, OR.

Berrett, D. (2012). *How 'Flipping' the classroom can improve the traditional lecture*. The Chronicle of Higher Education, 19.

Bishop, J. L. & Verleger, M. D., 2013, *The Flipped Classroom: A Survey of the Research*, ATLANTA ASEE Annual Conference and Exposition [Date Accessed 16 October 2013]

Bogdan, R.C., and Biklen, S.K., 1998. *Qualitative Research for Education An Introduction to Theory and Methods*. Boston: Allyn and Bacon.

Brooks, C., 2011, *Space Matters: The Impact of Formal Learning Environments on Student Learning Environments on Student Learning*. British Journal of Educational Technology 42(5) p719-726

Fulton, K., 2012. *Upside down and inside out: Flip Your Classroom to Improve Student Learning*. Learning & Leading with Technology, 39 (8), 12-17.

Gaffney, J.D., Richards, E., Kustusch, M.B., Ding, L., and Beichner, R.J., 2008. *Scaling up education reform.* Journal of College Science Teaching, 37 (5), 48.

Hamdan, N., Mcknight, P., Mcknight, K., and Arfstrom, K., 2013. *A review of flipped learning*. Flipped Learning Network: Http://www.Flippedlearning.org/cms/ lib07/VA01923112/Centricity/ Domain/41/LitReview _FlippedLearning.pdf [Date accessed 1 March 2014] .

Herreid, C.F., and Schiller, N.A., 2013. *Case studies and the flipped classroom*. Journal of College Science Teaching, 42 (5), 62-66.

Lancaster, S.J., 2013. *The Flipped Lecture*. New Directions, 9 (1), 28-32.

Marloew, C. A. & Montana, B., 2012. *The Effect of the Flipped Classroom on Student Achievement and Stress*. Doctoral Dissertation, Montana State University.

Mazur, E. 2012. *The Scientific Approach to Teaching: Research as a Basis for Course Design* in ALT-C Conference 11-13 September, Manchester University, UK.

Miller, A., 2012. *Five best practices for the flipped classroom*. [Date accessed 6 March 2014].

Rutherfoord, R.H., and Rutherfoord, J.K., 2013. *Flipping the classroom: is it for you?* In: Proceedings of the 13th annual ACM SIGITE conference on Information technology education, ACM, pp. 19-22

Sezer, R. (2010). *Pulling out All the Stops*. Education, 130(3), 416-423.

Shimamoto, D., 2012, *Implementing a Flipped Classroom: An Instructional Module, Department of Educational Technology*, University of Hawaii (Online) Available Via: TCC Conference [2012] [Date Accessed 17 October 2013]

Tucker, B., 2012. *The flipped classroom*. Education Next, 12 (1), 82-83.