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Original Paper

Threshold Concepts and Students' Learning Experience

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Abstract

This paper gives an account of students' learning experience entrenched in threshold concepts for a group of second year undergraduate Economics students at Bangor University during the 2008/2009 academic year. The majority of students who were involved in the supplementary class were totally satisfied with the quality of the intervention. Most students benefited from the clear style of delivery used for the intervention. A large number of students managed to cope with the difficult topics in their main class after having their confidence level improved. This made it possible for such group to develop a good understanding of the subject area covered in their main class. Majority of the students had their expectations met due to the relevance and accuracy of the course content.

Keywords

threshold, teaching, learning

1. Introduction

1.1 Background

The central aim of this report is to provide an account of students' learning experience embedded in threshold concepts. Meyer and Land (2003, 2005) propose that in certain disciplines, there are threshold concepts, which can be "considered akin to passing through a portal, or conceptual gateway that lead to a previously inaccessible, and initially perhaps 'troublesome', way of thinking about something". Such concepts can transform a way of understanding, or viewing something that represents how people think in a particular discipline, or how they perceive, apprehend, or experience particular phenomena within a discipline.

In Higher Education, threshold concepts provide potential help to lecturers who are grappling with two main reported problems (Davies, 2006; Davies & Mangan, 2005): Firstly, students who acquire formal knowledge of a discipline but are unable to utilise this knowledge when making sense of everyday experience, and secondly, students who struggle with underpinning theory and resort to verbatim learning of isolated aspects of the subject that they are unable to use effectively in conjunction. It is in

this context that Frank (2005) as cited in Davies and Mangan (2007) observe, in the *New York Times*, that "most students seem to emerge from introductory economics courses without having learned even the most important basic principles". More broadly, a familiar view was reported from "top firms", in the London *Times* (2006), that "Graduates are unfit for work" (Davies & Mangan, 2007).

This report focuses primarily on some of the reported problems, and evaluates how a supplementary class for second year undergraduate Economics students in the Bangor Business School can contribute to the understanding and application of fundamental concepts.

1.2 The Problem

Each year, module organisers have sometimes faced challenges to put across their views that would make students understand the concepts being covered in class. This has been caused by students weak background regarding fundamental concepts needed to cope with the modules of interest. The modules and their contents are necessary for students who aim to successfully achieve their degree programmes in the relevant chosen field. However, the required fundamental concepts needed to cope with these modules have not permitted certain groups of students to fully enjoy (or benefit from) their class due to their weak understanding of the "basics" needed before joining the class. Students are assumed to have covered these "basics", which may not have been the situation in some cases or may have been due to their lack of understanding, and as a result have ended up undermining learning outcomes and students' learning experience. In certain instances, students may have already been exposed to these fundamentals, but have either forgotten the concepts or not taken them seriously.

1.3 What the Literature Says: Theory and Practice

The idea of threshold concepts emerged from a UK national research project entitled, "Enhancing Teaching-Learning Environments in Undergraduate Courses". In the field of Economics, for example, the research was clear to Meyer and Land (2003, 2005, 2006) that certain concepts were held by economists as key to the mastery of their subject. As cited in Cousin (2006), Meyer and Land argue that these concepts could be described as "threshold" due to the commonality of their features.

Threshold concepts, often described as fundamental or core concepts have been widely documented in the academic literature (see, for example, Perkins, 1999; Davies, 2003; Meyer & Land, 2005; Cousin, 2006; Davies & Mangan, 2006a, 2006b). Meyer and Land (2003, 2005, 2006) define threshold concepts as transformative (occasioning a significant shift in the perception of a subject), irreversible (unlikely to be forgotten, or unlearned only through considerable effort), integrative (exposing the previously hidden interrelatedness of something), bounded (possessing terminal frontiers, bordering with thresholds into new conceptual areas), and troublesome knowledge (appears conceptually difficult, counter-intuitive, alien—coming from another culture or discourse, or seemingly incoherent—discrete aspects are unproblematic but there is no organising principle).

Davies and Mangan (2007) note that the first three features of the definition are interwoven: "a concept that integrates prior understanding is necessarily transformative, because it changes a learner's perception of their existing understanding. If a concept integrates a spectrum of prior understanding, it

is most likely to be irreversible, because it holds together a learner's thinking about many different phenomena. To abandon such a threshold concept would be massively disruptive to an individual's whole way of thinking".

In a further explanation, Davies and Mangan (2007) stress that the last two characteristics of the definition derive from the first three: "a threshold concept helps delimit the boundaries of a subject because it integrates a particular set of concepts, beliefs and theories. The stronger the integration, the sharper the boundaries of a subject will appear. The looser the integration, the more the boundaries of a subject become open to debate. The more transformative a concept, the more likely it is to be troublesome because it requires reconfiguration of previously acquired understanding".

Threshold concepts appear to be more readily identified in disciplines where there is a general consensus on what constitutes a body of knowledge (Meyer & Land, 2003). The concepts have found an immediate appeal as being "pedagogically fertile" and energising topics, including *precedents* in Law, *depreciation* in Accounting, *the central limit theorem* in Statistics, and *entropy* in Physics. Within literary studies, a troublesome concept that has long been reported is that of "irony". As one lecturer puts it, "initially, they just don't get it, but once they realise what 'irony' is and how it is used by writers, whole areas open up, and perceptions, in terms of the various layers of meaning and structure that might be operating within a work at one time. But it's a hard concept to teach" (Meyer & Land, 2005).

In an empirical work on threshold concepts within Economics at the University of South Australia, Meyer and Shanahan (2003) used "opportunity cost" to investigate whether students had an inclination to *think like an economist*. The following finding emerged from the study: "At least one insight provided by this approach should also be mentioned. There appear to be important implications for the manner in which students are initially introduced to threshold concepts. It is speculated here that one implication of the argument presented thus far is that 'first impressions matter'. Efforts to make threshold concepts 'easier' by simplifying their initial expression and application may, in fact, set students onto a path of 'ritualised' knowledge that actually creates a barrier that results in some students being prevented from crossing the 'threshold' of a concept. While this aside remains untested, it also reveals the potential insight that a systematic framework based on forms of troublesome knowledge may open up…The promise of this approach may be a method by which to identify more accurately *why* a student cannot grasp and express a threshold concept".

In areas where there is no clearly identified body of knowledge, the summary of Entwistle et al. (2002), Hounsell and McCune (2002) and McCune and Reimann (2002) in what is termed as "ways of thinking and practising" may constitute an essential threshold function. In their research project, Meyer and Land (2003) note that one of their interviewees identified the threshold function of a way of thinking and practising within the teaching of Economics: "We have to instill in students a kind of modelling which is quite fundamental to the way in which we approach most of our analysis…we want our students to start to think about problems, issues. You get them to formulate, if not explicitly at least implicitly, some kind of formal analytical structure or model that simplifies things but then allows

someone to think through a problem in a very structured way. That's something fundamental I think".

A similar view was offered by another interviewee: "Within Economics I sense that sometimes students see abstract models as abstract models and don't see the link between them and the real world, so that students would be quite happy talking about problems of inflation, unemployment and so on, but as soon as you say 'Good, let's have a look at the model', they sort of switch off. They think that's a completely separate issue. 'I don't want to do the model, I just want to talk about inflation or unemployment'. So the idea that models which look abstract—can be looked at abstractly—actually talk about the real world, perhaps that is a crucial factor. I mean they tend to put models into one box and then the discussion about the policy issues in another box. They don't necessarily see that the two must be linked. Perhaps that's a threshold issue…"

In a related development on the teaching of undergraduate Economics, Frank (1998) as quoted in Meyer and Land (2003) notes: "When the dust settles, most students leave the introductory course never having fully grasped the essence of microeconomics. Thus the opportunity cost concept, so utterly central to our understanding of what it means to *think* like an economist, is but one among hundreds of other concepts that go by in a blur".

2. The Intervention

The opportunity to intervene and put my thoughts into practice happened in the 2008/2009 academic year when I was asked to teach a group of second year undergraduate Macroeconomics and Business Economics students who were facing difficulties to understand essential topics in their main class. The students could just not blend the application of core concepts, such as *differentiation* in Quantitative Methods, with the required topics being covered. As lecturers and students were denied full enjoyment of their class due to the inability of students to cope with some elements of their main modules, there was a need for an intervention to bridge the gap that had been created by students' background. In this vein, less time would be used to explain the required concepts, permitting both parties (lecturer-students) to mutually benefit from the module. From this perspective, the objective of each class could be achieved.

My aim was to support with a supplementary class that would help prepare students (only those needing extra tuition) to cope with the technical and complex topics (assumed to be fundamental) in their main class. Due to the success of the intervention, the supplementary class was included in the 2009/2010 academic year, and has since become part of the curriculum design.

3. Application and Delivery

3.1 Preparation

With support from module organisers, I managed to put together key concepts that would help students follow and understand the essential topics in their main class. In this vein, we designed topics that are embedded with fundamental concepts relevant for the main class. Appropriate session plans were

designed for each class. This highlighted the course content, the method and resources to be used, assessment technique, and the expected learning outcomes to be achieved by students. Questions and tasks were also set and made available to the students on Blackboard before the class began (Xiao, 2010). The intuition behind this was to challenge students' minds before they attend the class. We also prepared well structured answers and made them available to the students at the end of each class. This was to help them, in their spare time, go over the set problems and the approach taken to answer them.

3.2 Teaching Methodology

As Norton (2009) puts it, it is possible to move away from the normal routine and find new ways to teach. I therefore adapted a more personal approach of engaging students to problem solving (quantitatively) that would allow them be acquainted with the required mathematical background needed for their main class. There was also a more frequent use of Flipcharts and Whiteboard, instead of PowerPoint, to allow students to follow a step-by-step procedure in dealing with quantitative techniques that would permit them to understand the practical applications expected in their main module of interest. PowerPoint was only used for definitions, explanations, and examples that go with the relevant concepts. A drop-in session outside the intervention hours was also used to further assist students that needed extra attention. I however noticed that most students were more comfortable with emails to address their concerns instead of utilising the drop-in session. Most students only made use of the drop-in session during exam preparation.

3.3 Assessment

To test the understanding of students, I tried to engage them by asking questions at each session. Only a few students were fully engaged in this process. This supports the view of Biggs (2003) who points out that students only look forward to summative assessment because that is what decides their degree. Formative feedback from my Teaching Adviser however suggests a need for improvement to engage all students. Feedback from my Academic Development Unit Tutor also suggests that most international students from certain countries are quiet and not interactive in class due to their cultural backgrounds.

Two online tests were however conducted to assess the overall students' understanding and performance. Due to the designed nature of the online test, it was not needed to provide individual feedback to the students. Formative feedback was however provided to the entire group when I gave them the solutions to the test questions in class. The overall student performance was really impressive, and this was eventually reflected in their examination performance.

4. Evaluation of the Intervention's Effectiveness

A questionnaire was administered at the end of the intervention. The main focus was to find out how the supplementary class had supported students in coping with the topics in their main class. The questionnaire was to reveal the improvement of students' confidence in understanding the practical applications of the module in the main class. Students' views about the approach adapted for delivery and the time allotted for each class were also to help evaluate the effectiveness of the intervention.

Issues on what could have been done to make the intervention more successful were expected to be revealed by the questionnaire.

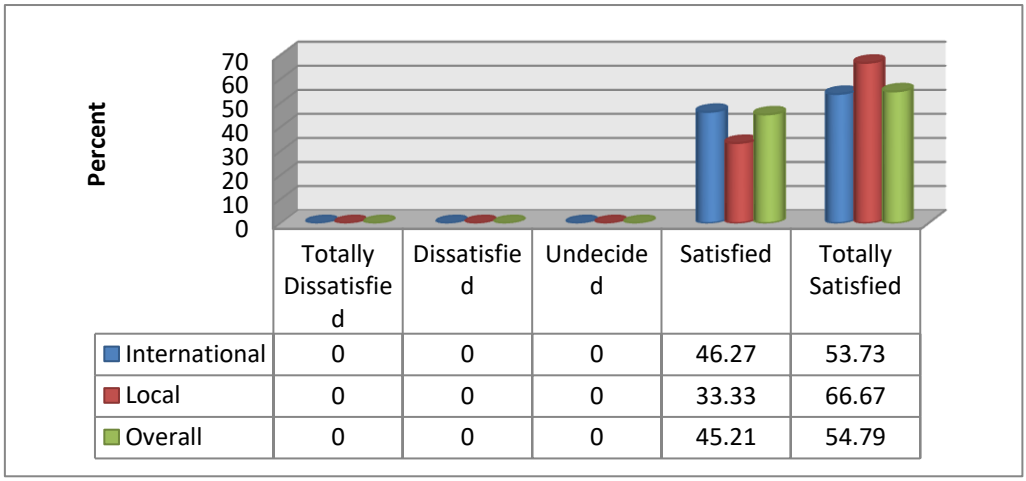
The success of the intervention was however not intended to be based on students' attendance. This was due to the fact that students were not obliged to attend every class if they could easily cope with certain topics in their main class. Rather, the success of the intervention was intended to increase students' confidence, due to the approach of the intervention, to deal with the practical applications in the main class. Moreover, some of the topics covered in the supplementary class were fundamental concepts that cut across every topic in the main class, and as such, students who became confident in the very few weeks of the intervention were not obliged to attend every session.

The intervention for the 2008/2009 academic year was split between a colleague and I to make the intervention more effective and also to enable us to cover as many topics as needed for the respective modules. While my colleague taught the Macroeconomics students, I focused mainly on the second year Business Economics students with a class size of 217. Each student was permitted to attend one of two intervention sessions per week. Each session lasted for an hour, making a total of two hours per week over a nine-week period. Of the 217 class size, overall attendance was about 34%. All the participants responded to the questionnaire at the end of the intervention. This was made up of about 92% international students and about 8% local students.

5. Findings and Discussion

Generally, the intervention appears to have been successful following the analysis from the administered questionnaire. Overall, about 55% of the students were totally satisfied while 45% were satisfied with the quality of the supplementary class. Whereas total satisfaction was greater for local students than for international students, the reverse was found among students who were just satisfied (Figure 1).

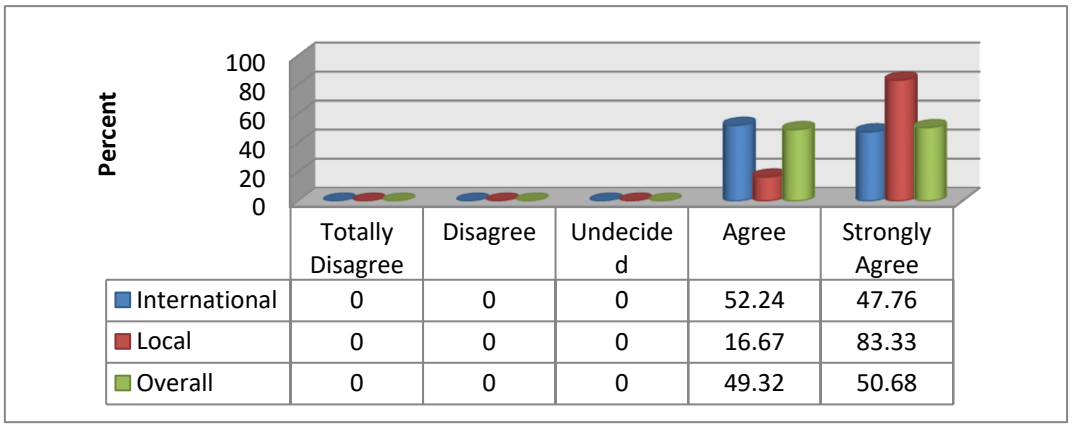
On the issue of the approach adapted, nearly 51% of the participants strongly agreed that there was a clear delivery style for the module. The remaining 49% agreed that the delivery style was clear (Figure 2). This attests to the fact that the personal approach I adapted greatly benefited the students. One student's comment reads: "*Very clear and patient*".



	Totally Dissatisfied	Dissatisfied	Undecided	Satisfied	Totally Satisfied
International	0	0	0	46.27	53.73
Local	0	0	0	33.33	66.67
Overall	0	0	0	45.21	54.79

Figure 1. Overall Satisfaction with the Quality of Intervention

Source: Response from administered questionnaire.

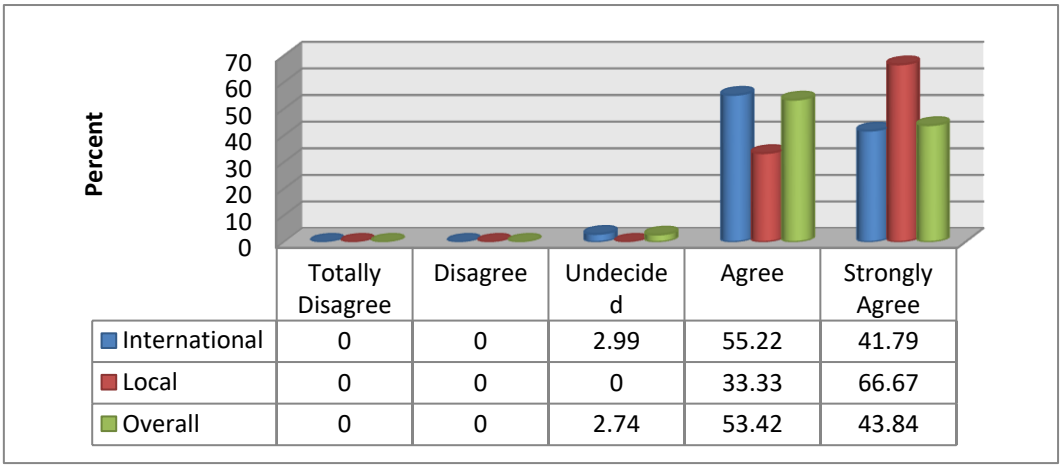


	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	0	52.24	47.76
Local	0	0	0	16.67	83.33
Overall	0	0	0	49.32	50.68

Figure 2. Satisfaction with Tutor's Adapted Style of Delivery

Source: Response from administered questionnaire.

On the whole, about 44% of the students strongly agreed that their confidence improved after the first four weeks of the intervention. This made it possible for them to cope with the difficult topics in their main class. 53% agreed while 3% were undecided. Among those who strongly agreed, confidence improvement was greater for local than for international students. The reverse was found among students who just agreed (Figure 3). A few international students joined in the middle of the intervention and more when the examination was approaching. This could have been those students who were undecided about their confidence improvement within the first four weeks.



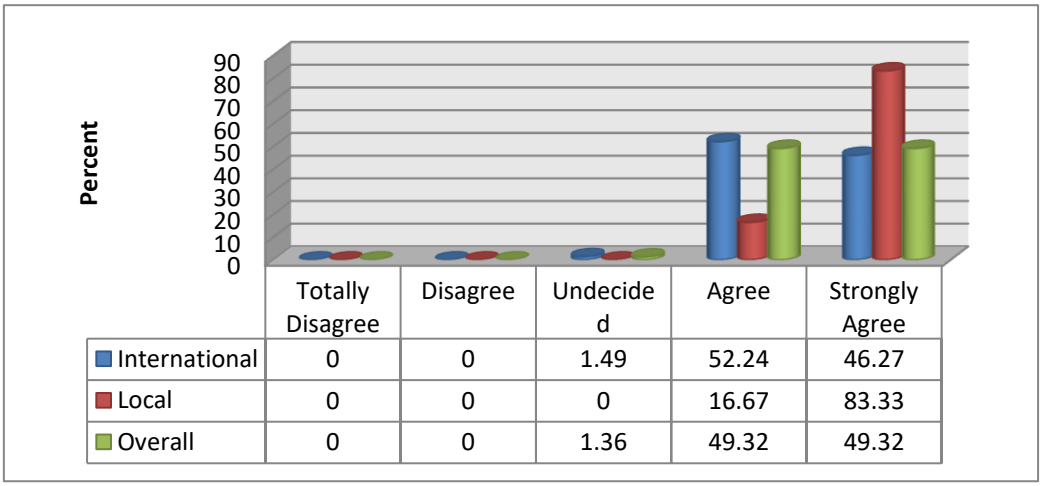
	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	2.99	55.22	41.79
Local	0	0	0	33.33	66.67
Overall	0	0	2.74	53.42	43.84

Figure 3. Confidence Improved after the First Four Weeks of Intervention

Source: Response from administered questionnaire.

Regarding the tasks given in the class, a greater percentage (83%) of local students strongly agreed that the exercises and solutions were well structured while nearly 17% agreed. About 52% of international students agreed with the structure of the exercises and solutions while 46% strongly agreed. Just over 1% of the students were undecided about the way the exercises and solutions were structured for the class (Figure 4). An international student who was very pleased with the structure of the exercises and solutions commented: "*Really helpful for exam*". This suggests that the step-by-step approach imbedded in the exercises and solutions may have contributed to the overall student satisfaction.

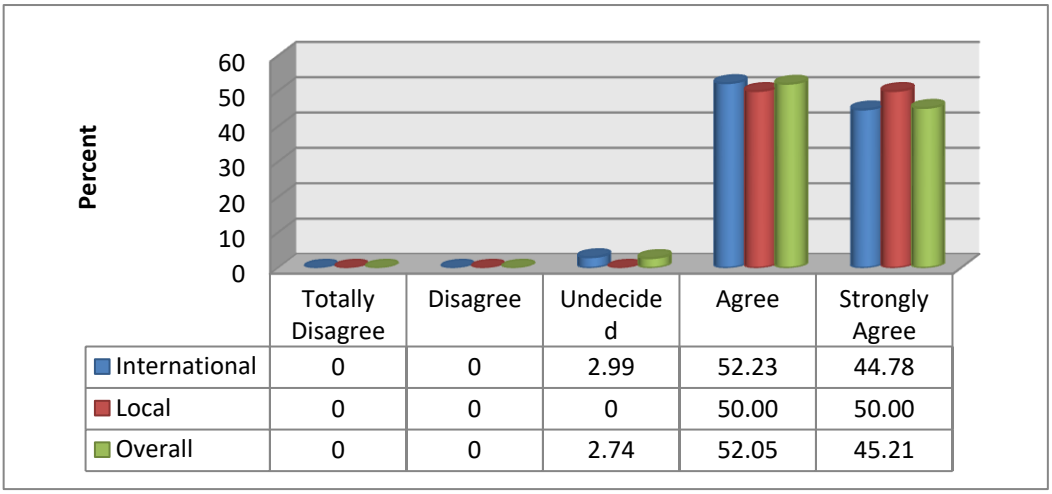
The administered questionnaire revealed that the relevance and accuracy of the course content met students' expectations. In general, 45% of the students strongly agreed with this assertion while 52% agreed. Only 3% of international students were undecided about whether their expectations had been met or not (Figure 5).



	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	1.49	52.24	46.27
Local	0	0	0	16.67	83.33
Overall	0	0	1.36	49.32	49.32

Figure 4. Satisfaction with the Structure of Exercises and Solutions

Source: Response from administered questionnaire

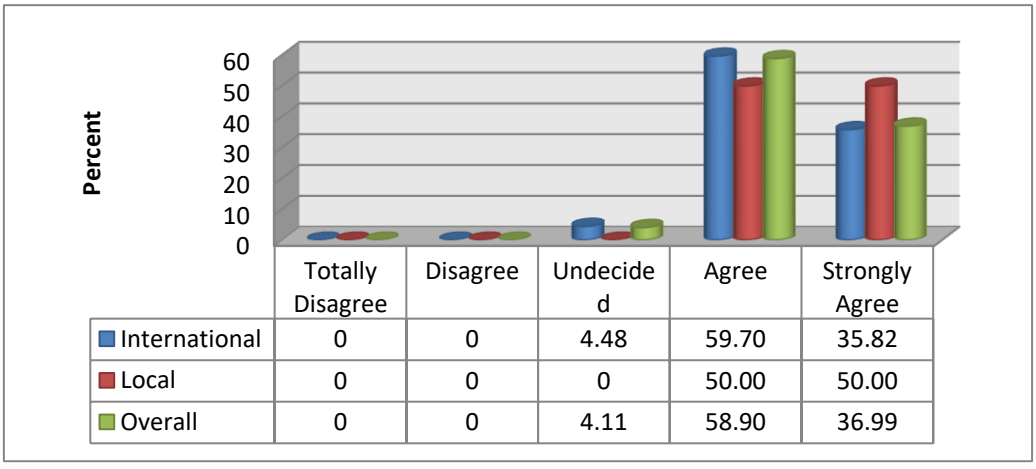


	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	2.99	52.23	44.78
Local	0	0	0	50.00	50.00
Overall	0	0	2.74	52.05	45.21

Figure 5. Relevance and Accuracy of Class Exercises Met Expectations

Source: Response from administered questionnaire.

Apart from helping students cope with difficult concepts, the essence of the course was also to challenge students' minds. Nearly 60% of international students agreed that their minds were challenged through engagement. About 36% strongly agreed while 4% were undecided. Although international students may not have been interactive in class, making it difficult to assess whether they were following the concepts or not, the response from the questionnaire shows that they were made to "think" despite the fact that they may not have wanted to engage due to cultural background. All the local students that participated in the intervention were either satisfied or strongly satisfied (Figure 6).



	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	4.48	59.70	35.82
Local	0	0	0	50.00	50.00
Overall	0	0	4.11	58.90	36.99

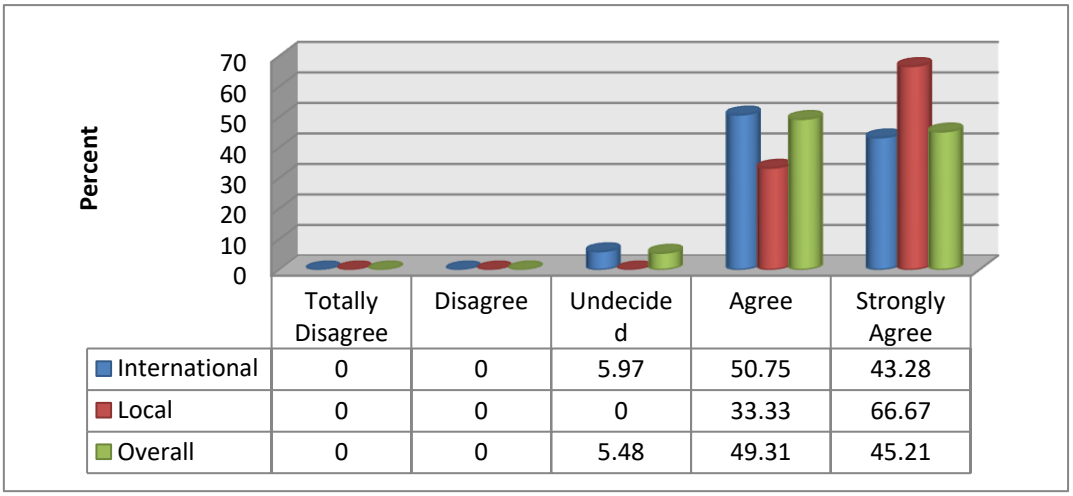
Figure 6. Students' Mind Challenged through Engagement in Class

Source: Response from administered questionnaire.

Although I made less use of PowerPoint for the intervention, it was necessary to find out how the use of the various linked resources including Flipcharts and Whiteboard helped students follow the

approach adapted for the intervention. Overall, both international and local students either agreed or strongly agreed that the link between the use of PowerPoint and Whiteboard was helpful in making them understand a step-by-step approach of solving practical problems. Only 6% of international students were undecided (Figure 7).

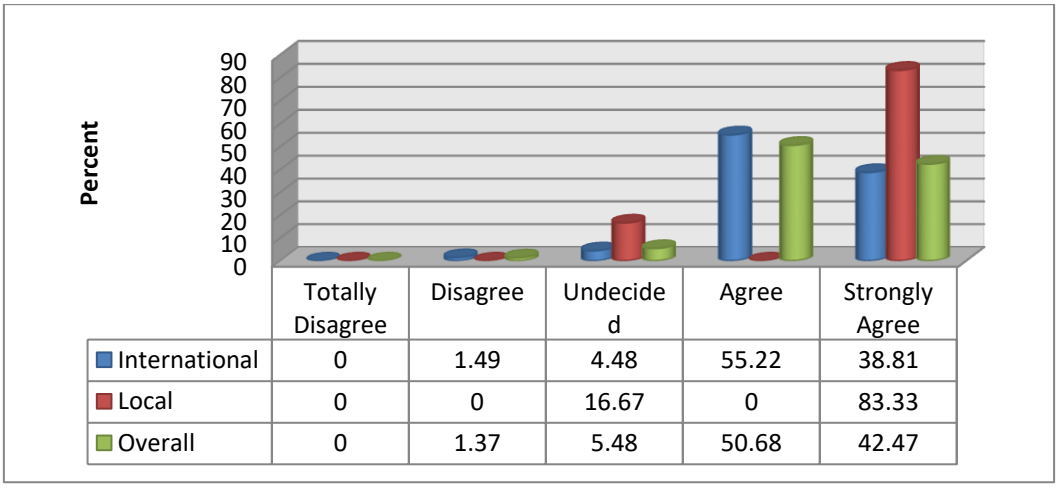
On the issue of time allotted for the intervention, a large percentage (83%) of local students strongly agreed that it was enough to meet their specific needs. Nearly 17% of this group of students were however undecided. Although the time allotted was sufficient for most international students, just over 1% of this group of students disagreed that the number of hours allotted for each class was enough to meet their specific needs (Figure 8). One of the disagreed students commented: "*Not enough, I hope much*".



	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	5.97	50.75	43.28
Local	0	0	0	33.33	66.67
Overall	0	0	5.48	49.31	45.21

Figure 7. Use of Linked Resources Helpful in Following Adapted Approach for the Intervention

Source: Response from administered questionnaire.

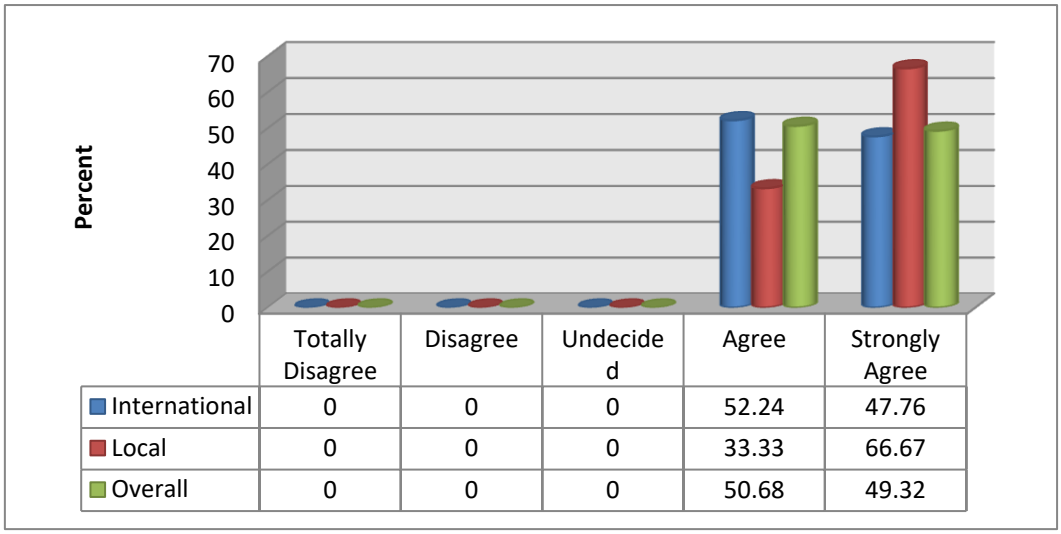


	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	1.49	4.48	55.22	38.81
Local	0	0	16.67	0	83.33
Overall	0	1.37	5.48	50.68	42.47

Figure 8. Enough Hours Allotted for Each Class

Source: Response from administered questionnaire.

Overall, nearly 51% of the students agreed that the supplementary class helped them develop a good understanding of the subject areas covered in their main class. About 49% of the students strongly agreed (Figure 9).



	Totally Disagree	Disagree	Undecided	Agree	Strongly Agree
International	0	0	0	52.24	47.76
Local	0	0	0	33.33	66.67
Overall	0	0	0	50.68	49.32

Figure 9. Good Understanding Developed in the Subject Area(s) Covered in the Main Class

Source: Response from administered questionnaire.

To find out if students had any further comments on any aspect of the supplementary class, the following responses were some of the few provided by some international students:

"Very very excellent!"

"Very satisfied, lecturer is remarkable"

"Everything goes well in this module"

"I think it's fine"

"I hope to see you next year"

"No, thanks so much!"

One local student's comment reads:

"Really good teaching style; breaks down complex questions fantastically; A+"

6. Reflections and Conclusion

Reflecting on the learning cycle and formative feedback received, I may consider introducing video with the same style to allow students to catch up online. For future intervention, I will use a voting system to make the class more interactive instead of relying on one person to give answers to questions in class. I will also organise a focus group to find out whether students really followed the class to confirm feedback from the questionnaire. Marks from class test could also be used as part of the evaluation process to find out the correlation between students' performance and their level of satisfaction revealed by the questionnaire.

The analysis and various comments from students have however shown that supplementary classes, as a means of intervention, are helpful in bridging the gap that has been created by students' background. The understanding of threshold concepts that are needed to cope with technical and complex topics can be gained if different ways of teaching are adapted to suit students' learning capabilities. Given the success of the intervention, a reflection is needed on how similar exercise and approach could be embarked on and adopted in other modules and at various levels including postgraduate programmes.

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