

# Squaring the open circle: resolving the iron triangle and the interaction equivalence theorem

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## **Abstract**

A number of visual models have been proposed to help explain the interplay and interactions between specified components of higher education systems at different levels and to take account of emerging trends towards open education systems. At sector and institutional levels the notion of an iron triangle has been posited linking firstly access, quality and cost and latterly accessibility, quality and efficiency in order to suggest means for widening access to higher education for the same or lower cost without compromising outcomes). At the level of teaching and learning an interaction equivalence theorem was developed to explain the relative contributions to successful study of teachers, students and educational content in formal settings and which has recently been extended to informal settings. However both models deal mainly with the supply side of the educational systems they attempt to represent, namely impacts of the availability and accessibility to more people of the elements in the models, and largely ignore the demand side in terms of the affordability and acceptability of the available and accessible provision to students and learners alike. This paper explores ways of extending these existing models both visually and conceptually by adding in the perspective of the prospective learner or student in respect to their organisational capacity to invest sufficient time for studying, the levels of preparedness and/or confidence that they hold before they engage in learning and the level of motivation for undertaking those studies. It is argued that these modified models provide a new contextual framework with which to examine the capacity of more open education systems at the national, institutional and individual learner level to be expanded effectively and equitably.

## **Keywords**

Open educational resources, iron triangle, interaction equivalence theorem, diagrams, engagement

## **Introduction**

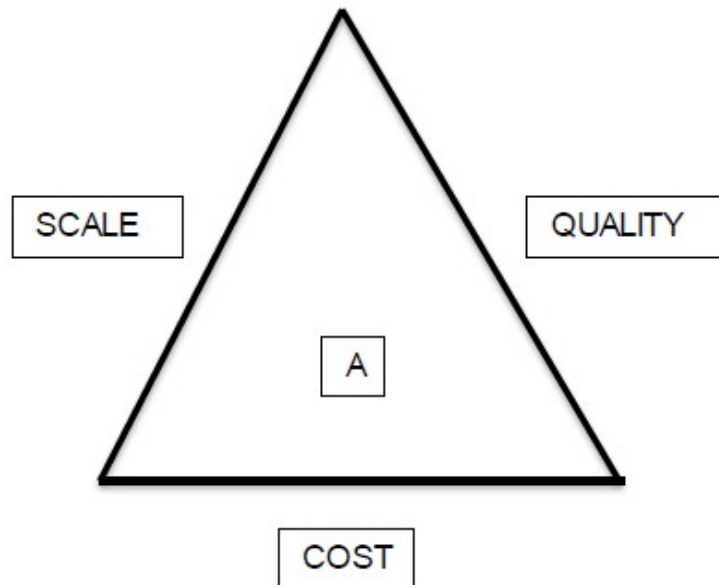
There are many socio-economic factors involved in higher education in general and open education in particular (Lane, 2013); which can make it difficult to understand and predict the individual and collective impacts of those factors. A number of visual models have been proposed to help explain the interplay and interactions between specified components of higher education systems at different levels and to take account of the emerging trends towards more open education systems involving open entry, open educational resources (OER) and Massive Open Online Courses (MOOCs). As with many such visual models they are there to reinforce or help explain an argument or conceptual logic, but can equally conceal as much as they reveal unless tested out. In this paper I look at two major visual models and then add to and/or modify them in order to reveal some hidden assumptions that link them.

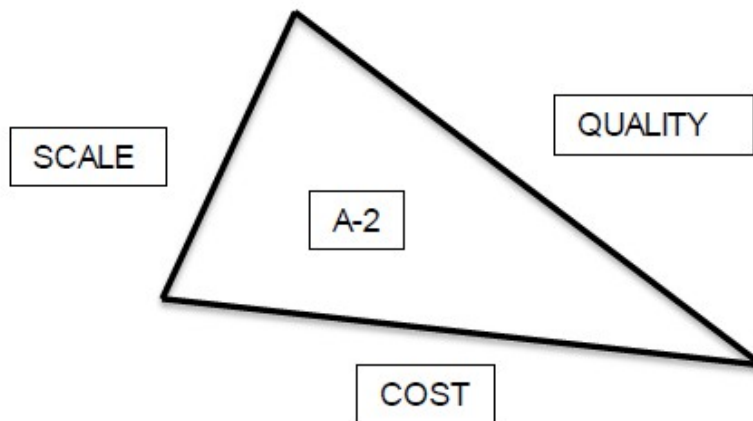
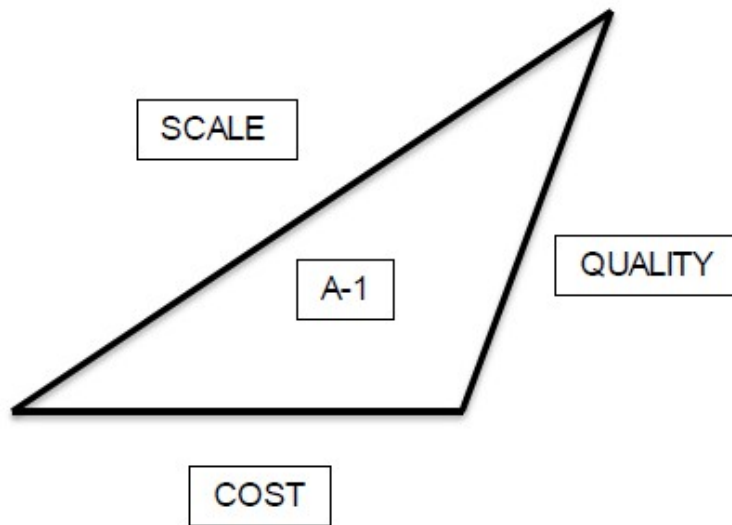
## **The iron triangle model**

At sector and institutional levels the notion of an iron triangle for education has been posited,

linking firstly access, quality and cost (and latterly accessibility, quality and efficiency) in order to suggest means of using open, distance and e-learning (ODEL) and/or OER for widening access to higher education for the same or lower cost without compromising outcomes (Immerwhar *et al*, 2008; Daniel and Uvalic-Trumbic, 2011; Mulder, 2013). Figure 1 shows the basic triangle as outlined by Daniel and Uvalic-Trumbic with equal length sides representing the three factors, in this model, of scale, quality and cost. The assumption is that increases in one point of the triangle will inevitably lead to stresses in the other points. This is particularly assumed to be so because of the relatively fixed costs of the physical infrastructure of universities and the number of teachers they employ due to the relatively small cohorts that each teacher can manage to teach successfully (there are many debates worldwide about optimum class sizes and effects on pedagogic quality but the physical limitations of most existing classroom sizes in expensive buildings and their occupancy rates are universal). They go on to visualize changes within this triangle of inter-related factors (Figure 1 - A). These changes make the basic point that with conventional teaching in classrooms there is little scope to alter these factors advantageously because improving one factor will worsen the others. Pack more students into the class and quality will be perceived to suffer (Figure 1- A1). Equally, try to improve quality by providing more learning materials or better teachers and the overall cost will go up (Figure 1- A2). In effect the area under the triangle does not change because of these physical limitations.

Figure 1. The Iron Triangle of Education





From this basic position, Daniel and Uvalic-Trumbic assert that ODeL, because it is not so constrained by physical limits, is able to change the shape and size of the triangle because it can provide quality in the educational experience (e.g. in the educational resources or support structures) at greater scale for a similar or even lower cost than place based learning.

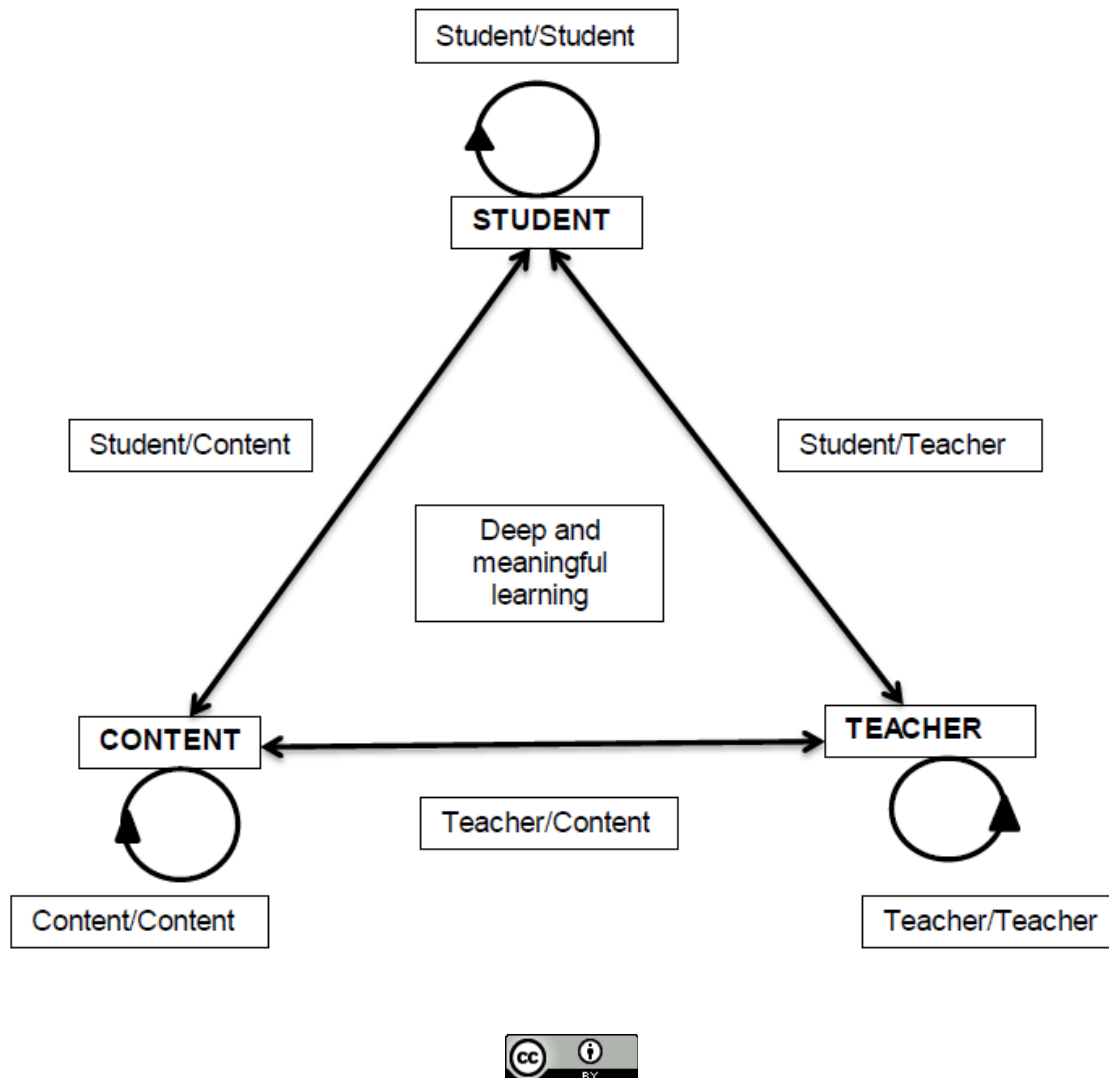
Interestingly Mulder (2013) has recently modified this model from a 2-dimensional to a more 3-dimensional one, focussing on the accessibility, quality and efficiency of education as the three factors, the aim for all being maximisation of the factor rather than minimisation as it is for cost in the original model. Mulder also postulates that a radical intervention such as OER can end up increasing all three factors and so enlarging the educational space represented by the triangle and thus the increase the numbers of people participating.

## The interaction equivalence theorem model

At the level of teaching and learning within a course, and particularly within ODeL, an interaction equivalence theorem or EQuiv (Figure 2) was developed to explain the relative contributions to successful study of teachers, students and educational content in formal settings (Anderson, 2003; Miyazoe and Anderson, 2010), and which has recently been extended to informal settings using OER and MOOCs, with passing mention of links to the original iron triangle model (Miyazoe and Anderson, 2013). The basic premise of the EQuiv is that:

*'... deep and meaningful learning is supported as long as one of the three forms of interaction (student-teacher; student- student; student-content) is at a high level. The other two may be offered at minimal levels, or even eliminated, without degrading the student experience'. (p2).*

Figure 2. The Interaction Equivalence Theorem



While there are more elements to the EQuiv models than presented here, and while Miyazoe

and Anderson (2013) have also acknowledged that the '*ability to manage the cost and the time for learning is becoming extremely critical to formal students and lifelong learners*' (p11-12), the theorem in itself does not fully address the wider range of capabilities of the prospective learner or student capabilities as conditioned by their intrinsic psychological characteristics and their extrinsic socio-economic context and/or status.

### **Supply side versus demand side**

It is often a strategic governmental aim to widen access to and participation in higher education by as large a proportion of the adult population as is reasonably possible (Lane, 2012). When considering the scope for widening participation by people who would not traditionally attend higher education it can be useful to consider the availability, accessibility, affordability and acceptability of the provision to learners and their families (ibid). Thus both these models deal mainly with the supply side of the educational systems they attempt to represent, namely impacts of the *availability and accessibility* to more people of the teaching or interaction elements in the models, and largely ignore the demand side in terms of the *affordability and acceptability* of the available and accessible provision to students and learners alike as seen from their own contexts and life experiences. In the next section I attempt to address this deficiency by adding to and modifying these two visual models.

### ***Modifying the models***

#### **Adding a circle of success to the iron triangle**

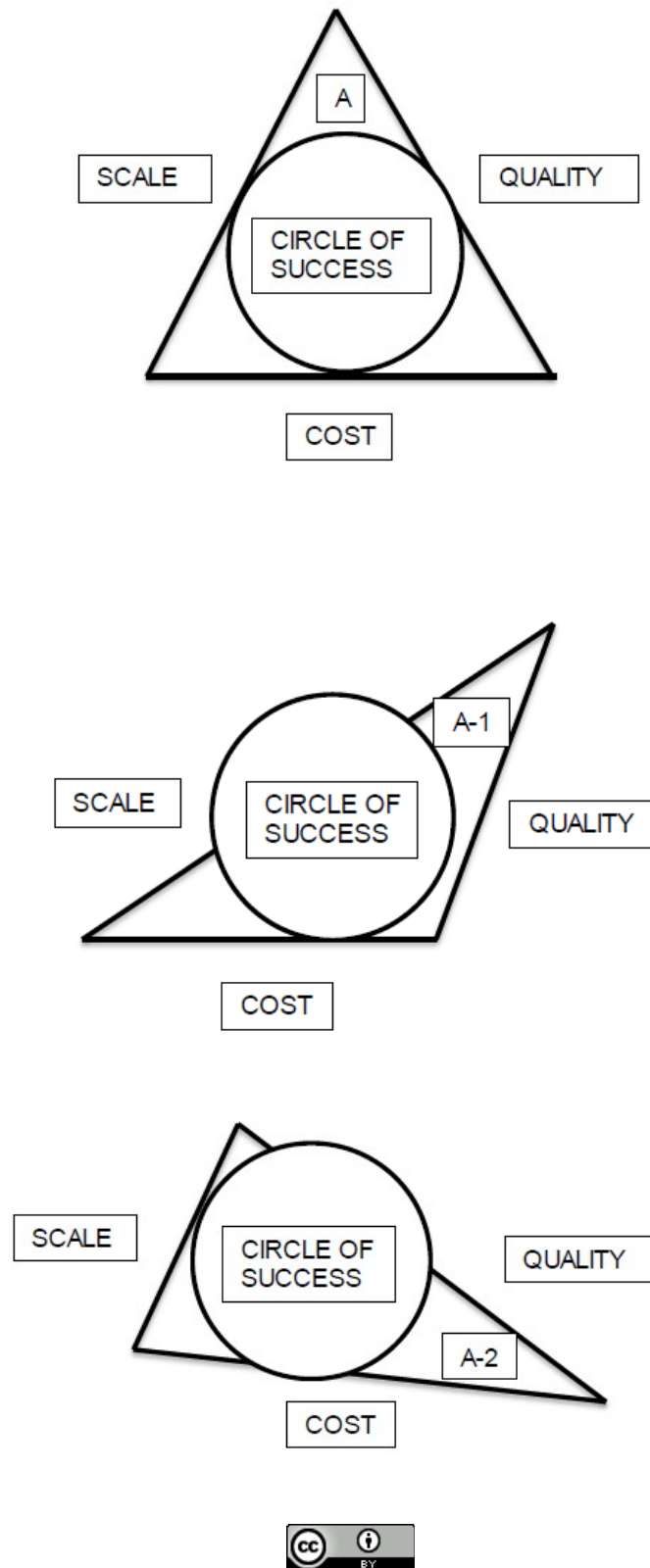
A defining feature of many higher education systems has been one of selecting students based on prior educational experiences and achievements, thus ensuring that they are more likely to be well prepared and confident in the learning abilities (Lane, 2013). Where ODeL has been used then often greater efforts are made to accommodate less advantaged students (Lane, 2012). In extreme cases, such as The Open University UK, there are no formal entry requirements enabling up to 40% of undergraduate entrants to not have the school level qualifications expected of entrants in other universities (while up to a third already hold a previous higher qualification) . However such open entry also means that retention rates are lower, with many fewer not completing either a module or their chosen qualification (Woodley, 2011). Nevertheless, Open University students consistently rate the quality of their education as being very good in both internal and external surveys. Thus while the iron triangle may be expanded, but not broken, by open and distance learning from the perspective of the sector and institution, there are apparently plenty more people to replace the ones that drop out (Woodley, 2011).

This expansion of opportunity does not, in itself, indicate what other measures of success might be, such as from more of a student perspective. To do just that, I have firstly added a 'circle of success' to the iron triangle (Figure 3-A) to represent students who participate completing their chosen studies in good standing<sup>1</sup>. In this case any changes in the triangle as noted before (e.g. increased cost; a drop in quality; fewer students) will inevitably breach this circle of success (Figure 3-A1 & 2), thus representing a lowering of the numbers left in good standing.

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<sup>1</sup> There are separate debates to be had about what constitutes participation, completion and good standing both within formal courses and also informal MOOCs or OERs.

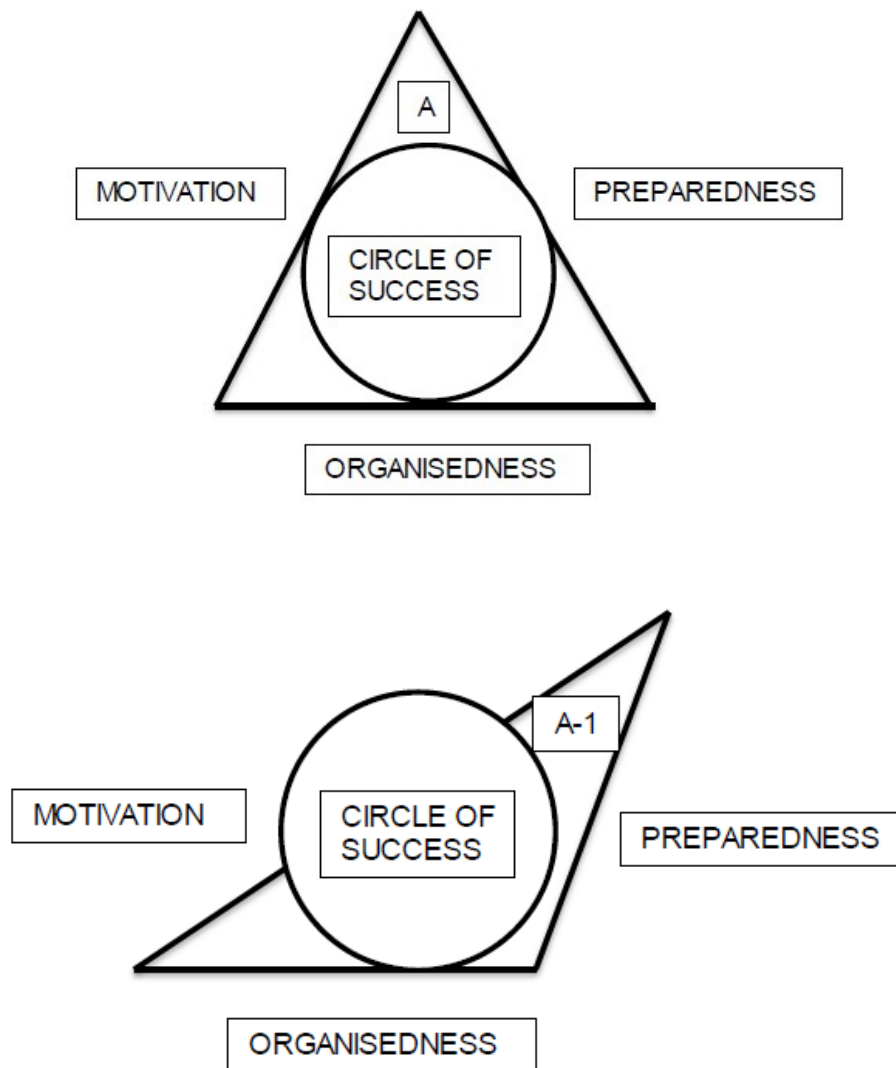
Figure 3. The Iron Triangle and Circle of Success of Education from an Institutional perspective

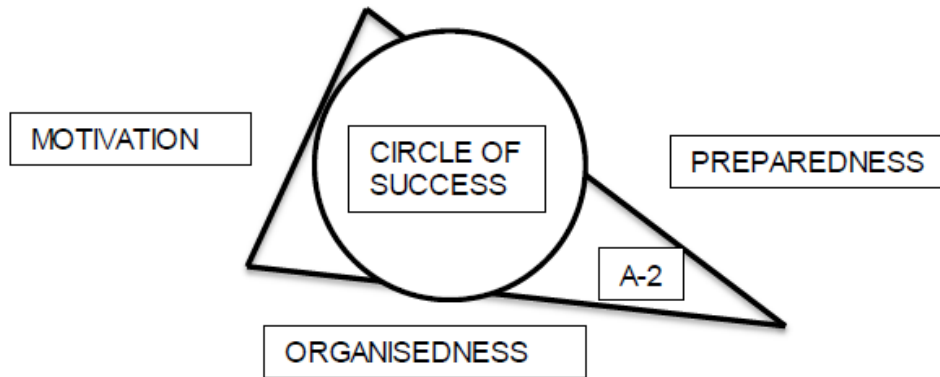


### A student centred iron triangle

In addition I then modified the iron triangle itself to reflect the perspective of the prospective learner or student in respect to their organisational capacity to invest the time required to study, the levels of confidence and/or preparedness that they hold and their motivations for undertaking those studies. This new triangle therefore captures and adds in key aspects of the learners' or students' own context and prior experiences (Figure 4-A). And as in Figure 3 I have also added a circle of success that can easily represent that a student's chances of completing their chosen studies will be compromised if, for example, they are low in preparedness (Figure 4-A1) or cannot devote sufficient time to their studies (Figure 4-A2)

Figure 4. The Iron Triangle and Circle of Success of Education from a Student's perspective





### **A student centred Interaction Engagement Equivalence Theorem**

As already noted, just because high levels of content or interaction might be available and accessible does not mean that is affordable (in terms of money or time) or acceptable (if ill prepared or poorly motivated) in which cases the student will be unlikely to engage in deep and meaningful learning but is more likely to engage in shallow and meaningless learning and, at the extreme, ‘drop-out’ or withdraw from the educational system on offer because they are disillusioned and dis-satisfied with the quality or the interactions. To understand this demand side of the education ‘equation’ I propose another model, an interaction engagement equivalence theorem (Figure 5). This replaces the simple notion of a student in the EQuiv with the new student centred iron triangle introduced above, changing the assumption of just a student to one of student engagement with the interactions on offer to them. It also aligns the two different sets of equivalences within the same conceptual framework.

Thus, as seen with the earlier model, high levels in one of either motivation, ‘organisedness’<sup>2</sup>, or preparedness on the part of the student for engaging in the educational interactions on offer to them can offset lower levels in the others. For example, a highly motivated person with no previous qualifications and few study skills can succeed if they are able to engage fully with such study skills through the learning design and other support interventions. However if all three engagement factors are low then successful learning is also likely to be low, whatever the learning design and whatever efforts are put in by others to support and encourage greater engagement with their studies.

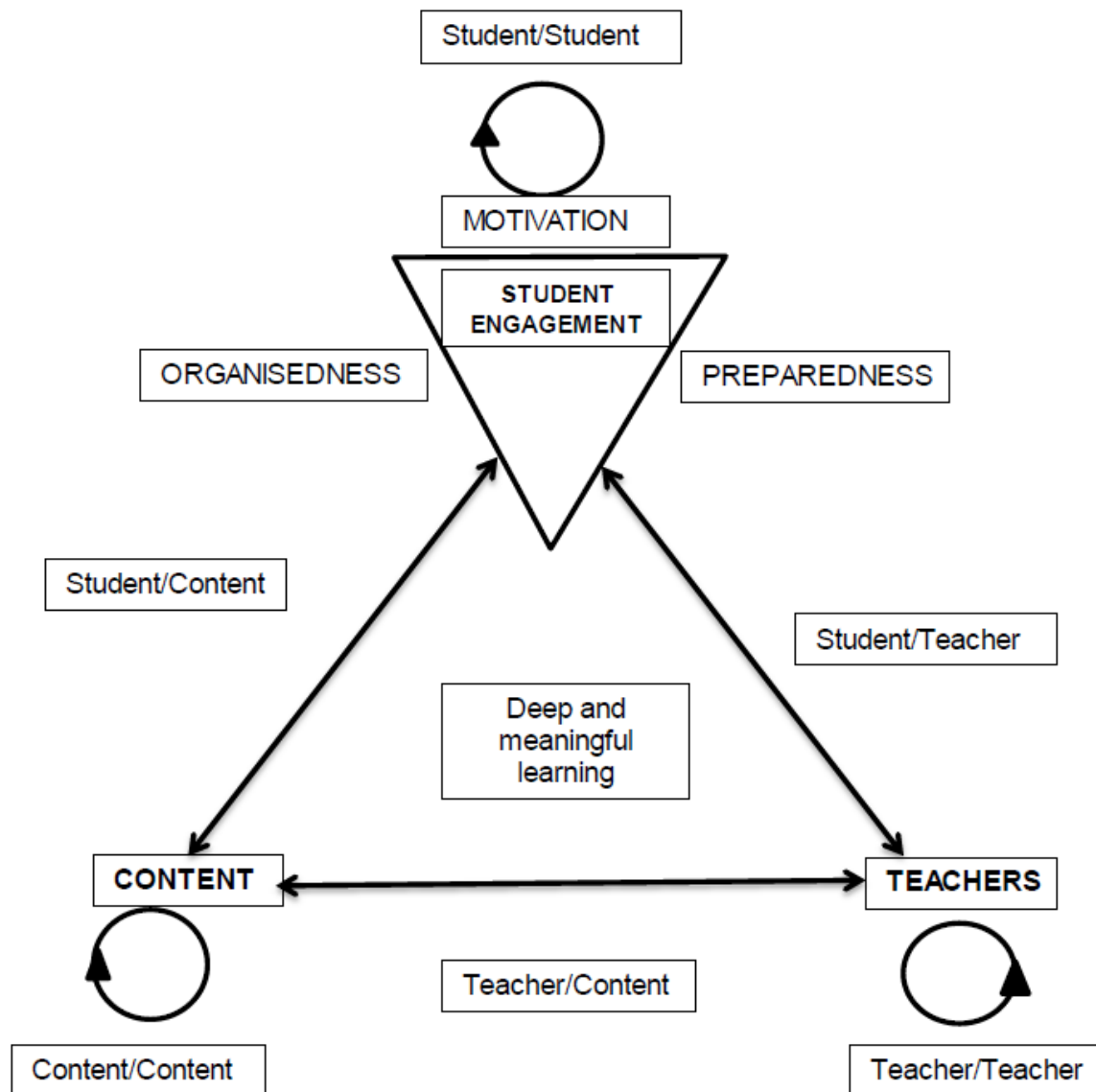
And while this is mainly student centred, the use of the student iron triangle also has link backs to the use of the iron triangle at sector and institutional levels.

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<sup>2</sup> I use this term rather than organisation to imply it is a property of the student and one that can be difficult to change



Figure 5. The Interaction Engagement Equivalence Theorem



### Discussion

There is much debate as to whether and how OER and/or MOOCs will provide cheaper and more scalable solutions to increasing participation rates in higher education compared to the current face to face or ODeL solutions available from higher educational institutions. An examination of the iron triangle model indicates that a hidden constraint is the capabilities of the student so that even if it is possible to increase one factor such as a lower unit cost per student, as has been possible with ODeL and could be even more so with MOOCs, it may not increase successful student participation owing to lack of motivation or preparedness on the part of additional students from non traditional backgrounds. This may also help explain why most

MOOC participants that 'complete' their courses do not apparently lack preparedness, motivation or organisedness as implied in the findings of many MOOC studies to date.

The Interaction Equivalency Theorem model highlights the significance of high levels of interaction for successful learning but it also ignores the capabilities of the students to be able to engage with those interactions. The creation of an Interaction Engagement Equivalence Theorem visual model highlights once more that increases in OER and MOOCs, or even e-learning within formal education, will not in itself increase meaningful learning without these engagement issues being addressed by some means or other.

The modified visual models presented here provide a new framework with which to examine the capacity of more open education systems at the national, institutional and individual learner level to be expanded effectively and equitably. They also indicate that such models need to be evaluated against the particular contexts to which they might be applied.

This paper argues that neither the iron triangle of interaction equivalence theorem model adequately reflects the influence that learners' personal attributes and circumstances have on the phenomena that they are trying to account for. It also argues that to support and increase the level of successful engagement and attainment by less privileged learners requires the use of a combined visual model that resolves many of the tensions and opposing forces inherent in these two models.

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