

## **Working Partnerships in Education: How should we assess ‘partnership’?**

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### **Abstract**

Education is full of partnerships. A search of the internet shows that public-private partnerships are key items on the policy agenda of many national and provincial governments. Less formally, education is acknowledged to involve a partnership between parents, the family, the community and the school. This paper proposes a ladder of partnership which indicates the relative roles that each partner plays in decision making in the partnership. This is intended to restore some rigour to the use of the word partnership, which has been stretched so far that it now describes almost anything, and therefore nothing.

*Keywords:* Partnership in Education, Shapley Value, School, Mixed motive games

### **Introduction**

There is an old joke that illustrates the difference between ‘involvement’ and ‘commitment’ in partnerships. Consider a bacon and egg breakfast; the chicken is involved, but the pig is committed. Partnerships frequently involve different levels of engagement of this kind, since the essence of a good working partnership is that each partner brings something into the partnership that nobody else can provide. Partnership is unnecessary where partners have access to a complete range of identical resources.

These inequalities in partnerships are sometimes recognised by assigning adjectives to some of the partners; ‘junior’ partners, or even ‘sleeping’ partners, where the active involvement is slight. However, if a partner’s involvement is very small, there is a question as to whether what we are looking at is a partnership at all. In the area of education, non-governmental organisations, voluntary organisations and community groups may often feel that they have been assigned the role of ‘pig’.

Education is full of partnerships. A search of the internet shows that public-private partnerships are key items on the policy agenda of many national and provincial governments. Less formally, education is acknowledged to involve a partnership between parents, the family, the community and the school. What happens in the classroom is frequently a partnership between teachers and pupils, and possibly other partners who are not physically present in the classroom, such as textbook writers and curriculum designers. And since 2002 we have had the Global Partnership for Educa-

tion. What is immediately clear, however, is that the word 'partnership' is being used to cover such a wide range of activity that it is in danger of losing any real sense.

This paper sets out to examine the concept of 'partnership', and to look at ways of developing concepts of partnership that can promote critical evaluation of actual partnerships in education. Of particular importance will be the question of whether there are upper and lower limits to the levels of involvement and commitment beyond which we can no longer be said to be looking at a working partnership. Does it make sense to talk of 'partnership' where one 'partner' has much more power in the relationship? And if not, at which point does 'partnership' end and 'dictatorship' begin? Does 'partnership' imply anything about the way in which the costs and benefits that accrue to partnership are distributed? In the traditional breakfast, are the chicken and the pig really in partnership?

In order to examine these questions, this paper draws on a classic paper by Shapley and Shubik (1954). That paper examined the power which committee members have by virtue of voting procedures adopted by committees. In particular, Shapley and Shubik examined inequalities of power which arise from non-symmetrical voting rules, and from the formation of voting blocs and caucuses. They suggested an index that provided a measure of the power held by particular groupings on committees, the Shapley value.

The original work has been further extended in the area of partnerships, particularly by Kalai and Samet (1987) and Carreras (1996). This later work suggests some formal definitions of 'partnership', which distinguish it from other concepts, such as 'coalition' or 'caucus', and in doing so provide criteria by which we may start to assess whether the word 'partnership' is appropriately applied in all cases.

This paper is structured around the historical development of the concepts. In the section that follows the concept of Shapley value is explained. The third section of the paper examines the concept of partnership as it is developed in the literature relating to Shapley values. The fourth section examines how the concepts developed can be applied in less formal settings where collaboration and partnership are not governed by rigorous voting procedures. The fifth and final section of this paper applies the concepts developed to actual settings of educational partnership and to explicit statements of policy relating to educational partnership, and draws a number of conclusions.

## **Shapley Value**

Shapley and Shubik (1954) presented a highly abstract method for evaluating the power of groupings in committee settings. The method, which can appear extremely complex in some of its more mathematical developments, is conceptually very simple. The following example sets out the main principles.

Suppose that a committee has seven members, and that a resolution is passed if a simple majority votes for it. The committee members vote in sequence, the order in which they vote being decided by drawing lots. The Shapley value, which must be a number between 0 and 1, is the proportion of votes when a committee member casts the decisive vote (the fourth vote in favour of, or against, a particular resolution). Although the exact method of calculation can be complicated, the principle suggested by Shapley and Shubik is that we should consider every possible combination of voting preferences held by the committee members, and every possible order in which the committee could vote, and calculate the proportion of occasions when the committee member under review casts the fourth vote in favour of (or against) the proposition.

In this particular case we are saved the complication of calculating the result, because the position of each of the seven members of the committee is the same, and each has one seventh of the power, or makes the pivotal vote on one seventh of the occasions. The Shapley value of any member of the committee is thus  $\frac{1}{7}$  or 0.14.

It follows that any pair of committee members will have a combined power of 0.28. However, if two members of the committee form a pact, whereby they agree always to vote in the same way after discussions between themselves, the chances of them having the pivotal vote increase even further. In fact, their Shapley value rises to 0.33 in this scenario.

Similarly, if three committee members group together (while all the other members continue to act as individuals) then their collective Shapley value rises to 0.6. This contrasts with the arithmetical sum of their individual Shapley values, namely 0.43. Thus it can be seen that by forming groups which agree to vote as a bloc, committee members can exercise more power than they would if they acted alone, or relied upon the chance agreement of colleagues.

This finding is relevant in educational partnerships, where, for example, there might be a three-way partnership between local government, business representatives and representatives of community groups or non-governmental organisations. A steering committee might be formed with equal representation from the three sectors. But despite the explicit intention to provide equal representation, a formal coalition (for example a decision that all local government representatives should be constrained by policy decisions of the council) or an informal coalition (for example arising from the similarity of perspectives among business representatives) might still mean that one of the groups could exercise more than their fair share of power (have a higher Shapley value).

Before moving on to examine specific applications of Shapley values, it would be well to repeat the warning given by Shapley and Shubik (1954: 791) in their original paper, that Shapley values are "not intended to be a representation of present 'reality'". They do not take into account any of the subtle interactions of real committees, of influence or persuasion. Shapley values are thus a starting point, an abstraction against which the behaviour of real committee members can be compared, rather than an attempt to capture the subtleties of human interaction. However, they do provide a framework for assessing organisational structures.

As the above example indicates, simply providing equal representation for parties on a committee does not guarantee equal influence, if some of the participants are institutionally related in such a way as to make it more likely that they will operate as a voting bloc. It is this kind of insight that the calculation of Shapley values can support, prior to the actual observation of how such committees work in practice. It should be noted that the constituencies that are particularly affected by these shifts in Shapley values are those that are most fragmented and diverse, which is to say, those that are most likely to have been excluded from decision making prior to the formation of the partnership.

### **Mixed Motive Games**

The work of Kalai and Samet (1987), and subsequently of Carreras (1996) extends the work of Shapley and Shubik to mixed motive games. Mixed motive games involve both cooperation in achieving a benefit, and competition in distributing that benefit among the members of the coalition that creates it. Cooperation means that it is possi-

ble to create a benefit that would not be available to the players in the absence of a coalition, but this creates the subsidiary problem of dividing the benefits equitably.

Carreras gives the example of a group of three towns contemplating the installation of municipal water systems. The total cost of installing a single system for all three towns is less than the sum of the cost of installing three separate systems. By coming together in cooperation the three towns can therefore create a good, a cost saving, but it is by no means clear how that benefit should be distributed between the three towns. This is a mixed motive game in which cooperation is necessary to create the desired end, but competition over its distribution is still possible.

One way of distributing the benefit equitably is to allocate the prize in proportion with the Shapley value of the coalition members, and this is what Carreras (1996: 58) advocates. The example illustrates a situation where players in a game come together to create a benefit that can then be divided among the coalition members. This is exactly the kind of situation which might be described as a 'partnership'. It will be noticed, however, that up to this point we have only referred to a 'coalition' rather than a 'partnership'.

A coalition is a group of players that comes together to secure an outcome. And of all the coalitions that can be formed, that which is of most interest is the winning coalition, the coalition that commands the resources to secure the desired outcome.

Even at this level, there are some interesting lessons for situations where the term 'partnership' has been applied. Coalitions require a certain amount of energy and effort to keep them together, and the larger the coalition, the more energy and investment it takes to keep all parties on board. For this reason the minimum winning coalition, the smallest coalition that can achieve the desired result, is the one that will normally win. This has the obvious effect of creating an 'out group'. Where public policy deals with inclusive partnerships in education, as in public-private partnerships, or partnerships between schools, businesses and the community, the idea that the *minimum* winning coalition will be the one that prevails is contrary to the intuition that partnerships will be inclusive.

This constellation of concepts provides some valuable tools that may be of use in the analysis of the behaviour of bodies that are intended to represent three or more interest groups in education, as when school boards or governing bodies are supposed to bring together representatives of the teaching profession, parents and employers. We can then see that a minimum winning coalition is likely to involve two of the participant groups and exclude the third.

Moreover, if we then add to the analysis a calculation of the Shapley value for different groups, we will be able to see whether the winning coalition is more likely to involve two specific partners, and exclude specific interest groups. And this in turn might be of importance where it is very difficult to engage with particular interest groups, as formal inclusion on representative bodies might be coupled with Shapley values so low as to amount to exclusion from all important decision making.

One might also look for methods of overcoming these difficulties. The most obvious way of preventing the formation of winning coalitions which exclude certain interest groups is to modify voting procedures. Clearly, a requirement for unanimity prevents the formation of an 'out group', as the winning coalition must include everybody. This has the disadvantage that it gives every minority group the power to block decisions, and makes it more difficult to decide on actions that can be implemented.

On the other hand, a requirement that decisions are unanimous has a very dramatic effect upon Shapley values, equalising power in decision making, and removing the increased influence of voting blocs and caucuses.

### Partnerships

Returning again to the distinction between 'coalitions' and 'partnerships', it should be noted that up to this point we have only discussed coalitions, those alliances that come together with a common interest on a particular issue. Although coalitions may be of some interest in illuminating the behaviour of partnerships, as broadly defined, in public policy, it should be noted that Kalai and Samet (1987) introduced a distinct concept of 'partnership' which is different from a coalition. Although, in one sense, Kalai and Samet's definition is a negative one, it is also instructive.

Kalai and Samet argue that a partnership is a prior agreement that no partner will enter into a coalition which the partnership as a whole does not agree to. In effect, this is a prior agreement that excludes certain voting patterns and voting orders, and as a result it is an agreement that alters Shapley values for all participants. At the same time, since all partners are able to block the entry of the partnership into a coalition, the partnership agreement also has the effect of changing Shapley values within the partnership, effectively sharing the power of the partnership equally between partners.

Carreras (1996: 63) gives an illustrative example of the outcome of the 1993 parliamentary elections in Spain, where twelve parties gained seats, and the number of seats held by parties was respectively 176, 159, 141, 18, 17, 5, 4, 2, and four parties with 1 member of parliament each. Carreras points out that there were only four winning coalitions. The largest party could combine with any of the next three parties to form a majority, or the second, third and fourth parties could combine to outvote the largest party, but no other winning combinations were possible. The remaining eight parties were irrelevant to the formation of a winning coalition, and can therefore be regarded as 'sleeping partners'.

Carreras (1996: 64) continues: "It seems, then, rather surprising that party 5 was immediately included in the negotiations held by party 1 with party 4 in order to form a coalition government or, at least, to guarantee a parliamentary support for a minority cabinet". Although there was no public statement of partnership, Carreras concludes that this can only be explained by the presence of an implicit partnership, either between party 1 and party 4, or between party 4 and party 5. He explains that either is plausible in terms of party histories and ideologies, and proceeds to calculate how either partnership would affect the Shapley values of the players. In both cases party 5 escapes from a dummy position, by taking half of the Shapley value of its more powerful partner: the Shapley value of the partnership is the same as that of the senior partner, and the senior partner loses influence by being a member of the partnership.

It should be noted that Kalai and Samet's (1987) definition of partnership is a strict one, involving inclusion of partners in coalitions, even when their presence is unnecessary for the development of a winning coalition, and pre-supposing equality of influence within the partnership. It is doubtful whether any arrangements that are loosely described as 'partnerships' in the educational sector will live up to those demanding standards.

However, this concept of partnership has a number of interesting implications. In the formation of coalitions it is advantageous for like-minded players to form voting blocs, but in partnerships the opposite is true. A voting bloc can be considered,

in mixed motive games, to be a single player with multiple votes. In the formation of coalitions, the Shapley value for a single player with multiple votes is more than the sum of individual players with single votes, as illustrated above. In contrast with this, in a partnership all players have the same Shapley value, and any single player can block entry into a coalition. A voting bloc, therefore, sacrifices any advantage that it has within the partnership. This result suggests an interesting test for the presence of true partnerships. Where the primary mechanism for decision making is coalition formation, we might expect to see like-minded representatives (of local government or business) exercising voting discipline to achieve their collective goals. We might expect to see more tolerance of diverse opinions and discussion within a partnership. This might be one way in which the insights provided by mixed motive games can be used in structuring observation of supposed 'partnerships' in education.

In addition to this notion of a partnership as an organisation without internal structure in which all partners are equal (which Kalai and Samet term a 'p type coalition' (Kalai and Samet, 1987: 211)), Kalai and Samet also describe a partnership which recognises that partners have different costs in coming together in partnership. For example, partners might distribute benefits in proportion to their different costs. (Kalai and Samet (1977: 215) term this a 'p\* type coalition'.) Kalai and Samet (1987: 221) note that taking partners' costs into account would be particularly relevant in management boards, where members represent constituencies of different sizes, where the costs of consulting with a constituency and maintaining a consensus within it would be likely to rise with the size of that constituency. In such cases we might see reference to the benefits accruing to a partner as being in some way related to their costs, or to what they bring to the partnership.

All of the examples discussed to this point have been from formal settings, where voting rules and numbers of votes are clear. However, even in such formal settings, as in school boards, ministerial committees or parent-teacher associations, decisions are not always formally put to a vote. Chairs of meetings will often sense the will of a meeting, and the absence of strong dissent will be taken as an indication that those who oppose (if any) recognise that they cannot form a blocking coalition. And even where there is a formal requirement for the voting procedure, the chair may operate informally to a completely different voting rule, for example seeking some kind of consensus rather than relying on a simple majority.

These general considerations of the concepts first advanced by Shapley and Shubik (1954), and developed by others, suggest that partnership might not be a homogeneous category, but might range from no-partnership (exclusion from any possible winning coalition), through a p\* type coalition (when parties that are not able to contribute much, do not benefit much from the partnership), to a p type coalition (where all members of the coalition are equal partners. Clarifying the confusion which now surrounds the multiple applications of the word "partnership" might thus be advanced by the introduction of a ladder of partnership, analogous to the ladder of participation, first proposed by Arnstein (1969). That original proposal was made in the context of urban planning, but has since been widely adopted in many areas, including education.

### **A Ladder of Partnership**

The ladder of participation presents a hierarchy of relationships which ranges from the manipulation of dupes by the planners right through to citizen control (Arnstein, 1969). The complete spectrum is:

Citizen Control – Delegated Power – Partnership – Placation – Consultation – Informing – Therapy – Manipulation.

One obvious obstacle to developing a similar spectrum to describe the range of partnerships is that “partnership” already appears as one of the levels in Arnstein’s original ladder of participation. Indeed, categorised by Arnstein as the lowest level of citizen power, and above the level of tokenism, partnership occupies a position of something to be aspired to in most bureaucratic organisations.

Arnstein (1969: 221) remarks that at this rung on the ladder, “power is in fact redistributed through negotiation between citizens and powerholders... After the groundrules have been established through some form of give-and-take, they are not subject to unilateral change”. Arnstein (*ibid.*) goes on to comment that, “Partnership can work most effectively when there is an organized power-base in the community to which the citizen leaders are accountable”.

However, what Arnstein clearly implies is that partnership can only work effectively when there are those links of accountability to the wider community, because he contrasts the arrangements in partnerships with those in placation, the next level down, which Arnstein (1969: 220) categorises as tokenism: “An example of placation strategy is to place a few handpicked ‘worthy’ poor on boards of Community Action Agencies or on public bodies like the board of education, police commission, or housing authority. If they are not accountable to a constituency in the community and if the traditional power elite hold the majority of seats, the have-nots can be easily outvoted and outfoxed”.

We can see that partnership, like participation, has gradations. What we attempt in this paper is, first, to develop a view of partnership as a separate dimension from participation. Crucially, a person’s or group’s position in a partnership is a matter of power, and that is best thought of in terms of representation on the central governing body of the partnership. There may be further ramifications of this question of power, as may be the case, for example, if a coalition on the main governing body or committee of the partnership is able to use its power to dominate the appointments to certain sub-committees, thereby obtaining even more dominance in certain areas, notably finance and compensation.

Secondly, we propose to use Shapley values to give an indication of how much power partners have in making crucial decisions. These considerations will necessarily be fairly general, and consequently the Shapley values assigned will be approximate. For example, a member of a five person committee which operates on a simple majority vote, where all members are equal, will have a Shapley value of 0.20. On a seven person committee, under the same conditions, each member will have a Shapley value of 0.14. Although a partnership must have at least two members, there is, in principle, no upper limit to the size of a partnership, so it is not possible to be precise about the Shapley values of partners.

Variations in voting procedures, such as the chair having a casting vote in the event of a tied vote, complicate the calculation of Shapley values, increasing that of the chair at the expense of all other members of the committee. However, for the sake of explication, we will ignore such relatively minor variations in what follows, assuming that all committees vote by simple majority.

At one end of the scale of partnership a member of a nominal category which has a number of members is selected to represent that group in the partnership. For example, a parent governor might be appointed to a school board, or a “representative” business person might be appointed to an urban regeneration committee. It is fairly easy to calculate the Shapley value of that person, as an individual, on the committee.

It is likely to fall somewhere between 0.05 to 0.20 depending on the size of the committee. It should be noted, however, that the Shapley value of an individual can be affected by the actions of other members of the committee. If coalitions form with the intention of voting as a bloc, then the Shapley value of committee members who are not members of the bloc are reduced. In the extreme case, where a majority of the committee agree to act in concert to dictate the business of the committee, the Shapley value of other committee members falls to zero.

From the point of view of the partner, there is an important distinction here between having a small non-zero Shapley value and having a Shapley value of zero. In the former case the partner can exert some influence on decisions that are made. In the latter they are mere window-dressing and might as well not turn up for meetings of the “partnership”.

There are important questions to examine in relation to the way that the power possessed by a committee member is transmitted to the constituency that they nominally represent. As Arnstein notes, this very much depends on whether or not there is a functional organisation within that constituency. We might consider two cases: when there is a fully functioning democratic group which meets and mandates their representative on the basis of a majority vote, and when there is no organisation at all. The latter case might happen when the school principal appoints a “friendly” parent to represent all parents on the school board. In that latter case, the power rests with the individual rather than with the nominal group (although the exact Shapley value may depend on the power of the principal to rescind the appointment). Where there is a formal, functioning organisation the Shapley value of the parent representative will be uniformly distributed among all the parents concerned, in which case each parent will have a Shapley value of approximately 0.0001, (on the basis that an original Shapley value of 0.1 is shared equally among a thousand parents) which is small, certainly, but non-zero.

In between these two extremes there will be a variety of other arrangements which might imply that the general body of the constituency has some influence over the decisions supported by their representative, but not much. Being able to elect a representative for a fixed term of office, but without the power to mandate the actions of the representative or to recall him or her before the end of that term might be an example. In that case most of the power (Shapley value) would remain with the individual, and very little transmitted by their presence to the constituency.

In going beyond the main committee, we would also need to look at the structure of sub-committees. We need to look at this from two perspectives. From the point of view of members of the main committee who are appointed to a sub-committee, that sub-committee represents an opportunity to form alliances and coalitions, and to increase influence when the sub-committee makes recommendations to the main committee. Some powers may be directly delegated by the main committee, and in relation to those, the sub-committee may be treated as autonomous in terms of calculating Shapley values. But even where the sub-committee merely makes recommendations and the main committee has to ratify them, the use of sub-committees can increase the likelihood of certain policies being adopted, and can have an influence on the relative Shapley values of committee members.

The sub-committee may also include members who are not appointed from the main committee, and this is another route by which community representation, or partner representation, may be sought. Again, discussion of the extent to which such inclusion actually creates representation follows very similar lines to those already introduced in relation to the main committee.



This general discussion probably gives sufficient insight into how Shapley values could be used to distinguish between levels of involvement in partnerships. It will also, no doubt, provide a background for a few general conclusions about how Shapley values work. In multi-cameral systems of government, smaller bodies have larger Shapley values, as do the individual members of those smaller bodies. So, for example, in the Government of the United States, the President has more power, and a higher Shapley value, than the Senate, which in turn has more power than the House of Representatives. Correspondingly, each senator has more power than each member of the House. To make exact calculations in any particular case one would need to take into account, first the make up and voting rules for a particular organisation. This would make it possible to calculate a base-line Shapley value for each member of a partnership.

This step would be followed by a review of any alliances, coalitions and voting blocs to determine how these affected the Shapley value of different partners. Calculation of precise values for any particular case is beyond the scope of this paper. However, in terms of general orders of magnitude, from what has already been seen, Shapley values vary from 1.00, when a single partner has complete control of decisions, through 0.10 for members of the main partnership governing body, to zero, with 0.01 to 0.0001 being typical values for members of small or large constituencies that are represented in the partnership.

Since these are very small numbers, we propose to transform the scale, so that the level of partnership is indicated by the logarithm (base 10) of the Shapley value, with the sign changed, i.e.  $P = -\log_{10}(\text{Shapley value})$

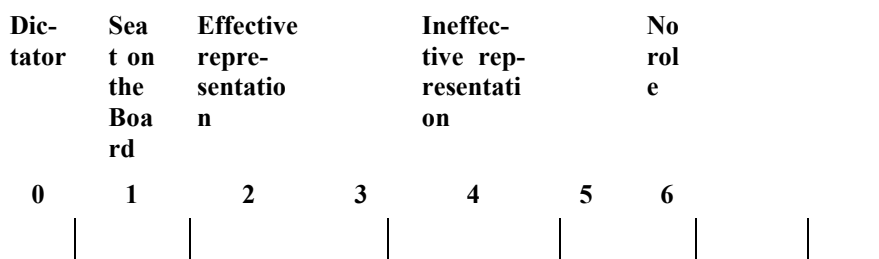


Figure 1: A ladder of partnership

### Conclusion

Given the latitude that seems to have attached to the word “partnership”, it might be good practice if anybody who claimed to be operating a partnership provided, at the same time, an estimate of the level of partnership of each of the partners. This could restore some precision to the concept and give a more accurate picture of how equal the different partners are in specific structures.

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