Isolation game heuristic analysis

The heuristics I tried for the game of Isolation were incremental and complementary.
My ID_Improved had a performance of 60 - 65% over multiple iterations so all the numbers of the student are with respect to this.

They are the following:

1) Any element on the board can have 8 possible moves at a place(assuming an empty board) except for the first 2 rows, last 2 rows, first 2 columns and last 2 columns. I used this observation to weight my_moves and opp_moves respectively according to their row and column number, weighing the cells in the middle more as compared to the edges. Then I used the improved score variant:

   my_weighted_moves - 2 * opp_weighted_moves

   This allowed a performance of 65 - 70% by the student.

2) I observed that there were some terminal cases which could be ignored by the algorithm or not given as much weight as they deserve. Here is an example:

2	_	_	_	_	_	_
_	_	_	_	_	_	_
_		_	_	_	_	_
_	_	_	1	_	_	_
_		_	_	_	_	_
_	_	_	_		_	_
_	_	_	_	_	_	_

   In the above example, we can clearly see that if player 1 is to move next, it can finish the game by moving to (2, 1), so player 1 is winning this game; it would be good if we return +inf from this node and similarly for the reverse situation.

   Adding this heuristic made my student reach 70 - 75% performance.

Apart from this, I did some minor optimizations to first move. If my player is to move first, it chooses the center. If it goes second, it chooses center if unoccupied, or else it reduces the search space i.e. legal_moves to one quadrant owing to the symmetry of the board after the first move.
I also made sure, that if minimax or alphabeta are not able to find a non losing move but there are still legal moves available, they return a valid move.

Here is a complete performance table of student and ID_Improved against all the variants.

OPPONENT	A1	A2	A3
Random	18	17	20
MM_Null	16	14	16
MM_Open	12	13	13
MM_Improved	10	10	14
AB_Null	12	18	15
AB_Open	11	10	13
AB_Improved	11	14	12
Total (%)	64.29	68.57	73.57

Columns 1 to 3 shows the #of matches won by the respective agents
A1 => ID_Improved
A2 => Student with heuristic described in (1)
A3 => Student with heuristic (1) + (2)
Matches played against each opponent 20

I hence chose the combined heuristic of using the weighted moves and the early detection of win/lose to improve the estimation of the heuristic.