# Exploring recurrence relationships with TI-Nspire™ Navigator™

Teacher – Nevil Hopley, George Watson's College, Scotland

Case Study
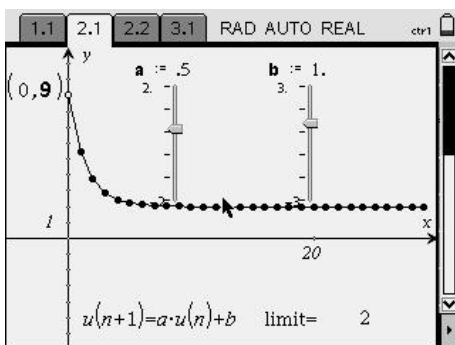
# Exploring recurrence relationships with TI-Nspire[TM] Navigator[TM]

| Teacher | Nevil Hopley |
|---|---|
| Location | George Watson's College, Scotland |
| Class | 14-15 year old students following the compulsory secondary curriculum. |
| Technology | TI-Nspire[TM] Navigator[TM] |

**Setting**: George Watson's College is a mixed independent school and I have been using the TI-Nspire[TM] Navigator[TM] since October 2008 with most of my classes. In this lesson I used the File transfer, Screen Capture and Quick Poll features.

**The lesson**: This lesson focused on students exploration of the variant and invariant features of recurrence relations of the type $u_{n+1} = au_n + b$. I used TI-Nspire[TM] Navigator[TM] to transfer a file to their handhelds which allowed students to adjust the initial values of $u_0$, **a** and **b** and see the long term effect of these changes.



All of the students were engaged with the task very quickly – they are experienced TI-Nspire[TM] users. Whilst the students were working, I asked them to insert a Notes page to record their emerging thoughts and I used the Screen Capture view to share these around the class, showcase them, and

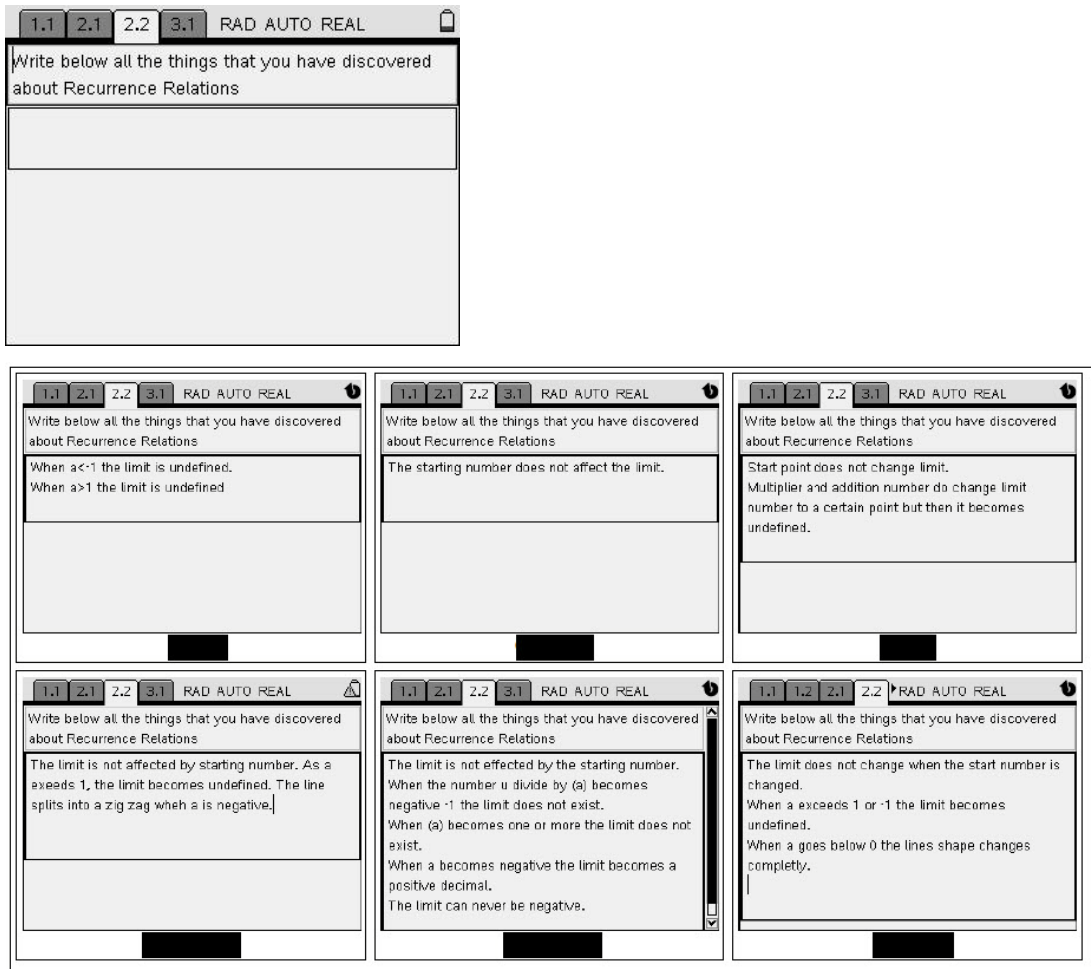then let the students continue using any ideas that had been revealed to them from others in the room.





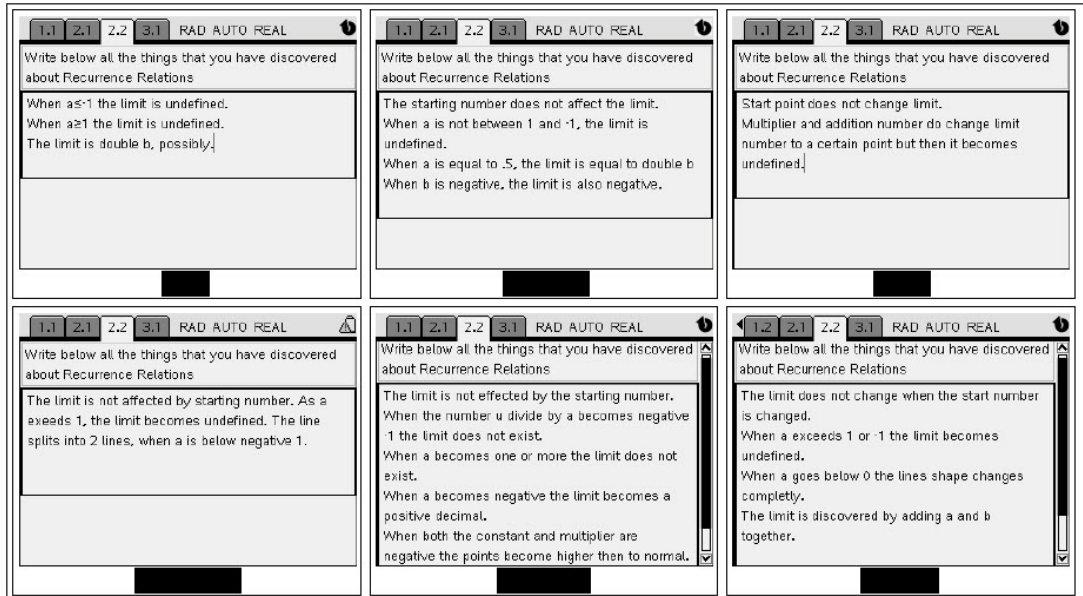**Figure 1 Sample of Screen Capture view (midway through the lesson)**

Figure 2 Sample of Screen Capture view (end of the lesson)

Near to the end of the lesson I used Quick Poll to find out which students wanted me to show them how to work out the value of the limit algebraically. 14 students said yes, 3 said no and 3 were having technical issues at the time. So, in the spirit of democracy, I went ahead and showed them how the limit could be worked out algebraically. I made reference to what happens when n gets very big, and how $u_n$ and $u_{n+1}$ are different by progressively smaller and smaller amounts. I referred to the graph they had been using and they all seemed to accept the argument that I presented to them. The graph – and their playing with it – helped enormously with this part of the 'conclusion'.

## Students' mathematical learning

The students had the opportunity to explore a numerical sequence displayed to them as a graph. This forced them to look at the trends in the terms of the sequence and not just the numbers. The sharing of thoughts at the 'half-way' stage led in several cases of students checking some of the declarations that had been made by their peers and revising their own statements in response.

## Conclusion

All of the students discovered the key ideas behind the trends of the sequences and everyone was on task. I observed them making real, engaged progress. Of all of the lessons I have taught with TI-Nspire™ Navigator™ so far, I think that this has been the best 'showcase' for what it can do and I have some very tangible evidence for how the TI-Nspire™ Navigator™ system supported the students' learning.