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## Tacaí - Supporting the Understanding of Mathematical Concepts in Further Education in Ireland

Student Dissertation

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## MON: Tacaí - Supporting the Understanding of Mathematical Concepts in Further Education in Ireland (Paul Curran)

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Cloud created by:



Paul Curran

8 January 2017

"Tacaí" is an online, free-to-use learning support tool, aimed at being used within the Irish Further Education sector. It supports the learning of mathematical concepts commonly encountered at QQI Level 4 in the Irish system, specifically those required in Functional Mathematics 4N2138. The support itself will be offered online and open to all, at least in its initial stage as currently envisaged. The word "Tacaíocht" is of the Irish language (or Gaeilge), which roughly translates into English as "support" and can be understood in a literal physical way but also in the context of moral support and encouragement. "Tacaí" means supporter in the same sense. The approach to learning taken by the project is one of scaffolding learning which is a metaphor referring to a structure offering physical support that is removed when it is no longer needed.

Mathematical ability and numeracy has long been linked to employment prospects as evidenced by the National Adult Literacy Agency (2014), the Programme for the International Assessment of Adult Competencies (PIAAC) report (2012), the School Completion Programme and the Programme for International Student Assessment (PISA). Hughes and Schwab (2010) describe literacy as a situated social practice. By this they mean that literacy is more than just a set of discrete skills. Numeracy is rightly considered a form of literacy by Hughes and Schwab and by NALA (2014). It is in this context that this project approaches mathematical skills. An activity system in the style of Vygotsky gives recognition to a number of factors, including mediating artefacts or tools. This is the role Tacaí envisages for itself: as a tool that supports learners who are also supported in other ways including interacting with a community of learners. It forms an artefact around which interactions can occur.

As a mediating artefact Tacaí will draw upon the theory, much cited in the context of reading and writing literacy, of scaffolding. This is the idea that during the learning process the teacher or a facilitator offers a variety of supporting mechanisms to assist the learner to grasp a

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concept. As Tacai is a support to mathematical learning it will take the form of hints, suggested strategies and useful metaphors towards the aim of understanding mathematical concepts and procedures. Central to the approach taken by Tacai is the strategy of progressing from concrete materials to abstract concepts. Thompson (1994) describes how the effective use of concrete materials can help avoid misunderstandings. Lee and Tan (2012) discuss the effectiveness of a concrete-pictorial-abstract (C-P-A) progression. They develop a role for virtual manipulatives within this progression and outline a C-V & V-P-A alternative. The use of virtual manipulatives is a tool that Tacai will employ to allow learners to explore concepts and relationships between concepts.

The work of Richardson et al. (2014) on colour and contrast in e-learning and instructional design and the work by Murch (1987) on readability have been used to design the tool with accessibility, split-attention issues and cognitive load in mind. Development is on-going.

## Extra content

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## Embedded Content

### Prototype of Tacai

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[Accessible Alternative](#)

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### Screengrabs of Tacai Prototype

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**Discussion (17)**

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[Leanne Johnstone](#)

8:20pm 28 January 2017 [Permalink](#)

Hi Paul,

I like that the project allows for collaboration between learners to support understanding. Will you be using forums to facilitate this? I look forward to hearing more about your project at the conference.

Best wishes,

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Leanne



[Mary Howell](#)

3:04pm 29 January 2017 [Permalink](#)

Hi Paul I think Tacaíocht may be the tool I have needed for many years. Please excuse my ignorance, but what is QQI?

I am interested to know what you are going to show us in the presentation - are you going to give us a web tour or overview of the resource in some way? Or are you going to report on pilot activity?

I know it is aimed at a different target audience and different set of skills but I have participated in and recommended to teachers and parents the National Numeracy challenge tool at <https://www.nnchallenge.org.uk/home/index.html> from the site at <https://www.nationalnumeracy.org.uk/> In fact it was his site, along with OU study that got me much more interested in online learning.

I am also interested that the scaffolding approach and can see how that fits with developing numeracy. I look forward to hearing more about your project.



[Paul Curran](#)

8:44pm 29 January 2017 [Permalink](#)

Leanne,

Glad you're interested in the project. The prototype I'm building is going to have forums on certain pages to allow discussions to be centred on particular artefacts.

Mary,

I'm hoping to have a prototype functioning online for the presentation and do a web tour. QQI is Quality and Qualifications Ireland, they recently mapped all qualifications onto a single framework in Ireland, my experience is mostly at level 4 which is somewhere between GCSE and A Level. Thanks for sharing those links, I will definitely check those out.

Bring on the conference!



[Jan Turner](#)

6:21pm 1 February 2017 [Permalink](#)

Hi Paul, By the title 'Tacaíocht' I assume that the material will also be presented in Gaeilge, or perhaps in both Gaelige and English. I wondered if you found any difference in the level of engagement with the material when presented in either language and whether you found any significant difference in performance on test?

I noticed Mary's comment about 'scaffolding' and am likewise interested in hearing more about your project.



[Paul Curran](#)

7:58pm 1 February 2017 [Permalink](#)

Jan,

I actually haven't developed the resources in Irish (yet anyway). I would expect an Irish-language version to receive much less traffic just because of the amount of people for whom it is a first language is so small. I know it seems paradoxical but a lot of services here would be named in Irish but operate for the vast majority of the time in English.

I'm glad the scaffolding idea is of interest to you, I hope to get some visuals up on this cloud soon.



[Paul Curran](#)

2:02pm 3 February 2017 [Permalink](#)

I've changed the title from Tacaiocht to just Tacai. Tacaiocht means support whereas Tacai is a supporter. The simpler name had some advantages but I also thought it more appropriate for the website to be describing itself not just what it offers.



[Dr Simon Ball](#)

10:50am 14 February 2017 [Permalink](#)

Hi Paul

Please find below the main questions and comments from your live presentation. It's up to you how to answer them, whether you wish to group them, or whether you wish to point to an answer already given above, for example.

Best wishes

Simon

- ▶ Do you think there are cultural differences which make people in some countries more confident in their numeracy and more committed to developing their literacy?
- ▶ Sorry Paul maybe I missed the point, what is meant by mathematics is discrete
- ▶ Its great that you're basing this on concept. Problems with this can really hold back further learning
- ▶ You may cover this but i am interested in the learner take up.
- ▶ In functional maths in FE in UK, the tests are very wordy, and students who can't understand the narrative question correctly can't do the correct maths to answer the question.
- ▶ I like this approach of starting with the concrete and moving to the more abstract
- ▶ Do you link into FE and HEIs for specific progression? Numeracy is something many of my potential student nurses struggle with...
- ▶ Do the learners have any opportunities for any authentic learning activities? By authentic, I mean real world numeracy activities.
- ▶ Will it include an assessment? assessment linked to level 4?



[Paul Curran](#)

1:26pm 14 February 2017 [Permalink](#)

A1: I would say yes there are differences between countries but it is not something I have looked into at depth. I wonder is it perhaps the culture as it pertains to teachers rather than the students' own commitment but then how can you separate the two completely? Certainly Singapore, for example, has a particular culture that affects teachers and students and leads to high achievement in mathematics. There is, of course, an entirely different question about the purpose of education and whether or not a narrow focus on STEM is desirable but certainly there are differences between cultures.



[Paul Curran](#)

1:30pm 14 February 2017 [Permalink](#)

A2: As discussed on Twitter I have a habit of falling into jargon-speak. I'm using 'discrete' in the sense of being separate and distinct. So the ability to solve a quadratic equation is a distinct (discrete) skill and so is every individual mathematical process but a numerate person is one who can use the appropriate skills in the appropriate context.



[Paul Curran](#)

1:32pm 14 February 2017 [Permalink](#)

A3: Thanks, I found the process quite beneficial and my initial concept changed quite a bit through reading and engaging with other ideas.



[Paul Curran](#)

1:32pm 14 February 2017 [Permalink](#)

A4: As I came around to mentioning it's still at concept phase. :-)



[Paul Curran](#)

1:35pm 14 February 2017 [Permalink](#)

A5: That's a very valid point and I've also noticed a bias towards sport as the source of real life scenarios, which might appeal to some learners but not all. I think perhaps a well-intentioned effort was made at some point to reach out to a certain cohort and this has come at the expense of others.



[Paul Curran](#)

1:37pm 14 February 2017 [Permalink](#)

A6: Yes the Lee and Tan paper was quite central to my work. I'm hoping to incorporate some aspect of relating to the concrete in the finished project. In particular using digital media as an example from the world around us.



[Paul Curran](#)

1:39pm 14 February 2017 [Permalink](#)

A7: It's not quite at the stage where I will be sharing it widely but I plan on making it available to a wide audience



[Paul Curran](#)

1:40pm 14 February 2017 [Permalink](#)

A8: As I mentioned I haven't yet planned for authentic activities. It is something I might consider.



[Paul Curran](#)

1:40pm 14 February 2017 [Permalink](#)

A9: It won't cover assessment but it will contain the ability to test one's self on a given topic



[Paul Curran](#)

1:41pm 14 February 2017 [Permalink](#)

Thanks for all of the feedback/ questions. I quite enjoyed last night.

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