Case Study: Utilising Learning Journals in Mathematics Assessment

Context where the assessment was used

The ‘WIT Certificate in Foundation Studies,’ accredited by the Further Education and Training Awards Council (FETAC) and Waterford Institute of Technology (WIT) targets adult learners intending to progress onto third level education. The assessment methodology outlined here relates to the ‘Business Mathematics’ and ‘Technology Mathematics’ modules. Their objective: enable the learner to undertake any full-time Business or Science/Engineering course at WIT. Achieving this requires varying levels of mathematics, however the overall level approximates FETAC level 5/Leaving Cert (NQAI level 5). Some areas are necessarily covered deeper than others so that levels approach that of first year mathematics.

Assessment is by means of formative and summative examinations; a 50/50 weighting of continuous assessment/final examination exists, providing an overall final mark.

Learning outcomes being assessed

The course document, written some years ago, prior to contemporary learning expertise, states the learning outcomes of the overall programme as follows:

At the end of the course, participants will have:

- Been given opportunities to diagnose their own education and training needs in relation to the educational and vocational opportunities presented by society;
- Acquired a set of transferable core skills which will prepare them to access further education and training opportunities;
- Acquired a set of subject skills, which will prepare them for entry into Year 1 of a full-time college course

[Foundation Course Document; p3]

The Learning Journal assessed so-called ‘softer’ or transferable skills more than ‘harder’ skills; in other words, learning was assessed by the learner in the form of a dialogue between learner and tutor as opposed to say, simply assessing mathematical ability or competency in a written examination. Enabling learners to transform their typically didactic expectation of learning to a more self-directed type is a major aim of the programme. The journal facilitated learners and tutor in this regard. A primary goal was to assist learners to engage with members of their study groups and myself as tutor; in other words, they were to become interdependent learners. This goal was expressed as an overall programme aim, however, the course document was
unspecific in terms of how this goal was to have been achieved, and the use of Learning Journals for mathematics was never expressed or implied.

Utilising Learning Journals against this backdrop placed me in somewhat uncharted territory in terms of my own pedagogy and assessment methodology. To begin with, I framed the Journal learning outcomes conscious of the primary goal above, stating that by the end of the module, the learner should be able to:

- Gauge learning progress and engagement with the subject;
- Evaluate personal strengths/weaknesses as an adult learner of mathematics;
- Evaluate remedial actions that might be necessary;
- Dialogue freely and openly with their tutor.

**Assessment procedures/details**

The module assessments include assessment of the Learning Journal, break down as follows:

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<tr>
<th>Table of Assessments</th>
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<tr>
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<tr>
<td>Continuous Assessment (making up 100%)</td>
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<tr>
<td>Mid-term Assessment - 10%</td>
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<tr>
<td>Written Assignment #1 - 10%</td>
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<td>Written Assignment #2 - 10%</td>
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<td>Christmas Assignment - 20%</td>
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<td>PowerPoint Assignment - 20%</td>
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<td>Learning Journal - 30%</td>
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The Journal was utilised by the learners, both in and out of the classroom. Typically, learners made entries after each of our three one-hour sessions in the week; some journalled more often, some less, but each was encouraged to journal on a weekly basis at least.

I attempted to assist the learners who were not familiar and/or comfortable reflecting by simplifying the process as much as possible (i.e.):

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<tr>
<td>What?</td>
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<td>So What?</td>
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<td>Now What?</td>
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The learners were further provided with guidance on how to reflect and on the assessment itself i.e.:

**What will be assessed?**

1. *How your learning and engagement with the subject matter is progressing.*
2. *Your identification of your strengths and weaknesses as an adult learner and as a student of mathematics.*
3. *Your identification of any remedial actions that need to be considered.*
4. *Noting improvements where you have taken action(s).*
5. *Your engagement with the dialogue afforded by the Learning Journal*

As a percentage of the learners' continuous assessment, the Journal was worth 30%. I provided each learner with formative submission milestones throughout the year and a final summative deadline towards the completion of the academic year. The Journal was assessed across four categories, each comprising 25% of the overall marks. The categories, based upon the bullet points above, were:

- Quality of reflection-in-action [encompassing points 1, 5];
- Quality of reflection-on-action [encompassing points 2, 3, 4];
- Frequency of reflections [encompassing point 5];
- Overall presentation of reflections.

From the many journals read over the last two years, I've noted just some of the benefits of such an enterprise and have quoted portions for explanation/illustration. Student entries are in italics.

**Confidence building:** a major goal of the project from the outset. Examples of quotes from various students: “I'm helping out in my local homework club and I'm breaking the maths down so a kid can get it – I'm loving it! Before this course I'd never have bothered because I didn't think I could do it but now I know I can and if I don't do it I'll always regret not trying.”

Another wrote: “We did formulae today again. I had a very good ‘maths day’; I got the sums right and more importantly I understand what I was doing. I asked the right questions and understood the answers. It feels very good when you actually know what you're doing…”

Another student wrote: “Since the day I left school I never envisaged myself being confident about maths. I did Leaving Certificate maths twice and got an F-grade both times. That ‘F’ has represented ‘FEAR’ to me and maths for the past 20 years. In the last 8 months ‘We’ [student and tutor] managed to change it to ‘FEARLESS!’ This student was later to get an overall result of 89% in maths.

In a unique class that I remember vividly, the same somewhat timid lady who had struggled hard with mathematics for years derived a new and improved method of working out a
solution. Here’s her entry from that occasion: “Michael said today I got the ‘x-factor’; didn’t quite know what he meant by that but later at the tutorial I accidentally! made known a simpler way to do the sum. Quite honestly it was the first day the statistics made sense to me and I just saw what Michael had explained moments before in the sum. Sometimes it’s so easy to miss that which is most obvious – happens to me all the time! It’s really given me a boost so it seems having the ‘x-factor’ means using logic in a unique way…”

Another wrote, looking back over the year: “(I’m really glad I kept the journal now because reading through it not only helped me relive the highs and lows, but has also helped me to see the growth that’s taken place in me.”

Health and attitude check-up: one student wrote: “I’ve been thinking over the stuff I discussed yesterday and I am realising that it’s ok for me to feel the way I do. It’s the realities of my life that are staring me in the face and the amount of time I can give to the course is limited. I’m going to take stock of my time management again! It’s all gone out the window with me over the past few weeks. Looking forward to the break next week, take a bit of time out to make some realistic decisions.”

Another student stated: “Not really making head or tail of the maths today, but have felt like this before and I know that ‘this feeling too shall pass’, if I hang in there. Michael’s going to give me extra help on Monday so… hopefully.”

Earlier in the year the same student wrote: “…sometimes how I’m looking at a situation has a huge effect on the outcome. If I sit in class thinking ‘I can’t get this – I can’t understand’, chances are I won’t. Whereas if I think I’m here to learn – I’m listening up in class, I am attempting to understand, then eventually I will.”

Dealing with exams and anxiety: “Feel pretty good about the test even though I missed all the classes in the week before.” Another wrote after her mid-term result: “Words cannot describe – I got 74% in my test. I nearly knocked Michael over with the hug I gave him. I really didn’t think I’d do that well, I’m so thrilled - the kids and my mother were at home when I walked in with my results – think everyone in [my] Street knows!”

One veteran of a previous exam wrote: “I did worry that my mind would go blank and I wouldn’t know how to do any of the sums as I’d been out last week, but I remained calm and I didn’t have a headache this time.” This last entry is also an example of the open nature of the learner-tutor dialogue that is afforded by the learning journal.

Assessment of own needs including learning blocks and hang-ups: A student who had negative experiences of institutional education wrote: “…I can’t believe how upset I’ve been over maths. I’ve been taking a deeper look at why it is I’m so upset about the maths – it definitely relates back to my time in school and the beliefs I developed in myself about me and maths.” Earlier the same student had written: “I feel more inadequate than ever towards maths after today’s test. I know these feelings of incapability are deep-rooted. I used to think the fact that I was inattentive in class whilst in school was the reason I didn’t do well at maths but I’ve been at every maths class and tutorial bar one and I feel more inadequate and confused than ever… and that’s leaking into other areas of the course for me. I said in a few entries ago that ‘I couldn’t hurt’ to do the test but by golly it did.”

Collaboration and interdependent learning: Having the learners cooperate and work together in groups is something that is almost entirely dependent on the learners themselves. One student who had a pleasant surprise wrote: “…what surprised me was that I had to explain Permutations & Combinations to S [male student, quite competent at maths]. I couldn’t believe it! What surprised me even more was that when I explained it – he got it!” This female student had been intimidated somewhat by her male colleague, but through collaboration with him on this occasion and others she developed confidence and utilised his experience and knowledge to help her with a presentation on maths later on in the year.

Another group of students, who collaborated in the same study group, wrote the following entries (individuals’ names are shown as initials):

“Didn’t have a clue today. Totally lost the plot. Couldn’t understand a thing. Personally having a bad day, so it was probably more that than the lesson. I pulled myself together though and a few of us stayed behind after class and things started to make sense.”

“Today was a bit of an ‘Eureka day’ for me. I understood the maths and managed to keep up. Stayed behind with a few people (no tutorial). After B explained one part to me, I got it all and I was then able to explain it to P. I found that by explaining it to him I understood even more myself. A very good day.”

“Had it, lost it and found it again after class with some of the others! Stayed for tutorial and found that great. B and H are very good. They take time to help and explain. What I did know I tried to explain to S and M.”

“We went back over formulae today. I was very positive and concentrated well. The hour is just not long enough. A few of us stayed back. H and I did a sum. B already had it done and Michael said it was right. So we asked B to check ours. We both had it wrong. So B (God bless her) did it on the board for us. We’d be lost without that girl. She is so helpful and ready to share her knowledge. She went through it all step-by-step and I think I really understand it now.”
### List of strengths/limitations

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<th>Strengths</th>
<th>Weaknesses</th>
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<tr>
<td>Assessment of students' own needs</td>
<td>Time consuming</td>
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<tr>
<td>Confidence building</td>
<td>Student opposition</td>
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<td>Gradual awareness</td>
<td>Superficiality</td>
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<td>Evaluation of own progress</td>
<td>Tutor's own prejudices</td>
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<td>Change in attitude (+ve)</td>
<td>Not for everyone</td>
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<tr>
<td>Self-directed learning</td>
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<td>Making mistakes is ‘ok’</td>
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These are expanded on below with students' quotations in italics:

**Strengths:**

1. **Assessment of own needs:** Exam techniques and learning strategies identified; some trial and error methodologies apparent; some learners quoted this stage ‘…sussing out…’. Some moved position in class, separating from a group to form with another.

2. **Confidence building:** assertiveness – unintimidated; transformation from fearful to tentative, from timidity to assertiveness; conscious and open questioning.

3. **Gradual awareness:** contrast re: adult learning in third level versus child in school. The latter being the predominant experience of the group.

4. **Monitoring and evaluation:** of own progress and remedial attention. Included learner-tutor dialogue; coping strategies for academic and personal/private areas of students’ lives – ‘…getting a balance’.

5. **Change in attitude:** identified from early negative outlook to positive later viewpoint. Some identification as ‘life-long’ learners; value of experience ‘…carried forward’ with progression.

6. **Self-directed learning:** requesting further information and exercises. Actively seeking learning opportunities other than in classroom. Early formation/ramp-up of study groups. Four-fifths of student group attached to one or more study groups. Didactic approach rejected for enquiry-based learning environment.

7. **Making and admitting to making mistakes:** accepting mistakes as learning opportunities; engagement with trial and error - experimentation. Permission given to themselves to make mistakes; not perceived any longer as ‘stupidity’ to them: evidence of paradigm shift amongst this cohort with ‘…maths to ‘blame’…’. Most cited their reasons for this as being their exposure to transposition of formulae, affectionately known to them as ‘…solve for ‘x’ and prove’.

**Limitations:**

1. Feedback to all students time consuming. Combated by engaging with a dozen Learning Journals per week - advantage of allowing me be more attentive and thoughtful. Time consuming for some students also.

2. Student opposition to journaling is not to be underestimated. Some vehemently dislike it for any number of reasons. The most common include: unwillingness to engage because of upsetting past memories, and unwillingness to change.

3. Superficiality: I wonder sometimes if learners journal what they think I expect rather than what they feel. There is a limit to the depth of tutor engagement with learners demonstrating such superficiality. This is a big limiting factor.

4. Tutor’s own prejudices: I offer the opinion, that a tutor not comfortable journaling, will find such an exercise off-putting, disconcerting and downright uncomfortable.

5. The Journal is limited to what it can assess. It is not a panacea; on the contrary it can cause as many problems as it cures. However, in my experience it is a worthwhile method of engaging students in diagnosing (assessing) their own learning needs. This is a huge help to me as tutor, meaning I do not need to examine learners ‘on day one’, thereby fulfilling their worst fears of being exposed as stupid or worthless (as some actually believe).

**Contributor’s reflections on the assessment**

I attempted to assess maths levels and ability early in the programme as historically, [mathematically] weaker students disengaged and I believed early intervention would mean better prognosis. A traditional means of assessment i.e. examination is not effective in preventing learners disengaging. Therefore, a means of self-assessment, in the form of the Learning Journal, was devised. Although the term ‘self-assessment’ is used throughout this case study, the term applies to the learners’ assessment of own learning needs with respect to mathematics. Ultimately, the execution of the Learning Journal constituted 30% of overall results. (See the Table of Assessment for details)

One of my goals in this experiment was to help adult learners become more self-directed and assertive, especially in seeking and requesting assistance from the most appropriate source(s), once needs were assessed. I desired an outcome whereby the learner would emerge from the reflexivity process, having gained insights into their own learning preference(s) and needs. The students gained an insight into their own learning style(s), and how they internalised learning i.e. they developed discernment.
By participation in this experiment, the learners gradually learned to learn in a manner that was unique to them.

From an administrative perspective, the amount of commitment on my behalf was huge: weekly readings of Learning Journals took much time and effort. I managed this because I kept in mind: firstly, to watch for the learner who diaried his struggles with the subject – I engaged in dialogue with this type of learner frequently; secondly, I selected several Journals from the main group and engaged with them. Thus, on any given week, I engaged with a dozen or so of the learners – thereby allowing much deeper engagement.

The Learning Journal has become an integral part of my pedagogy repertoire. Weaker students are helped and assisted earlier, thereby increasing chances of retention and completion; their dream becomes achievable.

The continuity of the Learning Journal is encouraging for the future. Prior to the collation of data for this case study, I observed attitudinal and behavioural changes in the group that, anecdotally, I attributed to the Learning Journal (subsequently validated). These manifested as: increased questioning of material, greater diligence in problem solving, improving interpersonal collaboration, and prioritising and addressing own needs. This latter phenomenon caused much soul-searching, exposed in journaling as false humility in some - guilty that they could take time for their own needs, exclusively however, a female trait remarkable amongst those with a partner/ex-partner and family and/or other commitments.

Assertiveness to ask questions is paramount for third level, therefore there existed within the Learning Journal an open learner-tutor dialogue. Noticeably, increased personal development paralleled their growing assertiveness. Moreover, tutor reliance diminished with self-directedness.

The learner-tutor dialogue explored learning issues: some reflected deeper than others, providing personal learning insights; others accepted the ‘necessary evil’ status of mathematics in humorously philosophical accounts. Under- or over-estimations of maths ability was recognised and dealt with.

In conclusion, most learners adjusted attitudes; some developed personal learning strategies over time, illustrating one benefit of mathematics Learning Journal. Moreover, the journal was the student’s space; they were relatively secure controlling the environment. They perceived learner-tutor equality, perhaps not perceived within the classroom context. Learner-tutor dialogue occurred semi-informally; students could ‘safely’ question their perceptions, attitudes, presuppositions, even prejudices. Their vulnerability and exposure were minimised through an indirect relationship.

My findings were presented to and validated by the learner groups.

References