Re-imagining our curriculum
Consolidating the First Year Experience

Prototype Project Updates:

January 2016

General Details

Project Title	**Learner Profiler**
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Date	01/06/2016

TU4D Theme (Please tick)

☐ **Induction/early orientation**   ☑ **First 5,6 or 7 weeks;**
☐ **Peer mentoring**   ☐ **Assessment and feedback;**
☐ **Graduate Attributes**   ☐ **Students/ autonomous self-directed learners,**
☐ **Learning spaces – virtual & physical**   ☐ **Alternative Curriculum models**

Summary of Prototype project (max 200 words)	The ultimate goal of this project is the development of an online, personalised portal to help first year students navigate their **transition** into tertiary education, particularly in the early weeks of semester 1. The objective is two fold:
	• Promote and support the development of effective learning dispositions in students, giving them valuable life skills while improving retention rates;
	• Help students navigate through our system of higher education via a personalised roadmap and recommendations on how succeed;
	A first step is already done – www.howilearn.ie is an online learner-profiling tool administered during first year student induction at ITB. The tool was developed as a collaborative project between ITB and NLN.[1] It provides feedback and explanations to students on their learning profile.
	This proposal represents the next steps: its reports on malleable factors indicative of academic performance in first year of study; reviews research at ITB into models predictive of at-risk students; reviews other publications on affecting change in malleable learning dispositions; and reports on both a student and staff survey at ITB giving feedback on learner profiling.
Project dates	Nov 1st 2015 to Jan 28th 2016t

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[1] The National Learning Network Assessment Service provides functional strategies and support for children, adolescents and adults with specific learning difficulties. They are located on campus at ITB (www.nln.ie).

Main proposed original project outputs for the TU4D (max 100 words)	1. Evaluation of our existing learner profiler; 2. Review possible interventions that encourage effective learner dispositions, with specific focus on strategies successfully deployed in other 3rd level institutions; See appended report for further details.
Project outputs including any evaluation data (max 300 words, data to be included in an appendix but can be summarised here)	1. *Induction/orientation: Feedback on learner profiling during first year induction* 2. *First 5,6 or 7 weeks; review of interventions to affect change in meallable, effective, learning dispositions* See appended report for further details
Lessons Learned (max 200 words)	Evidence from both research at ITB and elsewhere indicate measureable factors can predict students at risk of failing early in the academic year. Some of these factors are malleable, specifically factors relating to motivation, self-regulation and learning approach. While many publications discuss teaching approaches aimed an improving student motivation, self-regulation and learning approach, quantitative results showing the impact of such interventions on effective learning disposition, and so retention and progression, is harder to find. Response from a survey of academic staff and students at ITB suggest an interest amongst staff and students in improving learning disposition. Further work is required to research the best approach to achieve this.
Next stage(max (max 200 words)	The next stage is to undertake a larger body of research to evaluate interventions and their effect on both malleable learning dispositions and academic performance in first year of study.
	At this point, I don't believe a short-term project can achieve the required objectives.

A review of malleable, effective, learning dispositions for tertiary education

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1. Introduction

Factors impacting on academic performance have been the focus of research for many years, and still remains an active research topic (Buckingham Shum & Deakin Crick, 2012; Gray, 2015; Jayaprakash et al., 2014; Komarraju & Nadler, 2013) indicating the inherent difficulty in both measurement of learning (Knight et al., 2013; Tempelaar et al., 2013), and modelling learning process, particularly in tertiary education (Pardos et al., 2011).

Cognitive ability remains an important determinant of academic performance (Cassidy, 2011), often inferenced from prior academic achievement. Age has also been cited as significant in tertiary education (Naderi et al., 2009), as are data gathered from learner activity on online learning systems (Bayer et al., 2012; López et al., 2012). In addition, some non-cognitive factors of learning are indicative of potential academic performance in first year of study. For example, models predicting academic performance that include factors of motivation (e.g. self-efficacy, goal setting) with cognitive ability yield a lower error variance than models of cognitive ability alone (Robbins et al., 2004). Research into personality traits, specifically the Big Five factors of openness, conscientiousness, extroversion, agreeableness and neuroticism, suggests some personality factors are also indicative of potential academic performance (Chamorro-Premuzic & Furnham, 2004; Chamorro-Premuzic & Furnham, 2008; De Feyter et al., 2012). Learning approach (deep or shallow) and self-regulated learning strategies are also relevant, and have been shown to mediate between other factors (such as factors of personality and factors of motivation) and academic performance (Entwhistle, 2005; Swanberg & Martinsen, 2010).

Early modelling of students at risk of failing informs provisioning of supports and modifications to learning environment, to enable more students perform optimally (Lauria et al., 2013). Colby (2004) identified week two as a critical point in identifying at-risk students. Milne et al. (2012) reported successful results in predicting students at risk of failing based on analysis of online behaviour in week one. Gray (2015) found data gathered during first year induction at Institute of Technology Blanchardstown could identify students at risk of failing (accuracy=72%, n=1207). Of interest in this literary review is, once factors indicative of a poor academic performance have been identified, how can that inform interventions to support students at risk of failing in first year of study. Of particular interest are malleable, effective learning dispositions; specifically factors relating motivation, self-regulation and learning approach. Section 2 reviews reported correlations between motivation and academic performance in tertiary education; Section 3 reports on a similar review of factors relating to learning approach and self-regulation. Section 4 reports on a study in ITB that evaluated factors predictive of students at risk of

failing in first year of study, and section 5 discusses affecting changing in malleable learning dispositions. Finally, section 6 details survey results from both student and academic staff at ITB that assessed the level of interest in learner profiling. Concluding remarks are given in Section 7.

2. FACTORS OF MOTIVATION THAT ARE PREDICTIVE OF ACADEMIC PERFORMANCE

Ryan & Deci (2000) define motivation as being "*moved to do something*". Defining how learners are motivated to learn is more complex, and is characterised by a range of complementary theories which aim to explain both the level of individual motivation and the nature of the motivation (Steel & Konig, 2006). Current theories of motivation encompass a number of factors, some of which are relevant to academic performance. The following sections discuss two such theories, relating to expectancy and goals.

2.1 Expectancy motivation and correlation with academic performance

Expectancy models of motivation explore the extent to which a person regards outcome as being a consequence of behaviour. Levels of expectancy motivation are influenced by the extent to which a person believes they are in control of the outcome (Cassidy, 2011). There are two strands of expectancy motivation (Eccles & Wigfield, 2002; Pintrich & DeGroot, 1990):

- *Outcome expectation* refers to a belief that a particular behaviour will lead to a particular outcome, e.g. active engagement in class work results in better grades.
- *Self-efficacy* refers to a person's belief that they can achieve that outcome e.g. I can actively engage in class and so I can achieve better grades. High self-efficacy is associated with setting more challenging goals, a willingness to work hard, and persistence with a task.

A number of studies found self-efficacy specifically to be a useful predictor of academic performance in tertiary education (Brady-Amoon & Fuertes, 2011; Cassidy, 2011; Yusuf, 2011, Gray 2015). Correlation results from a selection of studies are summarised in Table 1. Indirect relationships between self-efficacy and academic performance mediated by either other motivational factors or learning strategies are also cited (Brown et al., 2010; Yusuf, 2011). In addition, self-efficacy is associated with an effective learning disposition (Buckingham Shum & Deakin Crick, 2012; Deakin Crick & Goldspink, 2014), is malleable, and can be fostered through positive encouragement to persist with a task that is challenging but achievable (Bandura, 2009).

2.2 Achievement goals and correlation with academic performance

Achievement goals fall into two categories: learning (intrinsic) goals where an individual is looking to increase their competency, and performance (extrinsic) goals where an individual is looking for favourable feedback (Covington, 2000; Dweck, 1986; Eccles & Wigfield, 2002; Eppler & Harju, 1997). Learning goals are motivated by the desire to increase existing competencies and master new skills and, therefore, tend to be more challenging in nature and result in active engagement in the learning process (Covington, 2000). Learning goals are

associated with high self-efficacy, a belief that ability is dynamic, and a belief that increased effort will result in increased success (outcome expectancy). This is regarded as an important learning disposition (Buckingham Shum & Deakin Crick, 2012). Performance oriented goals are associated with a tendency to engage in tasks in which a student is guaranteed to excel, and avoid tasks that may highlight incompetence (Dweck, 1986). This approach can inhibit a student from challenging and enhancing existing competencies. It is also associated with superficial cognitive processing and inefficient use of study time (Covington, 2000).

Studies have found learning goals to be more strongly correlated with academic performance than performance goals (see Table 1). Eppler & Harju (1997) found a statistically significant difference in the average GPA of students with high learning goals (some of whom also had high performance goals) and those with both low learning goals and low performance goals. They also found older students to be stronger in their endorsement of learning goals, while younger students in tertiary education tended towards performance oriented goals.

3. LEARNING STRATEGIES THAT ARE PREDICTIVE OF ACADEMIC PERFORMANCE

A number of studies found the relationship between academic performance and motivation is mediated by a student's approach to the learning task itself. Important factors include learning approach (e.g. Bruinsma, 2004; Chamorro-Premuzic & Furnham, 2008; Diseth, 2011) and self-regulation (e.g. Nasiriyan et al., 2011; Ning & Downing, 2010). The following sections discuss both learning approach and self-regulation.

3.1 Learning approach and correlation with academic performance

Learning approach has its foundations in the work of Marton & Säljö (2005) who classified learners as shallow or deep. Deep learners aim to understand content, while shallow learners aim to memorise content regardless of their level of understanding. Later studies added strategic learners (Entwhistle, 2005, p. 19), whose priority is to do well, and will adopt either a shallow or deep learning approach depending on the requisites for academic success. Intrinsic motivation is associated with a deep learning approach, while extrinsic motivation is associated with a shallow learning approach (Busato et al., 1999; Duff et al., 2004; Marton & Säljö, 2005).

There are some inconsistencies regarding which learning approach has highest correlation with academic achievement; some studies found correlations are higher for a deep learning approach (e.g. Chamorro-Premuzic & Furnham, 2008; Gray 2015, Snelgrove, 2004), while others cite marginally higher correlations with a strategic learning approach (e.g. Cassidy, 2011; Duff et al., 2004). However, Gray (2015) reported a negative correction between a strategic learning approach and academic performance when students were forced to choose just one learning approach; this contrasted with results from other studies that used separate scales for each learning approach. Many studies concur with a negative correlation between a shallow learning approach and academic performance (see summary in Table 1). A lack of correlation

between a deep learning approach and academic performance is in itself an insightful result, as it suggests an assessment design that fails to reward an important, malleable learning disposition (Buckingham Shum & Deakin Crick, 2012; Knight et al., 2013).

3.2 Self-regulation and correlation with academic performance

Self-regulated learners take responsibility for setting and achieving their own learning goals (Covington, 2000). This is done by planning their learning, having effective time management, using appropriate learning strategies, persisting with tasks considered boring or difficult (effort regulation), continually monitoring and evaluating the quality of their own learning (metacognitive self-regulation) and altering their learning strategies when required (Schunk, 2005; Zimmerman, 1990). Such learners regard learning as a process that they can control, but their motivation factors can vary (Pintrich & DeGroot, 1990). To be motivated to self-regulate, a student must be confident that they are able to set goals and organise their study, and in addition be confident that the effort they spend on studying will result in good marks (high self-efficacy). Volet (1996) argues that self-regulated learning is more significant in tertiary level than earlier levels of education because of the shift from a teacher-controlled environment to expected self-management of the learners own study. Furthermore, Lucieer et al. (2015) contended that encouragement of self-regulation strategies is important for life-long learning.

A number of studies cite significant correlations between academic performance and factors of self-regulation, see Table 1 for a summary. For example, a longitudinal study of first year students (n=581) found self-test strategies (r=0.48, p<0.001) and monitoring strategies (r=0.42, p<0.001) were more

Table 1. Correlations with Academic Performance in Tertiary Education

Study	N	age	AP	Motivation			Learning Approach			Self-Regulation		
				Self-efficacy	Intrinsic	Extrinsic	Deep	Shallow	Strategic	MC Self-regulation	Study Time	Study Effort
Bidjerano & Dai, 2007	217	m=22.0	GPA								0.23**	0.33**
Cassidy, 2011	97	m=23.5	GPA	0.40***			0.31**	-0.01	0.32**			
Chamorro-Premuzic & Furnham, 2008;	158	[18,21]	GPA				0.33*	-0.15	0.18*			
Dollinger et al., 2008[+]	338	m=21.9	exam		0.21**						0.21**	
Duff et al., 2004	146	[17,52]	GPA				0.10	-0.05	0.15			
Eppler & Harju, 1997	212	m=19.2	GPA		0.30***	0.13						
Eppler & Harju, 1997	50	m=29.8	GPA		0.28*	0.08						
Gray, 2015	1207	m=23.3	GPA	0.12***	0.15***	0.12***	0.23***	-0.15***	-0.16***	0.13***	0.19***	0.10***
Kappe & van der Flier, 2010	133	[18,22]	GPA									
Komarraju et al., 2011	308	[18,24]	GPA									
Komarraju & Nadler, 2013	257	m=20.5	GPA	0.30**						0.14*	0.31**	0.39**
Ning & Downing, 2010	581	m=20.5	GPA							0.42**		0.24**
Robbins et al., 2004[+]		meta analysis, 18+	GPA	0.50		0.18						
Swanberg & Martinsen, 2010	687	m=24.5	exam				0.16	-0.25				

*p<0.05; **p<0.01; ***p<0.001; +: studies cited achievement goals in general rather than intrinsic or extrinsic gaols specifically;
AP: Academic Performance; MC: meta-cognitive

strongly correlated with academic performance than time & effort management (r=0.24, p<0.01) (Ning & Downing, 2010). However, Komarraju & Nadler (2013) found effort management (r=0.39, p<0.01) had higher correlation with academic performance than other measures of self-regulation and found that self-regulation (monitoring and evaluating learning) did not account for any additional variance in academic performance over and above self-efficacy, but study effort and study time did account for additional variance. Interestingly, Gray (2015) reported that while there were significant correlations between factors and self-regulation and academic performance, self-regulation was not significant in classification models distinguishing at-risk students from other student cohorts.

4. MEALLABLE FACTORS OF LEARNING THAT ARE PREDICTIVE OF STUDENTS AT RISK OF FAILLING

A three-year study completed at Institute of Technology investigated a range of both cognitive and non-cognitive factors of learning. The objective of the study was to build models of learning predictive of students at risk of failing based on factors that can be measured before or during first year induction (Gray 2015). Resulting models of learning predicted first year students at risk of failing with an accuracy of 72% when applied to a new student cohort. The dataset was diverse in terms of age, academic discipline and assessment strategies used (n=1,207). Informed by a review of factors predictive of academic performance in tertiary education, study factors related to prior academic performance, personality, motivation, learning strategies, learner modality, age and gender. The twenty-four study factors used were measured prior to or during first year student enrolment.

Attributes that were significant in accurate prediction of students at risk of failing across a range of courses included:
- Age. The study sample had an age range of [18,60]. Younger students had a greater risk of failing in first year of study.
- Aggregates of prior academic performance. In particular, an aggregate of mathematics, science and business related subjects was found to be a stronger predictor of year 1 students at risk of failing compared to other prior academic performance aggregates.
- Factors of motivation, particularly self-efficacy and intrinsic goal orientation.
- Learning approach. A shallow or a strategic learning approach was indicative of students at risk of failing.
- Openness, indicating a creative, inquisitive temperament, was indicative of a passing grade.
- A kinaesthetic modality (preference for learn by doing) was indicative of students at risk of failing.

It was found that self-regulation factors were not significant once learning goals and approaches to learning were considered. In addition, respective correlations between study factors and GPA were not indicative of factors significant in classification models of students at risk of failing. For example, kinaesthetic learner modality was significant in a number of classification models but had poor correlation with GPA.

The primary value of non-cognitive factors of learning in this study was to distinguish the learning profile of students at risk of failing from the learning profile of students that passed, rather than provide improvement in model predictive accuracy. It has been argued that non-cognitive factors of motivation, self-regulation and approaches to learning are malleable, and key to an effective learning disposition, which in turn should be a valued learning outcome of courses in tertiary education. Further work is needed to evaluate subsequent benefits of learner profiling during student induction, both for the student, and for first year mentoring and support programmes.

5. AFFECTING CHANGE IN MEALLABLE, EFFECTIVE, LEARNING DISPOSITIONS

While studies investigation the relationships between factors of learning and academic performance are numerous, studies investigating interventions that affect malleable learning dispositions, particularly in tertiary education, are not as numerous. The following sections discuss some of these studies.

5.1 Improving motivation (self-efficacy and goal setting)

According to Asford et al. (2010), evidence concerning which are the most effective techniques for changing self-efficacy is lacking. Working with children, Schunk (2003) found three in-classroom activities improved self-efficacy, namely: requiring students to set short-term, specific goals that were considered moderately difficult but achievable; providing good, progress feedback on goals set; and requiring students to self-evaluate their own capabilities and progress. This concurs with Steyn and Mynhardt (2008) who reported that perceptions of self-efficacy are more profoundly influenced by self-referenced information than by social comparisons. Interestingly, Miller-Reilly (2006) found a positive, supportive teaching approach improved mathematical scores for tertiary students who already had good self-efficacy, but reduced the self-efficacy of weaker students. However one-to-one tuition significantly improved self-efficacy for a struggling student.

5.2 Improving learning strategies

Progress feedback also has a role in improving self-regulation strategies. Effective self–regulation is dependent on identifying achievable goals that can assessed (Nicol et al, 2006). As with self-efficacy, Nicol et al (2006) found that feedback is important in facilitating students regulate their performance, provided student understood feedback given. Nicol et al (2006) agreed with Schunk (2003) that feedback can information self-efficacy, but also reported that self-efficacy impacts on how feedback is interpreted. Therefore feedback both regulates, and is regulated by, motivational beliefs, which in turn influences the effectiveness of self-regulation strategies.

Volet (1996) also found that goal setting influences self-regulation, which in turn influences learning approach adopted. Many studies report a student centered teaching approach is more likely to promote a deep learning approach than content centered teaching (Entwhistle, 2000). In addition, as with other

malleable learning dispositions, actionable feedback promotes a deep learning approach, as does improved motivation and self-regulation (Hacker, 2000).

6. INTEREST IN LEARNER PROFILING

Both academic staff and students in Institute of Technology Blanchardstown were invited to give feedback on both their interest in student learner profiling, and how useful they thought this information would be. All academic staff were asked to complete a questionnaire; all first year students that completed learner profiling in September 2015 were also invited to complete a questionnaire. To date, 21 staff have responded, and 55 first years students have responded.

Staff were asked how useful it would be to know the learning profile of their class group. Eight factors of learning were rated using a 3-point likert scale of: *not interesting*; *interesting but I'm not sure how to use it*; *I would find this information useful*. The eight factors were: learner modalities (visual, auditory, kinaesthetic); self-efficacy; goal orientation (intrinsic / extrinsic motivation); ability to self-regulate learning; learning approach (deep or shallow); conscientiousness; openness; and preference for group work. The results are summarised in Table 2. The predominant response for all factors was '*I would find this information useful*'. The factors staff would find most useful to know were preference for group work; followed by openness, ability to self-regulate, and goal orientation. 55% of staff that responded were teaching first year students.

Table 2. Staff responses

Factors	I would find this information useful	This could be interesting, but I'm not sure how I would use it	Not of interest
Learner modalities: the percentage of students that express a preference for visual (text and images), auditory (listen and talk) and/or kinaesthetic (learn by doing) learner modalities.	**71.43%** 15	**9.52%** 2	**19.05%** 4
Self-efficacy: the percentage of students who believe they can do well, if they try.	**66.67%** 14	**23.81%** 5	**9.52%** 2
The number of students in the class who are intrinsically (want to learning new skills) or extrinsically (want to get good results) motivated.	**76.19%** 16	**14.29%** 3	**9.52%** 2
The extent to which can students self regulate their learning, and have a study plan.	**76.19%** 16	**14.29%** 3	**9.52%** 2
The percentage of students with a deep (like to understand material) versus shallow (happy to just learn it off) learning approach.	**71.43%** 15	**23.81%** 5	**4.76%** 1
The personality dimension of conscientiousness (organisation / self-discipline / persistence).	**71.43%** 15	**23.81%** 5	**4.76%** 1
The personality dimension of openness (willingness to learn new things / open to a new perspective / creative).	**76.19%** 16	**19.05%** 4	**4.76%** 1
Preference for working alone or working in groups.	**85.71%** 18	**4.76%** 1	**9.52%** 2

A total of 82% of student respondents would like to know more about factors relevant to an effective learning disposition. A total of 33% couldn't remember much about the learner profiling during induction; of those who did remember it as being interesting, 55% said they had used the information since. This concurs with an earlier study at ITB that found 56% of students understood their learner profile based on online feedback; and this figure rose to 83% when learner profiling was followed by explanatory workshops (Duffin & Gray, 2009). Details are included in Table 3.

Table 3. Student responses

Answer Choices	Responses
I don't remember learner profiling	**3.64%** 2
I remember doing it, but I have forgotten the details	**34.55%** 19
I remember it, but I didn't find it interesting or useful	**5.45%** 3
I remember it, and found it interesting at the time, but I haven't used the information since	**40.00%** 22
It seemed interesting, but I would need to have it explained to me in more detail	**14.55%** 8
I remember it, and found it useful to know	**18.18%** 10

Concluding remarks

Evidence from both research at ITB and elsewhere indicate measureable factors can predict first year students at risk of failing early in the academic year. Some of these factors are malleable; specifically factors relating to motivation, self-regulation and learning approach. Many publications discuss teaching approaches aimed at improving student motivation, self-regulation and learning approach. However, quantitative results showing the impact of such interventions on effective learning disposition, and consequential improvements in retention and progression, is harder to find. Interestingly, Jayaprakash et al. (2014) found that simply making students aware that they may be at risk of failing significantly increased numbers passing and number of withdrawals, but providing further supports did not effect additional change in either measure.

Response from a survey of academic staff and students at ITB suggested an interest amongst staff and students in improving learning disposition. Further work is required to research the best approach to achieve this.

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