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The Difficulty of Transfer and Academic Engagement of Further Education Students when Progressing to Higher Education Environments

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Abstract

The difficulty of students transferring from Further Education Colleges and progressing to Higher Education Universities in the United Kingdom is a well-known problem. The study presented here focuses on the ability of students to begin to engage with the subject of computer programming on transferring after 2 years of study at a further education college into a 3rd year of a university programme. There is an assumption that there are environmental factors within the change that cause the problems of student engagement with their studies. The findings of this study concurs with difficulties for many students with beginning to engage with skills such as programming. However, the findings presented in this paper challenges the assumption that it is environmental factors within the university and proposes that the problem is not due to a difficulty of transfer from further education to Higher Education but that the problem pre-dates this transfer. The problem proposed from this study is that many students simply do not gain the skills their qualifications suggest while in Further Education. Subsequently, many students cannot begin to engage with skilled subject areas at University. It is proposed that the extent of the problem remains hidden and ultimately unsolvable due to a target-driven management system placing a focus on pass rates.

1. Introduction

After attending a further education college, and studying computing for 2 years, many student wish to continue their studies to degree level at university. Credit transfer allows them to gain direct entry to 3rd year if they have been successful in their studies and gained the necessary qualification of a Higher National Diploma from college.

For many of these students, computer programming is the most difficult subject undertaken during their studies and subsequently. Computer programming has been widely reported as a difficult subject that students perform less well in than other subjects (Jenkins 2002, Albison 2017). Many different proposals for improvement have been made such as: Innovative pedagogy approached (HEA, 2015); Web based technology (Anderson, P. (2007).); Efforts to improve motivation (Albinson, P. (2016).); Technology enhanced learning (Gordon, N. (2014)); Blended learning (Friesen, N. (2012).), and 'Flipped' classrooms (Brame, C. J. (ca. 2015).) However, there is no directly relatable research that answers the questions of the problem of transfer and computer programming skills engagement for students studying computer programming initially at a further education college for 2 years and subsequently at university for their 3rd year; this problem, and causal factors, are the focus of this study.

2. Methodology

A skills test of basic introductory level programming concepts was given to the 3rd year, direct entry (further education) students, in order to investigate their level of understanding of basic programming concepts and to ascertain the accuracy of the presumption, based on passing the Higher National Diploma (HND), that all students were fully ready, and capable of engagement with degree level modules. The test was administered during their first week of entry to university and consisted of basic programming concepts that may be presumed gained by all in their HND, and be pre-requisite knowledge for study and engagement at degree level. There was no time limit for the test given and it was conducted as a written closed book exam in normal class time. The basic programming syntax was made available in the reading section of the test paper so the students did not have to remember basic syntax.

The same test was repeated each year, over a 3-year period, and 3 student intakes. Within this period seventy-two direct entry students were not only tested but also subsequently interviewed.

3. Study Questions

This study sets out to investigate 2 basic questions:

- What misconceptions and problems with basic skills of programming would the students demonstrate?
- Why are direct entry Further Education students failing to fully engage with learning computer programming at university, and what are the underlying causal factors of such failure to engage?

4.   Findings

The students were given a series of questions based around being able to read code at an introductory programming concepts level including 'memory and assignment', and 'Selection, Sequence, and Iteration'. The students were asked what the outcome would be for values in memory after code statements and blocks of code statements had executed. The students demonstrated good understanding in the initial tasks of reading basic code and statement operations. For example, the students were asked the outcome selection statements and the values of the variable in memory before and after the statement executed; 75% (54) of the students were able to understand how selection statements worked and were able to correctly identify the operation affect. However, understanding Iteration and the values in memory once a loop had executed proved a little more difficult. Only 58% (42) of the students could correctly identify the change in values following the statement execution; 42% (30)of the students struggled with such tasks.   With more complex tasks only 25% (18) of the students demonstrated proficiency and were able to read and correctly identify the results of nested statements and were thus able to demonstrate understanding of the control flow of the more complex operations.

The students were also given some basic questions designed to confirm the basic levels of knowledge had been acquired in writing code. Asked to write program code to: *"prompt a user for a name and print the name to the screen 5 times"*, 58% (42) of the students were unable to write this code. This is a very basic code exercise that would be very simply for anyone with basic programming skills, this is the type of exercise that may be given to a first year student in the first week of learning to code. Moving on to more difficult exercises such as writing the code that would perform a 'swap' in memory only 34% (24) of the students were able to do

this task. With the more difficult tasks of writing functions that would involve parameter passing only 17% (12) were able to do such tasks proficiently.

It would have been expected that all students should have been able to do the exercises given in the test. The results demonstrated that approximately $1/6^{th}$ of the students were good programmers on entry to 3rd year, another 1/6th could write basic code. However, $2/3^{rd}$ of students had difficulty writing the most basic programming code and had problems reading all but the most basic code statements. The test demonstrated that approximately 66% of students would have difficulty engaging in third year modules that required pre-requisite programming ability. Similar results have now been observed over a number of years with similar tests results pointing to a saturation of such results. It can be reasonably concluded that students in this study have passed modules in Further Education without gaining the skills assumed and that would be suggested by the award of a Higher National Diploma gained after two years of successful study at college and needed for entry to University. It is further proposed that this is the reason that so many students have difficulty in beginning to engage with modules, not that there is an environmental problem evident in the transfer from further to higher education.

5.   Interview Analysis

The students were given feedback sessions on the results and this also gave the opportunity to conduct informal interviews on a one-to-one basis while their test results were discussed individually. Each interview session lasted between 5 and 15 minutes with the most problematic (test results) taking longest. From the interviews general themes emerged that were interpreted as a general pattern that seemed common among those that had struggled with the test:

- The initial problem was that students struggled to learn the difficult subject at college.
- Coping strategies emerged in order to pass assessments.
- Both lecturers and students were aware of widespread difficulty.

The students who had not done well, in general, knew that they had a pre-existing problem with gaining the programming skills while at college. The main conclusion from the interviews was that, for many, during the taught period the students interaction within the environment

remained passive and at a surface level; with initial and ongoing difficulty in engagement with the subject.

The general recurring themes reported by the students included the difficulty of understanding what was being presented within the taught situation and the difficulty of keeping up with what was being required. It was concluded that many of the students, in the learning situation remained cognitively passive. The lack of deep level domain engagement resulted in poor, surface level, engagement within the environment, with little immersed activity, or implicit knowledge construction. A problem subsequently occurred with the assessment work that the students were to complete. Many stated that they did not understand what they were doing, either during or after, and the required knowledge remained beyond their developmental and skill level. Many of the students seemed to assume that it was them and they 'just couldn't do it'. From the interviews it seemed that those students who had gained the knowledge wanted to continue to do the subject at an advanced level, however, the majority of students who had struggled professed a wish to now avoid the subject as much as possible.

It was reported frequently during the interviews that those who failed to initially develop knowledge subsequently adopted coping strategies for assessment in order to avoid failure. Without having gained the basic programming skills that would enable a deep approach to assessment engagement, the assessment tasks proved difficult. Stress grew with diminishing time and a fear of failure. It seemed in general that they had a lot of support and help from fellow students who had learned or otherwise got their programs working and who would help get their code to work for assessment purposes and thus became reliant on this help. Holistic environmental interaction, engagement, and subsequently deep learning, did not take place. Situated implicit knowledge was not being built; information not being processed into knowledge and transferable semantic knowledge not gained.

A conclusion was reached from the interviews with the students that both lecturers and students were fully aware that many were passing that had not gained the desired knowledge and that this was a common, indeed normal, occurrence. This raises an important question: Why are students passing when staff know the required knowledge is not being gained.

6. Literature Comparison

From a wider search of educational literature a conclusion may be reached that educational theories do not transfer to practice well and will not provide answers (Jonassen, 1992) to the problems of further education to higher education transfer. For example the much quoted

theory: 'Deep and surface learning' (Marton and Saljo, 1976), would be inappropriate in this skill-based case situation where surface learning does not lead to skill development and therefore the student who does not gain the skill should simply fail assessments; but does not.

It is proposed that there is not only an educational problem of teaching and learning a difficult subject but also another basic underlying problem we must consider: Why have students who are unable to begin to engage and have not gained the requires knowledge passing qualifications? Perhaps another question should be asked: Why were they allowed to pass? It would have been obvious to even the most demotivated member of staff when students in their class have not gained programming skills: and yet many pass! The problem here is that the actual educational problems of students failing to gain skills is being hidden within a system that passes students who have not gained the necessary initial skills for progression. The student then seems doomed to adopt coping strategies within the subject area from that point on and subsequently onto university level. It may therefore be advantageous to adopt a more pragmatic approach and look in an alternative theoretical direction. It is therefore proposed that it should be considered that this is not a problem within the learning environment, but a problem with the wider management of the learning environment.

A growing trend in education is the adoption of the New Public Management styled approach (NPM); a target-driven performance approach in which targets for performance are set and staff must reach the targets through improvement in performance and key performance indicators (KPI). Classes and modules are often given a target pass rate and staff subsequently pressured into achieving that pass rate by academic management. During the last 20 years or so this target-driven management approach has become increasingly influential and pervasive throughout the educational systems.

Two reasons may be identified for growth and success of this target driven theories adoption into practice:

1. To improve systems and make them more efficient.

2. Measurement based on metrics is relatively easy.

 (Heinrich, 2008).

The Aims of NPM include: Accountability, clear purpose, and effective service delivery. (Hughes, 2003; Olsen, 2006). However, some argue that the target setting approach leads to

behaviour not envisaged by well-meaning proponents (Smith, 1990; Pidd, 2005) and that games are played to meet targets. According to Bevan and Hood (2006) 'gaming' results in data-manipulation and output distortions. Wheeler (2000) argues that when people are pressured to meet a target one (or more) of three responses ensue:

- Work to improve the system.

- Distort the system.

- Distort the data.

For example at the University of the West of Scotland the targets were gradually raised to a 90% pass rate at present; it would have been envisaged that the pass rate would be increased by, for example, better teaching. However, the new targets may also be reached by simply making the assessments easier by under pressure staff adopting a gaming approach to meeting such targets and ensuring the safety of their modules.

With a gaming approach targets are achieved at the expense of important, but unmeasured aspects of performance. Only that which is measured has attention paid to it. This becomes a reductionist focus and often adversely affects the whole i.e. the target is reached but causes problems (unmeasured) elsewhere. Whole systems become focussed on and optimised towards making the measured target. Well known examples of gaming include those from the NHS and police contexts (Loveday, 2006, 2008); within education, instances of 'teaching to the test' can be viewed as gaming (Loveday, 2005; Hood, 2006; Heinrich and Marshcke, 2010).

Are the results we see, and the difficulties Further Education students have, the result of gaming in an academic context? Could the problem of transfer between Further Education colleges and Higher Education Institutions be another example of New Public Management style strategic target setting and resultant operational Gaming? Is it time to look critically at the effects of management and targets on the practice of teaching and learning and the emergent situations?

7.   Summary Conclusions

Although it is not possible to generalise from exploratory studies such as this, we can say that the difficulty of student engagement evidenced in this study was indeed not caused by a transition from Further Education to Higher Education and that the problem investigated here

pre-dated that transfer. Many students who gained the necessary qualification had not gained the necessary skills. In not gaining the necessary skills it left the students unable to begin to engage with subjects such as computer programming at university. The results were produced over a 3 year period with anecdotal evidence suggesting a longer period in which the problem was evident. The conclusion being made here is that the management of the learning and assessment environment within further education is at fault and is a main causal factor in the problem studied. Given the widespread notion of the difficulty in transferring between further education and higher education that these are not isolated results. It is proposed that further research should be undertaken to identify the links between target setting and a lack of skill development within the learning environment. It is proposed that there is a need to investigate the detrimental influences of target setting and management pressures on classroom activity. Further research is needed to identify the links between such management policy and educational practice.

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