TROUBLESHOOTING AT THE ACADEMY: IMPROVED LEARNING BY ADAPTING LEARNING ENVIRONMENTS

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Abstract

Universities and colleges are in constant search to improve the quality of education, since learning outcomes are often poorer than intentions prior to the semester start. Obviously, no single explanation to discrepancies exists. Disciplines and programs are diverse, and so are the teachers, the students and respective content of courses. Recent decades have witnessed significant changes in approaches to educational development, particularly to broaden the perspective from focussing on the individual teacher to greater focus on the complexities of learning environments (LE). The current study comprised a group of 24 faculty undergoing an induction program to qualify for teaching. A new feature was to move from context neutral/blind to a context sensitive approach. This started with the identification of a main concern related to students' learning processes and/or outcomes followed by an explicit explanatory understanding, and an action plan. Only 50 % of the group managed to identify a proper concern, and even fewer provided and explanatory understanding and an action plan. More examples and exercises are obviously necessary to become proficient users of this approach.

Keywords: Action plans, learning environments, theorizing, troubleshooting

1 INTRODUCTION

Higher education institutions worldwide are under intense pressures to reduce failure rates of their students and generally to improve the quality of education. Due to the increasing numbers of students enrolled into higher education, teachers have to deal with more diverse student populations. Teaching methods that worked 30 years ago may not be suitable today. On the other hand, students nowadays enjoy greater opportunities to communicate with faculty and generally respond to the suitability of their learning environments. Student evaluation of teaching is now mandatory at most institutions as is comprehensive quality assurance systems and induction programs for new faculty. While all of these measures express good intentions, impacts on learning outcomes may not be easily identifiable.

Historically, educational development often involved the use of peer observation and video recording; however, the perspective has widened to include learning environments in a broad sense. Teachers' behaviour in lectures enjoys relatively less attention, while theoretical underpinnings and conceptual approaches play a greater role in induction programs for new academic staff [1]. A focus shift from teaching to the study of impacts caused by the learning environments opens a range of new opportunities in terms of cause effect studies. Theoretically, the learning environment not only means the context of learning in a physical sense, but the conditions that enable and constrain learning as well. This idea forms part of a critical realist ontology as opposed to behaviourist and constructivist models. By theorizing cause effect relationships and adapting learning environments accordingly, students' learning may benefit in ways that are highly productive [2].

"Trouble-shooting" denotes a method aimed at problem solving, particularly to repair failed products or processes; however, the same principle is applicable in educational settings as well. This includes a systematic search for the source(s) of a problem to identify appropriate measures to change the situation. Trouble-shooting has proven helpful when operating on complex systems where symptoms of a problem may have several different causes. The aim is to identify variable(s) causing the problem, and to become more grounded in the selection of measures to remedy the situation.

The study draws on data collected from a modularized induction program for new academics spanning one year, including five meetings and assignments associated with various program components. The program also featured group work, peer observation and feedback on teaching, and literature studies, adding up to a total of 100 hours. An innovative feature of the program urged participants to identify a main concern related to learning processes and/or outcomes in a course of their choice. The

associated assignment asked all participants to identify and establish an explanatory understanding of their concern, and to come up with an action plan to meet their identified challenges.

2 METHODOLOGY

This is an action research study combining the dual purposes of development and research as part of the same project. There is a rich literature on action learning and action research; however, no universally agreed definition exists [3]. A shared understanding is that action research and action learning is a method for personal, professional and organisational development. Action learning is learning from concrete experiences, including critical reflection, trial and error based on that experience. As part of this framework, grounded action typically serves as an operational strategy to implement changes. Grounded action differs from grounded theory by being practical, not exclusively aiming for theory generation but rather addressing change grounded in data [2]. The first assignment asked participants to outline concerns associated with teaching, learning and assessment; however, towards the end of the program focus was on issues of learning. This also aimed at raising awareness of the distinction between means and ends; teaching is a means towards and end.

The current study comprised 24 academics, drawing on data collected from their final assignment in which they had to respond to three questions related to key objectives of the induction program. This study builds upon the participants responses these questions: To what extent did the respondents manage to identify a main concern related to learning processes and/or learning outcomes? Were they able to establish an explanatory understanding of their main concern? And, to what extent did they manage to develop an action plan to meet identified challenge(s) in the selected module?

3 RESULTS

Prior to completing the assignment, participants had been through a comprehensive theoretical and practical training program of approximately 100 hours. In view of predicted challenges associated with the fifth and final submission, an outline of theoretical underpinnings and method was presented at the fourth meeting. A brief introduction was ensued by a case-based workshop in which the structure of the methodological approach were tested and results discussed in plenary. The application of a case proved helpful in that it added to their experience and brought about a sense of understanding of how complex issues could be analyzed as part of an educational development project. This was a new experience to the group and rather different from prior quests for tips and tricks in daily teaching.

The first step of the task requires a focus shift from teaching to learning. A seminal article refers to this as a paradigm shift, indicating a different understanding of reality [4]. Implications are that teachers move from teaching and instruction as an end itself to learning as the goal. Furthermore, this shift carries a series of consequences, as for example the selection and application of learning theory, success criteria and the execution of roles. Identifying a main concern requires an ability to sort important features of learning from less important ones, and being able to argue in favor of his/her decision by referring to observed tendencies in the data material.

Academics were familiar with theories within respective disciplines; however, none of them possessed any experience with theorizing within teaching/learning environments. A good theory has a sense of process referring to a (hidden) mechanism. However, education takes place in complex organizational and social structures making the identification of causal factors preliminary and uncertain. Theorizing starts with an observation of outcomes, and explanatory understandings facilitate the implementation of targeted measures aimed at promoting intended learning outcomes.

Performing tasks successfully turned out to be harder than expected. Submissions revealed that less than half (11) managed to identify a main concern related to learning processes or learning outcomes. However, only seven included a trustworthy explanatory understanding, while three responded satisfactorily to all components of the task. This was disappointing, prompting the author to examine submissions in further detail to learn more about shortcomings and potential misunderstandings.

Several respondents confused means and ends by addressing issues of teaching, curriculum or the course generally. This made the remainder of the task confusing since learning participants failed to make learning the ultimate goal. Consequently, measures aimed at general course improvements rather than addressing issues of learning specifically. The following example may illustrate this:

Table 1. Example of Assignment I

	My main concern	Explanatory understanding	My action plan
First concern	Not really advanced course	Historical reasons	
Second concern	Outdated exercises	Teaching assistant (TA) resources	Update content and exercises
Third concern	Fragmented teaching goals	Course management issue	Consolidate teaching goals

Table 1 contains three concerns, and the candidate fails to demonstrate the desired transition from teaching to learning. Not even the transition from teaching goals to learning outcomes has occurred. Items address features of content and curriculum design while there is no link to concerns of learning processes or learning outcomes, which is surprising given the selection of readings and advice offered prior to this assignment. The example also demonstrates the strength of set cognitive structures, and the significance of getting to grips with what has been termed "threshold concepts" [5].

The idea of threshold concepts first emerged as part of a national research project in the UK; however, subsequent studies have proven that certain concepts are unique to their respective disciplinary areas. Such concepts represent transformed ways of understanding, and are irreversible in the sense that once internalized any return to prior ways of thinking is highly unlikely. The conceptual transition from teaching to learning is akin to a gateway or portal through which the world looks differently on the other side. This is a simple idea in theory, but much harder to put into practice.

In the next paragraphs, a couple of responses illustrate the nature of reasoning starting with a main concern ensued by the candidate's explanatory understanding followed by an action plan:

My main concern:

In this course, students learn to do rote calculations, but not to think mathematically. The students learn to apply remembered knowledge, but not to understand, analyze, to create, or to evaluate.

Explanation of the phenomenon:

Students are not prepared for class. They spend class time absorbing what they see and copying what they read. In a lecture there is no time to think, to say "Stop, wait a minute, let me think that through." The lecturer can not help the students when they try to think, because this happens after class in the exercises. Students are not asked to do a 'thinking problem' before the exam. Exam outcome is poor on the 'thinking problem.'

Action plan: a restructured lecture-exercise cycle

Before class: Students read text (first contact). Students write responses to my questions and their own questions, and submit both before class. I read these to prepare. Students work on easy warm-up problems. They bring their write-ups to class. In class: Discussion on written comments on reading. Work in groups on problems brought to class. Hand in revised write-ups. After class: Students work on few but difficult problems and submit their written solutions to be marked in detail by the TAs. (NN)

This candidate managed to identify characteristic features of students' learning, including the nature of targeted learning. The unfortunate situation described is explained by students being unprepared, and the passive and receptive mode of their learning strategies. However, faculty rather than students are to blame since they are not asked "to do a 'thinking problem' before the exam". This alludes to the significance of task design. Refining and extending the nature of tasks and questions in assignments and exams probably represents the best way of engaging students in relevant learning activities.

My main concern:

Many students struggle with mathematical modelling … going from a textual description of a problem to a mathematical model. How can we improve the student's proficiency in modelling?

Explanation of the phenomenon:

Why is this difficult? There is no general recipe or procedure. Students are good at following recipes, but not as good at abstracting and applying. How do we notice this? Results at exams clearly shows this is most difficult. When supervising master students, many struggle with modelling.

Action plan:

Introduce case studies in lectures – walk through of examples. More modelling tasks in assignments with an emphasis on learning by doing. Finding literature on modelling. Pitfalls: Reduced focus on other content areas. Too high workload and need for new assignments each year to avoid plagiarism.

Interestingly, this candidate refers to evidence for his explanatory understanding. The candidate also mentions potential pitfalls associated with the action plan, thereby demonstrating an ability to consider unintended consequences. This is important to be aware of since unintended outcomes always occur.

4 CONCLUSIONS

There is of course of course no single right or wrong way of doing induction courses to new faculty. For a long time there has been at least two different teaching development movements going on at the same time [1]. One generic and centrally located serving the entire institution, for example multimedia centers specializing in the use of digital technologies in educational settings. Another example would be educational development units addressing educational theory and practice generically, making new faculty familiar with concepts and theory, usually ensued by peer observation and feedback. Obvious strengths of generic approaches are the inclusive nature of the offerings, enabling insights into teaching and learning environments that may be very different from one's own. However, there are limitations to this approach, for example the absence of discipline specific approaches. In order to respond to such issues, some institutions have configured units centrally or at the level of faculties.

The current study draws on experiences made within a generic and centrally located educational unit; however, attempting to include educational theory and tasks suited to disciplinary needs. Contrary to prevalent practices, the aim of the program was not limited to offering teaching tips and tricks but rather to assist in making the transition from teaching to learning. This served as a conceptual platform for the identification of a major concern to be examined and followed by the outline of an action plan.

The project yielded mixed outcomes. Less than half of the group succeeded in identifying a main concern, and far fewer established an explanatory understanding of their concern. This is worrying since any subsequent intervention has limited prospects of success. In instances when the nature of forces and mechanisms operating in the learning environment remain unidentified, interventions are deemed to be random rather than grounded. Shortcomings are associated with insufficient experience in the analysis and application of data. Theorizing is a useful skill to succeed, but unfortunately, not one that humans are born with. Successful submissions still suggest that there is much to gain from the new approach; however, more examples and exercises are necessary to promote necessary skills.

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