Measuring the Difference Between Student and Staff Perception of Self-Efficacy and Confidence Using Online Tools

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ABSTRACT

The COVID-19 pandemic has caused a shift in how we teach, how students learn, but has also drawn attention to the inequalities of pedagogy [1]. These inequalities have exacerbated the already known issues relating to student's self-efficacy, metacognition and confidence [2]. We present a workshop designed to discuss best practice in relation to online learning, with discussions about its capacity to promote self-regulated learning and improve student confidence in their technical skills [3]. The workshop will present a tool which addresses some of the barriers and difficulties students may encounter when learning AI [4]. We then ask participants for their thoughts on improving student self-efficacy and inclusive learning. Participants will leave the workshop with a greater understanding of these concepts and best practice they can implement within their own teaching.

CCS CONCEPTS

• **Applied computing** → *Collaborative learning*; Computer-managed instruction.

KEYWORDS

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1 INTRODUCTION

Within the Computing domain, students are less frequently turning to textbooks as a resource to aid learning and are instead using the internet to gain further information and guidance [5]. The relevance of online learning provision has been highlighted by the worldwide COVID-19 pandemic [6]. This speedy transition to online learning, for a lot of universities has presented a number of issues relating to "inequalities of access and outcomes in the new pedagogic spaces" which can impact student experience [1]. The pandemic has also led to the conclusion from many practitioners within HE that changes to the provision of education are needed as a consequence of this digital transformation [7]. However, there are concerns relating to the deficit of pedagogical consideration given within the implementation of online learning tools [8].

From a student's perspective the pandemic has led to them having to rapidly adjust to becoming more self-regulated learners. This is due to the distance learning aspect of education while the pandemic is ongoing, although this varied among institutions. Self-regulation, metacognition and self-efficacy are concepts which have been identified to "help students to organize their study activity independently and effectively" [9]. Metacognition is the "ability to articulate and regulate the mental processes that we use to construct our knowledge, understanding and skills"[9]. It has proven to be a key technique enabling students to self-regulate to advance a skill set [10]. Self-efficacy can be thought of as an amalgamation of "metacognitive knowledge, skill and regulation" [11]. Although these skills are considered key to becoming competent problem solvers they are rarely taught within the computing curriculum and have been shown to directly improve performance [12]. Another common issue raised is the concept of confidence. The student's ability to self-judge their own confidence level requires the students to monitor their metacognition [13]. Within Computing education students may experience a lack of confidence in both their technical skills and theoretical knowledge of this domain. Confidence and self-efficacy has been reported as a particular issue for those who identify as female studying Computer Science, which could be contributing to the lack of diversity in the field [3] [14].

Enabling students to be more self-regulated and increase their self-efficacy through subject specific mitigation strategies is one method of improving the barrier of low confidence, this workshop endeavors to assess the perceived usefulness of these strategies and to determine if there is one approach which is deemed to be more successful. However, Steven and Thomas (2019) [15] advise that "there will rarely be only one barrier facing a particular group," students may instead encounter several intersecting barriers which may coalesce. Looking into student experience from a learning perspective is important but to compliment this work we must also consider what we can do from a teaching perspective to improve the overall learning environment. Decolonising the curriculum includes staff reviewing their content and ensuring it is diverse and inclusive to everyone. One aspect of decolonising the curriculum is investigating the language used and checking the text is inclusive. Inclusive language is defined as "language that avoids the use of certain expressions or words that might be considered to exclude particular groups of people" [16]. This is commonly used in recruitment, so that employers can attract the best candidate. However, there is little testing or teaching of inclusive language in Computing education. There is evidence of industry applying

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inclusive language guidance in their developer's documentation guidance [17].

This workshop will discuss best practice in relation to online learning tools, with discussions about their capacity to promote self-regulated learning and improve student confidence in their technical skills. The workshop will also give participants a chance to consider if there is anything we as educators can do, particularly when writing assessment or teaching material to support students.

2 BACKGROUND

The Machine Learning tool has been created around the theory that learning is the main priority and that the technology employed needs to be the best option for the pedagogical aim of this learning tool [18]. The overarching pedagogical aim and purpose of this online tool is to give the users an introduction to AI, with content relating to mathematics and statistics for machine learning and machine learning and deep learning algorithms. There is also a focus on addressing some of the barriers and difficulties students may encounter when learning AI. Addressing the issue of mathematics anxiety and low confidence in technical skills was a priority due to the prevalence of mathematics concepts and level of knowledge needed to understand some of the ideas within AI. Improving student self-efficacy and metacognition was also a focus due to the intended audience for the tool and the importance of recognising personal progression within their learning. Within the tool, strategies to improve self-efficacy and metacognition include activities related to the process of learning such as knowledge surveys and the use of low stakes quizzing with automated feedback to help improve student competency and to become more self-regulated learners.

3 WORKSHOP DETAILS

We propose a workshop to help educators reflect and consider student self-efficacy, confidence and inclusive content in a way that is supportive and non-judgmental. This workshop has not been run before. Data will be collected anonymously via Miro Technology [19].

The aim of the workshop is: Participants will learn about different methods of assessing student self-efficacy and confidence. They will also take away methods for inclusive assessment which they can use in their own practice.

3.1 Workshop Structure

Introduction: A short presentation on student self-efficacy, confidence and potential barriers in Computer Science education. A review of current literature will be presented.

Group Discussion 1: We will ask the participants what they find can impact a student's self-efficacy.

Presentation: We will present a tool which is designed to equip students with the skills to reflect and accurately assess their learning through teaching them AI. Following this presentation, we will ask participants to provide feedback regarding the tool relating to student self-efficacy and confidence.

Group Discussion 2: We will ask participants what they think about inclusive assessment and content, what they think is and is not important and what needs to be considered.

Conclusion: We will then present a set of criteria based on content analysis of the current research, which will give guidance for helping students with confidence, self-efficacy and inclusive assessment. Drawing comparisons to the findings from the workshop.

4 WORKSHOP OUTPUTS

Participants will leave the workshop with an understanding of the importance of student self-efficacy, confidence and inclusive assessment. They will also leave with methods on how to implement these strategies within their own teaching practice.

All responses will be anonymised and will add to the criteria which is presented within the workshop. The organisers of the workshop will then repeat the study with students to check for trends and differences.

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