Validation of the Programming Emotions Questionnaire

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ABSTRACT

This overarching study aims to establish the validity of the Programming Emotions Questionnaire (PEQ). The PEQ is an instrument used for assessing students' emotions in the context of learning computer programming. It is adapted from the achievement emotions questionnaire (AEQ) that is grounded in the control-value theory of achievement emotions. AEQ has numerous contextual and psychometric challenges, because of which there is a need to adapt this questionnaire for programming. In this poster, we discuss the preliminary findings from the content validity phase of the overarching validation study. These findings suggest the need to develop the PEQ that significantly modifies the AEQ. The immediate next steps include conducting steps to ensure construct and criterion validity, and its reliability.

1 INTRODUCTION

Learning computer programming can be a difficult proposition especially for novices [1]. Students could experience a range of positive and negative emotions while learning how to program. One way to assess these emotions is by using a self-report instrument like the Achievement Emotions Questionnaire (AEQ) [2]. However, AEQ is designed to assess emotions in the context of education in general, and not specifically for programming. Furthermore, there are certain psychometric challenges with AEQ, which merits revision and revalidation. For instance, some items in AEQ are not atomic and contains multiple clauses [3]. For example, the item *"Because I enjoy preparing for the test, I'm motivated to do more than is necessary"* contains more than one clause which makes the item ambiguous and makes it hard for participants to understand. Therefore, we are revising and validating the adapted AEQ (we call the new scale the Programming Emotions Questionnaire – PEQ) to overcome the limitations of the AEQ.

2 METHODS

For validating the PEQ, we are focusing on three types of validity procedures namely, content validity, construct validity, and criteria validity [3]. We have started the validation process with the content validity. For this purpose, we consulted five experts with varying degrees of expertise in computer science and psychometrics.

For construct validity, we will perform exploratory factor analysis and confirmatory factor analysis of PEQ. For criterion validity we plan to carry out logistic regression and structural equation modeling. The target population is composed of students enrolled in the CS1 courses offered in C++, Java, Python and MATLAB. These courses are offered by departments in the college of engineering at a large midwestern university in the United States.

3 PRELIMINARY FINDINGS

Findings from our pilot study provide useful insights that we have used to refine the questionnaire. The results of content validity also confirm our initial decision of validating the instrument from scratch. For instance, some items in the AEQ are not atomic. Non-atomic items contain more than one clause. Since non-atomic items are ambiguous, these items could produce misleading data [4]. Another example is lower value of factor loading for non-atomic items. A low factor loading means that a particular factor shows relatively little influence on the set of measured variables [5]. Finally, there is a need to change the items slightly to fit them in the programming context. Detailed findings from the content validity phase will be presented during the poster session.

4 CONTRIBUTIONS AND FUTURE WORK

Review of literature suggests that there is no validated questionnaire that assess students' emotions in the context of learning programming. This adapted and validated PEQ will serve the purpose of assessing students' emotions as students learn programming. As an immediate future direction, our research team is in the process of planning data collection for construct and criterion validity of the PEQ.

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