

Codebook Definitions – Version 1

Original codebook definitions developed by Author 1, to be used for agreement checking by Author 2 on Gideon's and Hannah's transcripts. Tabs indicate sub-theming a higher-level theme.

Name	Description
Barriers to successful debugging	Factors that limit or prevent the likelihood of students having successful debugging experiences
Lack of time for sufficient debugging practice	Mentions of a lack of time for teaching programming, in turn affecting the amount of practice that students get with debugging and more widely, programming.
Negative affect	An overall lack of interest, confidence, or motivation from students when encountering errors that prevent or limit successful debugging experiences.
Program-related	Barriers that affect the programs students are writing.
Conceptual difficulties	Difficulty understanding certain programming concepts or constructs that may cause more logical errors, including misconceptions.
Hard to interpret PEMs	The difficulties of PEMs for students that contribute to difficulty with debugging.
The difficulty with getting syntax exactly right	Mentions of common errors that relate to getting students' syntax, most of which are very minor but prevent a working program nonetheless.
Promoting a positive error culture	Measures in place and morals enforced that promote a positive and healthy perspective on errors, rather than a fear around them.
Celebrating the effort as well as the outcome	Rewarding students who try to solve errors, rather than only focusing on successful resolutions of errors.

Name	Description
Getting used to erroneous code	Deliberately and regularly exposing students to erroneous code that may be created by a student, the teacher, or automatically. The essence of this sub-theme is getting students exposed to errors often, rather than just when they're struggling to program.
Verbal encouragement	Promoting a positive error culture through verbal persuasion, both when students get an error or when they are engaging in the debugging process.
Reliance on the teacher	Discourse related to the common observation that teachers are the first port of call for student debugging, often thought to be caused by a lack of personal resilience. This theme also includes teaching methods that teachers employ to alleviate the pressure on the teacher.
Motivating teacher-independent debugging	Strategies that teachers use that help students to debug independent of the teacher.
Encouraging collaboration first	The enforcing or encouragement from teachers to seek support and inspiration from their peers before asking for help from the teacher.
Refusing to help students	Deliberately not providing assistance to students, usually for the purpose of forcing students to attempt debugging by themselves first.
Signposting to other resources for assistance	The enforcing or encouragement from teachers to explore resources that may help in resolving errors in students' programs. These include, but are not limited to: the internet, specific websites, cheat sheets, documentation, or large language models.
Reliance due a lack of resilience	Mentions of the belief that students raise their hand due to a lack of resilience to solve errors without the teacher.
The commonness of teacher reliance	The effect of the heavy teacher reliance on the teacher. These may be challenges that teachers mention, or feelings that this kind of atmosphere evokes in the teachers.

Name	Description
The toll on the teacher of this reliance	
Teachers exemplifying their debugging practice	Teaching strategies and measures employed that showcase debugging behaviours that teachers use, for the purpose of helping students to become more successful debuggers.
Modelling debugging strategies	Mentions of teachers working through a particular debugging strategy, often their debugging process, with one or more students.
The effect of teacher's debugging strategies	Mentions of observed changes in students' debugging behaviour, which teachers attribute to their teaching practice around debugging.
Utilising PEMs	The view that PEMs are, to some extent, a useful source of automated feedback that can be harnessed in the classroom, as well as mentions of heuristics to "decode" them. A common example is along the lines of "look at the line above the one included in the PEM."
The emotional nature of debugging	A theme regarding the emotional aspect of students' observed debugging experiences, usually described with strong language.
Elation when solving an error	Any observed physical or verbal reactions that indicate strong positive emotions experienced by students at the point of resolving an error.
Muted reactions for quieter students	Observations of quieter students not reacting much or at all (usually directly compared with visible reactions).
Negative emotion during debugging struggle	Any observed physical or verbal reactions that indicate negative emotions experienced by students, including disengagement with the debugging/programming process.

Name	Description
The resilience of motivated students	Commentary on the positive affect (specifically resilience) that teachers observe among students who are more motivated or confident programmers.
Varying levels of scaffolding for helping students debug	The support mechanisms that teachers provide when they do assist students. These include a range of levels of scaffolding to help them get their programs working.
Asking students questions	Where teachers ask students questions rather than giving answers when providing individual support, usually with the purpose of getting students to "think for themselves".
Encouraging externalisation of ideas	Mentions of where teachers get students to get their thoughts "out of their heads" to help with debugging. This may be through forcing them to explain their code, sharing their thoughts with peers, or encouraging the use of specialist terminology.
Giving students hints	A high level of scaffolding where teachers provide nudges to help students get closer to the answer. This depends on the problem at hand and the student that the teacher is helping.
Giving students the solution	Mentions of teachers literally providing the resolution of the error, usually in the form of a change to make. This doesn't have to always be solicited by the student; a teacher point out the resolution to make without the student asking.