Improving Adolescents' Rationality to Improve Their Career Decision-Making Skills

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The hardest and most important decision that adolescents usually make is deciding what they will do after graduating from school. This decision poses a dilemma because adolescents do not have the knowledge and understanding of how to make long-term decisions under uncertainty (Blakemore & Choudhury, 2006; Icenogle & Cauffman, 2021). Yet, the most common advice given to adolescents–to "follow your dreams"–is highly misguided (Newport, 2016). Around 97% of adolescents dream of becoming musicians, athletes, or artists, but those areas account for only 3% of jobs (Newport, 2016). Even the advice to find 'stable jobs' may not be as useful. Artificial intelligence may threaten some 'stable' jobs (e.g., accountants or hiring managers) in the next few years (Abeliansky et al., 2020). If adolescents follow the advice without understanding the labour market needs, they are more likely to make poor career decisions.

So, how can adolescents make better decisions for their future? Studies show that rationality is the set of skills that help people overcome biases and gather relevant information, which leads to better judgement and decision-making (e.g., Donati et al., 2015; Ghazal et al., 2018; Stanovich, 2016). Schools teach 'critical thinking', but critical thinking classes do not improve students' rationality (Perkins, 2019; Willingham, 2007). Adolescents without the skills of rationality are more likely to continue making poor decisions into their adulthood (e.g., alcohol abuse; Kruse et al., 2017). Thus, there is a critical need to improve rationality in adolescents so they can make better decisions.

Decision-Making is a Crucial Life Skill for Adolescents, but It's Incredibly Hard

Adolescence marks a period of poor decision-making and higher risk-taking. Starting at the onset of puberty, adolescents go through physical, cognitive, social, and emotional

development that impact their behaviours (Icenogle & Cauffman, 2021). For example, adolescents take more risks than adults in abusing drugs, having unprotected sex, and engaging in risky driving (Casey et al., 2008; Kann et al., 2018). What drives these behaviours to be more prevalent in adolescents than adults? Studies found that adolescents have the cognitive resources and capacity to make rational, deliberate decision-making—like adults do (Aïte et al., 2018; Metzger et al., 2020). But, adolescents struggle more than adults to engage in self-regulation to make rational decisions (Schweizer et al., 2020). Hence, developmental changes can influence adolescents' decision-making process.

A major theory that can explain the decision-making process is the Dual-Process Theory (Kahneman, 2011). The theory posits that people often rely on fast mental shortcuts (System I processing) because we tend to conserve cognitive effort (Gigerenzer & Gaissmaier, 2011). However, using mental shortcuts (heuristics) inappropriately can lead to cognitive biases and fallacies (Shah & Oppenheimer, 2008), which can hinder good decision-making. Instead, when people engage in slow, effortful, and deliberate thinking (System II processing), they are more likely to detect and override inappropriate heuristics (Stanovich, 2018). If we can sustain this override to get an appropriate response, we are more likely to improve our decision quality (Stanovich et al., 2016). There is a general assumption that good decision-making processes are more likely to lead to good outcomes, at least on average (Hershey & Baron, 1995; Keren & De Bruin, 2003). Thus, if we improve our decision-making processes, we can increase the probability of good outcomes.

The outcomes of a decision can act as feedback for people's decision-making process. However, people do not get feedback for long-term decisions until they commit to the decision for some time. Without immediate feedback, making long-term decisions can be

incredibly challenging and overwhelming. An example of long-term decisions in adolescence is career decisions. Adolescents often feel highly pressured to make the "right" decision for their future. But, this pressure can cause adolescents to feel indecisive or rely on others' advice (Albion & Fogarty, 2002; Ma & Yeh, 2005). Yet, the current literature on how to effectively guide adolescents to make long-term decisions is limited (Newport, 2016). Therefore, we need to explore the roles of rationality in adolescents' long-term decision-making.

What is Rationality?

Rationality is a construct that is defined differently across different disciplines. In behavioural economics, a rational person makes decisions based on the utility values of outcomes multiplied by the probabilities of the outcomes (Savage, 1954; Von Neumann & Morgenstern, 1947). In behavioural economics, it is assumed that people aim to make decisions that benefit them the most. Thus, the source of rationality lies within the individual's wants or needs. However, scholars in psychology argued that rationality is limited by individuals' cognitive abilities, time constraints, and imperfect information (Simon, 1990; Tversky, 1975). Hence, people cannot always compute a full cost-benefit analysis to make the decisions that are best for them.

Within psychology, the definition of rationality steers away from simply maximising decision outcomes. Baron (1985) defined rationality as *how* people think, which leads to their belief formation and decision-making. Pinker (2021) defined rationality as the ability to use one's knowledge to attain their goals. He emphasised the *intentions* to be rational, as someone who stumbles on a decision that "happens to work" is not practising rationality (Pinker, 2021). Boostrom (2013) defined a rational person as someone "who forms beliefs, makes decisions, and takes action on the basis of sound evidence […] a person who subscribes to

the principle of truthfulness," (Boostrom, 2013 p. 148). Thus, rationality is focused on how people think and use their knowledge to reach their goals.

Rationality Impacts People's Abilities to Make Decisions More Than Intelligence

People often think intelligence is the core cognitive skill responsible for good decision-making. This assumption is not surprising, as intelligence is associated with better school grades, occupational attainment, and income (Bertua et al., 2005; Roth et al., 2015; Strenze, 2007). Researchers have examined the relationship between intelligence and decision-making using validated intelligence tests to measure intelligence (e.g., Wechsler Adult Intelligence Scale, WAIS; Wechsler, 2012) and gambling tasks to measure decision-making skills (e.g., Iowa Gambling Task, IGT; Bechara et al., 1994; Columbia Card Task, CCT; Figner & Voelki, 2004). Gambling tasks act as a proxy for decision-making skills because they simulate the uncertainty and unpredictability of real-life decisions (Weller et al., 2010). Hence, better performance in gambling tasks can simulate real-life decision-making skills.

There is inconsistent evidence of the relationship between intelligence and decision-making. Some studies have shown that fluid and crystallised intelligence is related to superior decision-making (e.g., Del Missier et al., 2012; Flouri et al., 2019; Michalkiewicz et al., 2018), although these relationships were weak. Fusinska-Korpik and Gacek's (2022) study on decision-making in people with mild intellectual disabilities found that only a few components of intelligence influence decision-making–verbal comprehension, memory, and attention. Other studies (Mata et al., 2013; Toplak et al., 2010) found that the relationship between intelligence and decision-making was non-significant. Therefore, the relationship between decision-making and intelligence is relatively weak.

There are some other factors that seem to influence decision-making skills. Studies have found that some factors are predictive of decision-making abilities above and beyond intelligence, such as rationality (Stanovich, 2016), emotional regulation skills (Eberhardt et al., 2019; Peters, 2006), cognitive reflection (Frederick, 2005), cognitive styles or dispositions (Bruine de Bruin et al., 2007; Parker & Fischhoff, 2005), and numeracy skills (Allan, 2018; Ghazal et al., 2018; Sobkow et al., 2020). For example, studies found that probabilistic reasoning ability mediates the relationship between intelligence and decision-making skills (Allan, 2018; Donati et al., 2015; Ghazal et al., 2018): intelligence is associated with better probabilistic reasoning, and the reasoning ability is the key factor that improves decision-making.

So smart people can make bad decisions when they lack the skills of rationality. A series of experimental studies on improving informal reasoning found that highly intelligent students developed better arguments with lesser effort (Perkins, 2019). Yet, their arguments were also more biased (Perkins, 2019). This result is similar to the results of Macpherson and Stanovich's (2007) study: there were near zero correlations between cognitive ability and myside bias (i.e., the tendency to evaluate evidence in a manner biased toward one's own opinions; Macpherson & Stanovich, 2007). These results highlighted the difference between rationality and intelligence. "Rationality calls for evenhandedness, which intelligence does not necessarily promote" (Perkins, 2019 p. 641). The good news is that, unlike intelligence, rationality may be amenable to change.

Epistemic and Instrumental Rationality

There are a few types of rationality, such as epistemic and instrumental rationality. Epistemic rationality is how closely someone's beliefs align with the world (Stanovich et al.,

2016). Instrumental rationality is how someone should act so they get what they most want, using the available resources (Stanovich et al., 2016). Epistemic rationality shapes intellectual *values*, which increases the *disposition* to exercise intellectual skills (Kuhn, 2001). In contrast, instrumental rationality reflects the *competence* to exercise intellectual skills and perform the behaviours to achieve one's goals (Kuhn, 2001).

Although epistemic rationality has been widely researched, instrumental rationality has been widely critiqued. For example, Cho (2014) argued instrumental rationality could be used to "justify" questionable or immoral behaviours as a means to achieve particular goals (i.e., how Kim Jong Un's pursuit of nuclear weapons is instrumentally rational; Cho, 2014). However, the same criticisms could be leveled at intelligence, where intelligence and prosocial values are not necessarily related (Bostrom, 2012). So, the problem is not instrumental rationality itself, but the need for rationality—like most other variables—has to be combined with other attributes if we want prosocial outcomes (Blau, 2021). It is useful to think of instrumental rationality as a skill to help us "be rational in a more reflective sense, calling into question ends we happen to have, revising them when they seem unfit" (Schmidtz, 1994, p. 227). After all, merely having epistemic rationality would not take someone towards their goals if they do not have instrumental rationality. When people combine both types of rationality, they can properly calibrate their beliefs to the world and act accordingly to achieve their life goals using the best means possible. Both types of rationality would be highly valuable for adolescents to nurture while they are still in school.

Current Practices and Challenges of Thinking Classes in Schools

Teaching critical thinking aims to improve students' reasoning, which may be necessary but not sufficient for rationality. Critical thinking teaches students to consider

claims critically, confront the different factors that impact their personal and social decisions, and reach sound solutions to problems (Perkins, 2019). But, there is inconsistent evidence of its effectiveness (Hamby, 2016; Perkins, 2019). Niu and colleagues (2013) systematically reviewed 31 studies to explore the effects of different critical thinking instructions in higher education. They found that instructional interventions yielded a small, though statistically significant effect size (effect size = .195, $p < .001$, 95% CI [.087, .303]). Abrami and colleagues (2015) reviewed 684 studies on strategies for teaching students of any age to think critically. They found that the strategies had a moderate effect size on content-specific critical thinking skills ($g = .57$). But, they had small effect sizes on both general critical thinking skills ($g = .30$) and general thinking dispositions ($g = .23$). Therefore, critical thinking interventions do not appear to hugely influence how students think generally.

There are some challenges to implementing effective critical thinking classes. Firstly, there is a disparity between the models of critical thinking and how critical thinking is taught in educational settings (Pettersson, 2020). Critical thinking is philosophically seen as the educational equivalent of epistemic rationality (Siegel, 2017). However, the skills that are taught in critical thinking do not fully represent all facets of rationality, especially in mitigating cognitive biases (Davies, 2015; Perkins et al., 1993). Although critical thinking education has started raising awareness of cognitive biases, it does not necessarily guide people on how to effectively mitigate them (Beaulac & Kenyon, 2014). Furthermore, most critical-thinking instructors do not necessarily understand how to foster critical thinking in the classroom (Paul et al., 1997). Even though critical thinking has become a core requirement in educational institutions, the instructors do not necessarily impart the value or nurture the motivation for students to think rationally (Choy & Cheah, 2009; Hamby, 2016).

Recommendations on how to address these challenges will be further discussed below.

Recommendations for Improving Critical Thinking Education to Teach Rationality

Explicit Debiasing Training

Some critical thinking courses in higher education have started implementing debiasing training to mitigate cognitive biases. A common and intuitive approach to debiasing training is to teach the different forms and meanings of cognitive biases to increase the awareness of biases (Beaulac & Kenyon, 2014). However, simply knowing about biases does not necessarily help people become more unbiased. The "G. I. Joe" fallacy[1] is a misguided belief that knowing about a bias is enough to overcome it (Santos & Gendler, 2014). Many studies have attempted to teach people to be aware of their cognitive biases, but they were ineffective in guiding people to override their biases (i.e., Bohnet, 2020; Paluck & Green, 2009).

Scholars have recommended several approaches to debiasing education. For example, Beaulac and Kenyon advocated for "teaching and ingraining the habits, skills, and dispositions that facilitate adopting general reasoning and decision-making principles" (Beaulac & Kenyon, 2014, p. 349). They suggested a four-level taxonomy of debiasing strategies (Beaulac & Kenyon, 2018), which are:

1. Mitigating an individual's *disposition* to produce biased judgement in the first place.
2. Training individuals to deploy cognitive *strategies* so they can mitigate biased judgments when they arise.
3. Training individuals (personally or collectively) to create and defer to situational

[1] "The name of this fallacy derives from the 1980s television series G. I. Joe, which ended each cartoon episode with a public service announcement and closing tagline, "Now you know. And knowing is half the battle." Santos and Gendler (2014) argued that for many cognitive and social biases, knowing is ***much less*** than half of the battle." (Kristal & Santos, 2021, p. 3)

nudges that can debias otherwise distorted judgments.

4. Training individuals (personally or collectively) to create and defer to *processes* or *situational constraints* that can debias actions even when individual judgments are biased and uncorrected.

The first two strategies represent more individualistic debiasing strategies that require the individual to rely on their own dispositions and strategies to overcome biases (Beaulac & Kenyon, 2018). The remaining strategies refer to the implementation and usage of external infrastructures or designs that are built to minimise biased judgments (Beaulac & Kenyon, 2018). Solely relying on an individual's motivation and cognitive load to overcome biases can be futile. Thus, creating and using "nudges" or external aids where possible can ease the cognitive burden on individuals. Ideally, combining all aforementioned strategies can maximise the mitigation of cognitive biases.

Imparting the Value of Rationality

It is insufficient to simply teach students how to think without imparting the value of why this is important. Baron (1993) argued that teachers need to impart an understanding of the value of thinking skills. After all, while the idea of being more rational sounds great, people are not always motivated to exercise rationality. Moreover, children who are told to perform behaviours without understanding the rationale are predicted to be more extrinsically motivated (Ryan & Deci, 2000), which does not necessarily increase their rationality. Perkins' (2019) study to improve students' informal reasoning supported this notion. He found that training helps individuals present more rational arguments. But, it has less impact on changing the students' prior beliefs (Perkins, 2019). Adolescents are also less likely than adults to update their beliefs after seeing scientific evidence (Moutsiana et al., 2013). This is because adolescents generally value their self-esteem more than the truth (Klaczynski, 2000).

If adolescents understand the *value* of having rational thinking skills, they are more likely to practise these skills.

Can We Improve Adolescents' Rationality?

A way to impart the value of learning about rationality is to frame rationality training as career decision-making training. Firstly, career decisions can be riddled with cognitive biases (Newport, 2016; *This Is Your Most Important Decision - 80,000 Hours*, 2021). For instance, biased self-assessments can influence one's career choice (e.g., Correll, 2001; Liu, 2018). When adolescents miscalibrated their competence, they were more likely to make unsuitable career decisions. Biases can also influence adolescents in their career exploration stage. As discussed earlier, adolescents can be highly influenced to pursue careers in arts, entertainment, or sports. Yet, they often overlook the probability of success in these careers (i.e., fewer than 14% of actors were employed in 2016 and only 0.04% are considered "famous"; Gleeson, 2018; Grove et al., 2019). This is a clear example of how base rate neglect could influence career decision-making.

Secondly, career decision-making is a real-world problem that all adolescents face. It is important to select a topic of high value to induce their curiosity, which will increase their engagement in the topic (Covington, 2000; Dubey et al., 2021; Schneider & Preckel, 2017). Adolescents are more curious to learn if they perceive that the information is important to them (Dubey & Griffiths, 2017; Schneider & Preckel, 2017). Therefore, adolescents are more likely to engage in rationality training if it helps them with a difficult, important decision.

Lastly, adolescents are more motivated to employ metacognitive and cognitive strategies if they view a task as important and useful (Ghasemi et al., 2018). Adolescents may not use rationality skills in unimportant decisions (e.g., what movie to watch), but are more

likely to employ these skills for hard, important decisions. Studies have shown that adolescents want to create an impact on the world using their careers (Giammattei et al., 2019; Romani et al., 2021; Santilli et al., 2019). However, the existing career decision education focuses more on building employability skills or on career counselling but does not include rationality training (Department of Education, Skills and Employment, 2019; Keele et al., 2020). There is also evidence that the current career education curricula in schools are insufficient to prepare adolescents for career and life transitions post-school (Department of Education, Skills and Employment, 2019; Torii & O'Connell, 2017), especially with the uncertainties that come after the COVID-19 pandemic (Georgievska & Uraguchi, 2020). Some independent organisations have established exemplary tools for students and educators to improve their rationality to aid their career decision-making process (*All Clearer Thinking Tools*, n.d., *Non-Trivial*, n.d.; Todd, 2014), but these are not included in the school curricula as of yet. Clearly, there is an opportunity to use career decision-making to train adolescents in schools to improve their rationality.

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