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A Longitudinal Study on Student Developments in Learning Communities

Changes in Grit, Passion, Mindset, Motivation, and Attendance During COVID-19

Master's thesis

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Master's thesis in Learning – brain, behaviour, environment.
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Foreword

The Current thesis was written as a part of a master's programme at NTNU, with a specialization in Learning – brain, behaviour, environment. It represents the completion of five years of studying which has formed me into person I am today. My time at NTNU showed me the wonders of being an educator and how it feels to facilitate learning in others. This has changed my course in life, making learning and the research of its many sides a core passion for me. A part of this passion has doubtlessly come from my supervisor for this thesis, Professor Sven Hroar Klempe. His nuanced opinions, historical knowledge, and open-mindedness were instrumental in staking a course for this thesis.

I have grown much as a person over the past five years, and I will be eternally grateful for the journey and the friendships I made along the way. A special thanks goes to my partner Effie, my best friend Jonas, and mentor Torhild. Without their support, humour, and reassurances I would not have reached as far as I have, let alone had the strength to continue along the same paths now that this thesis is complete. Another thanks goes out to all students whom I have had the pleasure of being a facilitator for throughout four years. Through their patience, willingness to learn, and feedback I have become confident in my chosen path as a facilitator of learning.

Finally, I have to thank all the students who took time out of their busy schedules to participate in the current study. Thanks to their dedication for research my master's thesis turned out to be something in which I can take great pride.

Abstract

The use of learning communities has been a staple in tertiary education for many years. There are however few studies that have investigated this programme in lieu of relevant variables of learning. The current study sought to investigate how participation in learning communities, amongst primarily first year psychology students, over their first semester in university affected the variables of grit, passion, mindset, motivation, and attendance. A thorough theoretical overview was also given for these variables. Potential gender differences and developmental patterns, alongside how attendance was affected by the ongoing COVID-19 pandemic, were also measured.

The sample consisted of 94 students in learning communities, 72 of which were used for further analysis, at the Norwegian University of Science and Technology (NTNU). By using one-way repeated measure ANCOVA it was found that over the course of a semester there was a significant increase in mindset ($p < .05$) but not in grit, passion, or motivation. No significant gender differences were observed. A paired-samples T-test showed that student attendance for learning communities in one subject was significantly better ($p < .05$) in the first semester of 2020 - 2021 (with COVID-19 restrictions) than the same period in the previous year.

The current study offers a unique insight into the potential of learning communities to incite change in students, alongside how these functioned under a global pandemic. Although there was only a significant change in mindset, several trends in the data of the other variables were observed. Through this it is hoped that general developmental patterns for the variables might be established, which has the potential to be a rich source of knowledge for future researchers and educators to draw upon when creating the educational programmes of tomorrow.

Sammendrag

Bruken av læringssamfunn har vært et vanlig syn i tertiær utdannelse i mange år. Det er derimot få studier som har undersøkt dette programmet i lys av relevante variabler for læring. Den nåværende studien søkte å undersøke om deltakelse i læringssamfunn på universitet påvirket variablene utholdenhet, lidenskap, tankesett, motivasjon og oppmøte. En grundig teoretisk oversikt ble også gitt for disse variablene. Potensielle kjønnsforskjeller og utviklingsmønstre, samt hvordan oppmøte ble påvirket av den pågående COVID-19 pandemien, ble også målt.

Utvalget besto av 94 studenter i læringssamfunn, hvorpå 72 av disse ble anvendt for videre analyse, ved Norges Teknisk-Naturvitenskapelige Universitet (NTNU). Gjennom bruken av one-way repeated measures ANCOVA ble det funnet at over et semester var det en signifikant økning i tankesett ($p < .05$) men ikke i utholdenhet, lidenskap eller motivasjon. Ingen signifikante kjønnsforskjeller ble observert. En paired-samples T-test viste at studentoppmøte for læringssamfunn i et emne var signifikant bedre ($p < .05$) i det første semesteret av 2020 – 2021 (med COVID-19 restriksjoner) enn den samme perioden foregående år.

Den nåværende studien gir en unik innsikt til potensialet læringssamfunn har for å skape endringer i studenter, samt hvordan læringssamfunn fungerte under en global pandemi. Til tross for at det bare var en signifikant endring i tankesett ble flere trender i dataene til de andre variablene observert. Gjennom dette håpes det at generelle utviklingsmønstre for variablene kan etableres, noe som har potensialet til å være en rik kilde til kunnskap som framtidige forskere og lærere kan trekke på når de skaper morgendagens utdanningsprogrammer.

Table of Contents

List of Figures

List of Tables

Learning stands as one of the foremost phenomena that allows for continued human evolution in all aspects of life. It is the tool by which we develop ourselves, as well as transfer lived experience and accumulated knowledge to coming generations. There is therefore little wonder that the myriad of variables that affects human learning has captivated scientists and philosophers throughout history.

As the years have gone by, many theories of human learning have come and gone, all leaving their trace on the scientific field. Now in modern times such theories have varied and sometimes vastly different ways of looking at the concept of learning, often arising from both the education and psychology branches of research, or the more recent joint field of educational psychology. Such theories stretch from the behaviourism angle with its focus on human learning through conditioning, all the way to humanism with its postulations that humans are driven by an innate need to reach self-actualization in order to to grow as individuals. This degree of variation speaks to the fundamental nature of learning, and with so much inherent value, it is little wonder that nearly all fields of science occupy themselves to some degree with learning.

With such a strong incentive for research and development it is only natural that the resulting programmes developed from such research are as varied as the theories themselves. Whereas most academic institutions ascribe themselves to educational theories through the well-tested tradition of physical in-person lectures, others have taken this concept in new directions. One such newer direction is the concept of learning communities, which have quickly become a common sight in tertiary education (Zhao & Kuh, 2004). With the use of such programmes it is paramount to establish what effect this might have with other variables that have shown themselves to be relevant for the field of educational psychology.

Purpose

The overarching purpose of this study is to examine what interactions and potential changes that can arise in set of variables through the participation in a particular co-curricular programme called learning communities. These programmes are linked to changes in variables associated with student success and achievement, intelligence, grades and grade point averages, retention, self-esteem, student retention, and more (Baker & Pomerantz, 2000; Goldman, 2012; Huerta & Bray, 2013; Stassen, 2003; Zhao & Kuh, 2004).

The main variables being explored in light of learning communities for the current study are *grit* (Duckworth & Quinn, 2009), *passion* (Jachimowicz et al., 2018; Sigmundsson et al., 2020a), *mindset* (De Castella & Byrne, 2015; Dweck et al., 1995a), and *motivation*

(Ryan & Deci, 2000b; Sundre & Kitsantas, 2004). Most of these are validated and well-established variables in the field of educational psychology. Alongside these, other related aspects such as gender differences and developmental trends will also be discussed.

This paper mostly follows the rules and guidelines presented in the seventh edition of the American Psychological Association Publication Manual, with the exception of when other parameters are specified by the master's course or when these rules would result in a text that is less orderly/harder to read.

Three central research questions have together moulded and directed the design of the current study, alongside being the basis for resulting hypotheses:

- Is there a relationship between participation in a learning community and changes in grit, passion, mindset, and motivation? If so: are there trends in the development of these variables?
- Are there gender differences in grit, passion, mindset, and motivation, and will these possible differences become more pronounced over the course of learning community activity?
- How has the COVID-19 pandemic affected learning communities in regard to attendance?

Theory

The scientific fields of learning and psychology both have long and twisting histories, with the rise and fall of differing theories and dogma throughout the ages. Even when disregarding this complex and interconnected history, it is clear that an interest in the fundamental processes and affecting variables behind one's ability to learn always has been of keen interest to scholars. Ever since the ancient Greeks with Socrates (470 – 399 B.C.E.), Plato (428 – 348 B.C.E.) and Aristotle (384 - 322 B.C.E.) the approaches to educating others have entered public and academic discourse.

In the modern day we are still influenced by such predecessors. In Socrates we can find the inherent value of education that forwards grit and a particular mindset of intellectual growth in students. This becomes apparent through his use of active learning in the Socratic method: giving students questions to ponder, rather than merely providing the correct answers, with subsequent follow-up questions meant to further critical thinking (*Socratic method*, n.d). By doing this, one can hope to encourage independent thinking and persistence in students. Alongside this one can look to Aristotle's focus on learning being an inherent

motivation and passion in all humans. On can see this by how Aristotle's *Metaphysics* first sentence reads: "All men by nature desire to know" (Lear, 1988, p. 1).

It is clear that learning always has, and always will, be an integral part of the human experience and overall societal structure. This fact only seems to have become more and more assured in modern times, as a steadily growing library of research continue to pinpoint the various ways in which education predicts results that benefit the individual, society, and humanity at large. This research has shown that those willing to learn have an increased likelihood of achieving lifelong happiness (Michalos, 2017); lessens the likelihood of being unemployed; letting them make better decisions with regard to their own health and close relationships; and makes one less likely to engage in risky and even criminal behaviour (Lochner & Moretti, 2004; Oreopoulos & Salvanes, 2011). These are but a few of the many established benefits to engaging in education.

With such a multitude of apparent benefits of learning, there is little wonder that learning has become the focus of multiple fields of research. However, as the interconnectivity of all variables that affect one's ability to learn becomes more apparent, there is also an increasing need for cooperation across fields long considered separate. In learning, a growing body of research has for many years hinted towards the strong influence of personal and interpersonal variables on an individual's ability to learn. After all, if the human mind is key to learning, then it stands to reason that the variables that affect said mind is of particular import. Such reasonings have in part led to the establishment of a new field of research, uniting traditional education with research into the human mind: educational psychology. This paper is rooted in theory and practice relevant to the field of educational psychology, which is natural given the concepts being researched and discussed.

In order to gain a clear grasp of the fundamental aspects of learning one first needs to establish a set of definitions that can serve as anchor points, as well as springboards for future discussion. In this context specifically, one would need to define the central themes being investigated as a part of the current study: learning, learning communities, emergency remote learning, and attendance. The variables of grit, passion, mindset, and motivation will all be given a compact theoretical overview, with the intention of consolidating these related theories. With the relatively recent creation of the passion tool used in the current study extra care will be made to establish the commonalities of this tool with the older, more established Dualistic Model of Passion. What follows is a thorough look into the theoretical frameworks and definitions important to the study, as well as how these are reflected in the tools used.

A Definition of Learning

Learning as a concept has been the subject of fascination ever since education started. Because of this, there have been many, often highly differing, views as to what learning entails. Immanuel Kant (1724 – 1804) describes a central dichotomy of learning in the form of individual freedom and the need to submit to an educational system: "One of the greatest problems of education is how to unite submission to the necessary restraint with the child's capability of exercising his free will—for restraint is necessary" (Kant, 1900, p. 27). A later edition to the field was that of behaviourism, spearheaded by John B. Watson (1878 – 1958). This new angle proposed that learning was a biological process defined by the act of conditioning; the strengthening or weakening of associations connecting a particular stimulus to a particular response (*Conditioning*, n.d). These two viewpoints place the act of learning in two differing spheres of existence: the individual (Kant) and the environment (behaviourism). That such differing approaches both are considered a form of learning makes it clear that learning is far from a clear concept even in modern times. Besides these one must also give credit to Edward L. Thorndike (1874 – 1949) who published three volumes of books named Educational Psychology (Thorndike, 1913a, 1913b, 1914), thereby coining the term and largely being responsible for establishing the field.

With such a long and storied history, it is rather difficult to pinpoint a definition that adequately covers all the many sides of learning. The definition would have to be general enough as to not exclude any central side of learning, whilst at the same time not being so general that it essentially states nothing. The definition chosen for this purpose is the one given by John Robert Anderson (b. 1947), which states that learning is to be viewed as any "process by which relatively permanent changes occur in behavioural potential as a result of experience" (Anderson, 1995, pp. 4-5). With regard to Kant this definition makes it clear that personal experience is paramount to the act of learning, with this being reflected in how an individual chooses to exercise their free will. From the behavioural angle, one can see the definition being influenced by how experiences can lead to long-lasting changes through biological processes. This definition is thereby applicable to the central tenet for all learning: that learning leads to changes in the individual, concerning knowledge as well as behaviour.

A Definition of Education and Educational Psychology

Learning leads naturally into a definition of education in general. As of 2019 approximately 90% of all children in school-age are enrolled in school, with a global attendance rate of around 75% (UNICEF, 2019). Schools are, in its multitude of variants

(e.g., kindergartens, high schools, and universities) the premium educational institution for individuals of all ages. When it comes to defining education, it would be challenging to base this on any one particular type or level of school (e.g., primary, secondary, or tertiary education), seeing as these differ highly depending on format and nationality. It would therefore serve a definition of education best to look towards the commonalities shared amongst all levels and variants of education, rather than focusing on any one in particular.

The question therefore becomes what unites all education, regardless of what form it takes. Given that no clear definition of general education is agreed upon in the literature, at least to this author's knowledge, one would have to look to the specific subcategories that constitute education, which in turn dictate the contents and procedure used by educational institutions. The subcategories that form the theoretical basis of all education can be summarized through pedagogy and didactics. These are oft confused in popular culture given how closely related they are on a theoretical level. From a pure definition standpoint pedagogy can be considered the "art, science, or profession of teaching" (*Pedagogy*, n.d). As a science, pedagogy is part of the field of the educational sciences.

Of more interest towards a definition of education is "didactics". The term didactics has its origin in "the German tradition of theorizing classroom learning and teaching" (Arnold, 2012, p. 986), with the dual complementary setup of general didactics and subject-matter didactics. Of most interest for our purposes is general didactics, which can be defined as "the overarching theory of both decision making on and processes of teaching and learning in societal institutions (especially in schools and universities devoted to general and domain-specific education)" (Arnold, 2012, p. 986). From this we can gleam that a possible definition of education might be "all teaching and learning that takes place in social institutions". This also mirrors possible dictionary definitions of the term with education being a discipline "that is concerned with methods of teaching and learning in schools or school-like environments as opposed to various nonformal and informal means of socialization" (Swink, n.d).

From such a definition of education one can seek to define the field of educational psychology. This is a sizable task, with educational psychology having undergone many revisions in tandem with societal norms and scientific trends (McCaslin & Hickey, 2001). In order to be an adequate definition for an entire field of research one encounters the same challenge as previously encountered in defining learning; it must cover a multitude of possible research angles, whilst also being specific enough. By searching thorough relevant articles one definition became prevalent. This stated that educational psychology is "the scientific study of psychology in education" (Wittrock, 1992, p. 1). In this context one can

consider pedagogy to be a form of applied psychology, with pedagogy representing how one can employ psychological concepts and theory to better learning. Educational psychology can therefore in practice be seen as a field seeking to research the variables and effects that affect individual learning in an educational environment.

To help with understanding this definition one can contextualize it through its central focus: "the rich and significant everyday problems of education, which include the teaching of subject matter in schools, the learners' cognitive and affective processes, self-concepts, preconceptions and background knowledge, personality development, intellectual development, testing, measurement, assessment, evaluation, professional and occupational training, and in-service education" (Wittrock, 1992, pp. 132-133). Although still expansive, this might help to narrow some central themes within the field of educational psychology, thereby giving some degree of focus to the differing research angles in the field at large.

What are Learning Communities?

It is important to start with a preface about the terms that will be used in this section and further on in the current study. At the Norwegian University of Science and Technology (NTNU), where this study took place, the groups measured are named *colloquium groups*. These are, for all intents and purposes, identical to what contemporary research refers to as *learning communities*. To avoid confusion, and to better reflect contemporary research, these groups will from this point onward be referred to as learning communities.

Learning communities are a type of educational group organized around an academic social environment, with the intent to improve multiple aspects of learning. In its strictest sense such groups have previously been defined as "the same group of students enrolled together in two or more courses" (Tinto, 1997). To further elaborate on such a general definition, one can point to the commonalities of such groups. Beyond being just a group of students sharing the same course and subjects, it is also common for these groups to be centred around shared active learning, collaborative effort, integrating knowledge across courses, and the creation of an open and welcoming environment (Andrade, 2007; Matthews et al., 2012; Tinto, 1999)

For added context, it is common for learning community students to attend lectures with a larger body of the student population, but also for them to meet in private to discuss and work with the assigned curriculum afterwards (Tinto, 1999). It is important to clarify that learning communities almost never replace traditional lectures but serve as a supplementary educational resource for students. On this basis these communities can, at large, be

summarized as being programs that "centre around a vision of faculty and students (…) working collaboratively toward shared academic goals in environments in which competition is de-emphasized" (Angelo, 1997, p. 3).

Such groups have become more and more popular in tertiary education ever since their modern iteration first were employed in late 1980 (Zhao & Kuh, 2004), but were slowly being developed as early as the 1970s (Matthews et al., 2012). The use of peers as teachers was, amongst others, forwarded in by Lev Vygotsky (1896 – 1934). As a part of his theory on zones of proximal development he stated that the zone of proximal development was "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). In this context a more capable peer, (e.g., a fellow student) would perform what has later come to be known as cognitive scaffolding (Flick, 1998).

In their modern form learning communities come in a wide variety of forms, often varying greatly from institution to institution (Taylor et al., 2003). Some examples of this are groups of students who meet regularly to discuss and confer on the curriculum of the day, or units of students who live together and perform various co-curricular activities in one another's company (Barefoot, 2000).

The concept of such communities was chiefly employed in order to remedy the negative takeaway students had of their educational programme. Amongst such negative perceptions was the experience and assumption that academic success came as a result of courses that offered little stimulating activity, thereby resulting in a boring activity seemingly devoid of engagement (Matthews et al., 2012). Such education was starting to feel like a perquisite to success to some students, as that was how "good education" was supposed to work. Alongside this was the worry that tertiary education would end up being little more than a binary experience of endless tests, without any meaningful learning actually taking place. All of these trends led to the logical result of declining attendance and retention rates in the 1990s (Baker & Pomerantz, 2000; Johnson, 2000). This then served as an impetus for a wave of new ideas and processes meant to stimmy and reverse the negative developments, an environment in which the learning community model saw widespread endorsement.

Learning Communities in the Current Study

The still ongoing COVID-19 pandemic has affected society on a fundamental level. With clear restrictions on social and physical interaction, performing tasks that previously

seemed menial has instead become trying. This can be felt in most aspects of education, where the norm for hundreds of years has been lectures held in person by a lecturer in front of students sitting in a relatively confined environment. The use of such physical lectures came to a grinding halt in the beginning months of 2020, with restrictions stretching into 2021.

For the current study learning communities arranged by NTNUs Department of Psychology were chosen. These were available to students in the one-year, bachelor's, and clinical master's study programmes in psychology. For students in the one-year and bachelor's studies all four course subjects in their first semester had associated learning communities, and students in the clinical master's had three of these subjects. Participation in these communities and weekly gatherings were voluntary, meaning that the size and attendance-rate for each group could vary. In order to account for the ongoing COVID-19 pandemic learning communities and lectures were changed to work under a blended model, hereunder defined as "the thoughtful integration of classroom face-to-face learning experiences with online learning experiences" (Garrison & Kanuka, 2004, p. 96). This was done to reduce the flow of students to-and-fro campus, with lectures and learning communities alternating every week between physical and digital attendance.

In the first semester of the 2020-2021 academic year there were a total of 17 different learning community groups arranged, with three or four leaders serving as facilitators for each group (one for each course subject). The communities, in an effort to further social interaction and creation of new friendships, were organized so that students shared the same community for all subjects. By signing up for a community the students would thus have four gatherings during the week where a community leader, chosen for their knowledge and experience in the subject in question, prepared an educational programme for the gathering.

Apparent Benefits of Learning Communities

As a remedy to the challenges that tertiary education faced in the 1990s (Matthews et al., 2012), learning communities appear to have met them in stride. If one only looks to increasing the level of engagement and learning in tertiary education there have been a multitude of studies indicating the positive value of learning communities. If one looks to the research by Zhao and Kuh (2004) one can see that the use of learning communities had positive effects on variables such as academic effort and performance, engagement, as well as active and collaborative learning. In the case of Zhao & Kuh (2004) they found that first year students and seniors who partook in learning communities both reported a higher degree of gains in general education than their peers who did not participate.

Learning communities also seem to have positive effects on student grades and grade point averages (Baker & Pomerantz, 2000; Goldman, 2012; Huerta & Bray, 2013; Stassen, 2003), as well as integrated and higher-order thinking (Pike et al., 2011). Further studies have also indicated the positive effects such communities have on student retention and persistence (Johnson, 2000; Stassen, 2003; Tinto & Russo, 1994). Participation in learning communities seem to incite its participants to engage in active and collaborative learning, which have been shown to be beneficial to academic success (Stassen, 2003; Tinto & Russo, 1994). These findings indicate the value of learning communities as platforms of learning.

Beyond the strictly academic gains associated with learning communities, studies have also indicated how learning communities can lead to developments that go beyond the academic context. Findings have suggested that organizing students in voluntary learning communities have led to those students experiencing increased satisfaction and belonging in their educational experiences (Baker & Pomerantz, 2000; Brower & Inkelas, 2010; Scrivener et al., 2008), more interaction between the individual student and their faculty (Cross, 1998; Inkelas & Weisman, 2003), and giving a view of campus and faculty as being supportive in both academic and social aspects (Baker & Pomerantz, 2000; Brower & Inkelas, 2010; Zhao & Kuh, 2004). These findings were summarized in a wonderful manner by Andrade (2007): "… it is the principle of connecting the learning experience in a meaningful way in a supportive environment that makes learning communities successful rather than the specific way the learning community concept is applied from institution to institution" (p. 12).

It also seems that learning communities lead to lasting changes on a more personal level. Research by Baker and Pomerantz (2000), alongside Zhao and Kuh (2004) have indicated that individuals that participate in learning communities experience increased development in both personal and social domains. Such developments are positive beyond just the gains of the individual to general functioning and development, but may also directly affect their academic performance (Durlak et al., 2010).

With the increased prevalence of learning communities also followed an increase in scrutiny regarding their supposed positive aspects. An interesting commonality amongst most studies exploring the effects of learning communities in tertiary education is that of self-selection. A comprehensive meta-review of studies relating to learning-communities (Andrade, 2007) showed how the only study reviewed that did not allow students to self-select their own groups/communities failed to show gains in either persistence or academic achievement (Goldberg & Finkelstein, 2002). One of the primary concerns troubling researchers with this trend has been the possibility that the results of learning communities

might be somewhat skewed, given the ability of students to self-select groups (Zhao & Kuh, 2004). The fear is that this might lead learning communities to be primarily filled by students who are, from the onset, more prepared for the rigors of academia than their peers (Zobac et al., 2014). It is a probability that communities showing positive gains are doing so in part because of how self-selection motivates group differences (Mayhew et al., 2016, p. 403).

Why Learning Communities were Selected for the Current Study

A logical question to ask oneself when studying longitudinal changes in students is what part of the educational course one wishes to examine. Multitudes of studies cover how students change from when they first enter education as children to when they leave mandatory education (e.g., Haimovitz & Dweck, 2017; Laursen, 2015). Likewise, there is no lack of studies covering the period of tertiary education (e.g., Hochanadel & Finamore, 2015; Sigmundsson et al., 2020b; Tuckwiller & Dardick, 2018). There is, however, not as much research that properly dives into how students in tertiary education change as a result of their first academic semester. This is the semester where most students experience a wealth of new impressions and experiences (Bewick et al., 2010; Gibney et al., 2011), so it stands to reason that this might be one of the most important semesters for multiple sides of the student experience and academic progress. Still fewer studies cover the niche subject of learning communities, despite their extensive use in tertiary education.

The reasoning for choosing to focus this study on the particular demographic of university students in their first year, who also participated in a learning community, was the result of multiple considerations. Perhaps chief amongst these were the ability of learning communities to incite change on multiple planes, from personal to academic (Baker & Pomerantz, 2000; Zhao & Kuh, 2004). By focusing on students in learning communities (a uniquely social, involved, and active learning environment) it was hoped that the resulting changes also would reflect in the variables of grit, passion, mindset, and motivation. It was also believed, though anecdotally, that participants in a programme with a focus on responsibility for one's own learning might show a lower study dropout-rate.

Beyond the changes in the students partaking in the study, their position in the academic course was highly relevant. Most studies conducted on students in tertiary education is done on those who are in their first year, as this is the time when new experiences and viewpoints are first encountered (Lefkowitz, 2005). In this time of change, it is probable that the students were most likely to show significant changes in the variables measured. Beyond these effects there was also the fact that the learning communities hosted

by the Department of Psychology at NTNU have previously shown good attendance rates. For more information on attendance in 2019 and 2020 see Figure 2 and 3. The full data regarding attendance can be seen in Appendix E.

Emergency Remote Learning

Most educators in the period where COVID influenced educational practice saw the need to change central facets of their curriculum. In many cases this led educators to reducing the scope of the curriculum and planned assignments (Johnson et al., 2020). These changes underpin a central distinction important to understanding the how and why of learning communities during the COVID pandemic.

As forwarded by Hodges et al. (2020) there ought to be made a clear distinction between "online education" and "emergency remote learning". Even though one employs a blended model in order to ensure less physical interaction between students and lecturers, the very definition of the term blended learning entails "thoughtful integration…" (Garrison & Kanuka, 2004, p. 96). This distinction is important for many reasons, but partly because of how the education is implemented. Proper blended and online learning requires extensive planning and development in order to give good results (Branch & Dousay, 2015), as well as proper infrastructure with which to support it (Rapanta et al., 2020). Some studies have even showed that properly implemented online learning can be more effective than traditional education (U.S. Department of Education, 2010). A switch to a programme with online elements implemented in haste (e.g., like what most tertiary education institutions did when faced with imminent societal shutdown) could by this metric be classified as emergency remote learning. As such one can argue that the learning community students that acted as the subjects for the current study was educated using this rather than a proper blended model.

The Value of Research into Emergency Remote Learning. Seeing as the emergency remote learning that the respondents in this study experienced differed from normal online or blended learning it becomes hard to argue for the possible impacts this might have had on the respondents. The reasoning for this is that at the current time little research had been done on how the COVID-19 pandemic could affect student learning, engagement, attendance, and so forth. Previously much of the research into rapid change in education practices has come as a result of local crises at a regional level following national disasters or societal unrest (Ayebi-Arthur, 2017; Czerniewicz et al., 2019; Tull et al., 2017).

In most cases the research into emergency remote learning situations has used interviews as a way to gather personal reflections from students and faculty. This research has reinforced the idea that online gatherings is a place for students to socialise and share information relevant to the circumstances their society finds itself in (Ayebi-Arthur, 2017). A clear theme in this was however the heavy reliance upon local infrastructure and capacity of the schools to offer such learning online at short notice (Ayebi-Arthur, 2017; Tull et al., 2017). In this regard the learning communities in the current study could have helped serve as a point of much needed social interaction, as well as a place to keep each other updated on the latest developments in the COVID situation.

In order to further explore the potential effects of COVID restrictions on students and the effects of emergency remote learning in the current study one can look to a study by Czerniewicz et al. (2019). This study explored a model adopted by four universities in South Africa in response to the civic unrest and university shutdowns experienced in 2015-2017 due to student protests. During this time, it became common practice to engage in blended learning (combined online teaching along with physical classroom activities). This is similar from the model employed by the Department of Psychology at NTNU for lectures and learning communities in the first semester of the academic year 2020-2021.

In the use of emergency remote teaching some academics noted that they had experienced less engagement from students, lower student performance, and fewer opportunities in which to give feedback to students (Czerniewicz et al., 2019). Others also argued for its potential benefits in providing a more diverse curriculum through the use of videos and pictures, alongside the course material being easier to access. Most of these findings have been echoed in contemporary research (e.g. Alqahtani & Rajkhan, 2020).

Though arising under vastly differing circumstances, the reflections made by Czerniewicz et al. (2019) still carry some weight in the current study. It can be argued that the students in learning communities were offered less room for individual feedback over the course of this study. Doing so whilst also facilitating learning in up towards an average of 20 students in a relatively new real-time digital environment would have required a lot of attention and effort on behalf of the community leaders, with some students possibly ending up simply blending into the background.

A related, though still somewhat poorly understood, is the effects of the umbrella term *Zoom fatigue*. This effect rose drastically in relevancy during the COVID pandemic when most lectures, meetings, social gatherings, etc. were forced to happen in a digital space rather than a physical one. This umbrella term covers a multitude of effects, but it might generally

be described as the sense of tiredness or exhaustion felt during and after a digital meeting (Wiederhold, 2020). The lack of body-language, engaging interaction, and the cognitive load involved in comprehending and engaging with this medium have been speculated to be the reasons for such feelings of fatigue (Nadler, 2020; Wiederhold, 2020). It is also important to note that this form of fatigue has arisen in correspondence with a general sense of *pandemic fatigue* (Michie et al., 2020; Reicher & Drury, 2021), but the effects underpinning these two fatigue types are still largely unknown. These effects might have influenced the respondents in the current study with half of all gatherings taking place online.

The Theory Behind the Grit Concept

Working to overcome challenges and enduring in the face of hardship and adversity. The notion that acts such as these promote higher levels of achievement is far from a novel idea. More than 100 years ago Guy G Fernald touched upon this idea when he put the following into writing: "…the success or failure of individuals depends largely on the ability to endure and to continue to strive for the sake of achievement, in spite of fatigue and discouragement" (Fernald, 1912, p. 331). So even when looking back as far as the early 1900s, one could already see the dawning of a focus on the predictive value of individual persistence and tenacity on learning and achievement. Such a focus has only continued to grow as more and more research indicated the value of this perspective (Cox, 1926; Edmiston & Jackson, 1949; Feather, 1961; Lent et al., 1984; Ryans, 1939).

Through many different iterations and variations of the same principle, there are today multiple different theories with their own angle on persistence and tenacity as driving forces of achievement and performance. However, off all the theories and tools that seek to measure this, one has solidified itself as a leading theory: *grit*. The current concept of grit was first conceptualized by Duckworth and colleagues (2007) as a way to measure why some individuals performed better than others, regardless of one's level of IQ or other variables central to predicting success. Grit was defined as "perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087). It was proposed to be an important variable in explaining why some individuals manage to commit the hours and face the hardships associated with becoming highly proficient in a given skill or area of expertise.

In order to prove the validity of a tool seeking to cover such a trait, suitable points of comparison from contemporary research were needed. With this in mind Duckworth and colleagues set out to investigate whether their tool for grit could predict success above and beyond what IQ and the five factors of the Big Five model could. IQ (Deary et al., 2007;

Roth et al., 2015) and Big Five (Barrick & Mount, 1991; Kappe & van der Flier, 2010; Sternberg et al., 2001; Van der Zee et al., 2002) are both highly validated and widely recognized measures of success and achievement. This meant that achieving better predictive value than these would have been considered a high benchmark of validity at the time.

The predictive value of grit was solidified in 2007, when Duckworth and colleagues published their first article on grit. Here they presented it as a concept with a suitable definition, alongside a scientific tool meant to measure it (Duckworth et al., 2007). To provide scientific backing of this they had also performed 4 tests of the tool on multiple diverse demographics ($N = 5,074$). The tool was designed as a combination of two subscales, consistency of interest and perseverance of effort, which together were intended to reflect the overall definition of grit ("perseverance and passion for long-term goals").

The subscales were subsequently explored through an exploratory factor analysis. In the following years, what started out as a 12-item questionnaire of grit was improved and refined to the current 8-item questionnaire known as the Short Grit Scale (Grit-S), while also retaining its two subscales (Duckworth & Quinn, 2009). With the Grit-S boasting a higher degree of predictive validity, test-retest validity, and internal consistency (Duckworth & Quinn, 2009), it has become the most used measure of grit in contemporary research. The grit concept in Grit-S was operationalized through items like "I am a hard worker" and "Setbacks don't discourage me" (see Appendix B, Table B3).

Contemporary Research of Grit Relevant to the Current Study

Contemporary research into the grit concept has indicated its value to a multitude of learning aspects. Amongst the most relevant findings in this regard is the research that indicates the specific academic gains associated with grit. A study by Hodge et al. (2018) indicated the positive effects of grit on academic achievement in university students, with it showing a positive relationship between grit, engagement and productivity. Yet further studies have also indicated the positive relationship between grit, academic motivation, academic achievement, grade attainment, and academic performance (Alhadabi & Karpinski, 2020; Reraki et al., 2015; Strayhorn, 2014). Duckworth has herself indicated that such effects might, at least in part, come as a result deliberate practice (leading to better performance) being mediated by grit (Duckworth et al., 2011).

Grit has also made itself known in themes relating to the well-being of students, which in itself might serve to better grades (Ciarrochi et al., 2007). Supporting the grit's role in student health Kannangara et al. (2018) reported that students with higher grit had

significantly higher levels of mental well-being and self-control. This is important, seeing as variables like worry and test anxiety seems to have a negative relationship with grade point averages (Steinmayr et al., 2016). Such findings indicate that grit might be a highly beneficial quality to possess for students, assisting in general well-being, and consequentially, grades.

Concerning potential gender differences in grit there has been conducted some relevant research, although much of this is conflicting. One study that found significant gender differences in grit stem from Jaeger et al. (2010) into engineering students. They found that there were significant gender differences in both total grit scores, and specifically in the consistency of interest subscale, with female engineering students being grittier than their male counterparts. Similarly, a study by Christensen and Knezek (2014) on students in upper secondary school showed that girls scored significantly higher on the consistency of interest subscale. Conflicting with these findings there have been a multitude of studies that have not been able to locate any such differences (Bazelais et al., 2016; Hodge et al., 2018; Sigmundsson et al., 2020b). This paints an unclear picture as to the potential presence or non-presence any differences in grit on the basis of gender.

It is also important to note a critique of the grit measure that has arisen in recent years. Although the perseverance of effort subscale has shown itself to be a good predictor of academic achievement, grade point averages, and engagement; but the same cannot be said for the consistency of interest subscale (Bowman et al., 2015; Jiang et al., 2019; Muenks et al., 2018; Tang et al., 2019). This has led researchers to speculate as to the perceived reliability of this particular subscale of grit, which in turn casts some doubt on any general grit score. Although more research is needed to conclusively establish if this is a consistent weakness in the tool, it would seem that any result stemming from the consistency of interest subscale at the very least ought to be judged with some healthy scepticism.

There appears to be clear lack of research into grit and learning communities, at least to this author's knowledge. Few studies covering grit mention learning communities in tertiary education. By linking the construct of Grit to relevant student activities and initiatives this could help to give insight and ideas of improvement to learning communities.

The Malleability of Grit

As proposed by Duckworth grit is a malleable trait (Perkins-Gough, 2013), meaning it should be theoretically possible to establish a general pattern of development corresponding to the activities and education one chooses to engage in. Furthermore, there is little research on whether individuals' participation in co-curricular activity, such as learning communities,

can influence one's grit scores. The closest parallel to this are the findings that the higher degree (e.g., bachelor's or master's degree) one has achieved the higher one's grit score (Duckworth et al., 2007).

Grit has been examined in students of all levels, from primary school (Oriol et al., 2017), high school (Muenks et al., 2018) to university (Kannangara et al., 2018). A constant interest for those within the educational field has been if and how grit can be nourished in students as a potential way of improving learning, well-being, and educational attainment. Duckworth and Eskreis-Winkler (2013) have further claimed that grit increases monotonically throughout adulthood (pp. 174-181); which they argue might be because individuals with age realise, to increasing degrees, the effectiveness of effort. Besides this it appears that grit also increases naturally during the course of normal education (Bowman et al., 2015). In such educational settings it has also been shown to be mildly affected by specific intervention in an academic context (Alan et al., 2019) as well as a result of functional imagery training (Rhodes et al., 2018).

Such findings have led to suggestions that specific academic activities can help boost the average level of grit in students. One candidate for such an activity might be learning communities. The challenge with this is that little to no research has covered grit in relation to such educational activities. When looking at articles relating to grit and student behaviour a common theme starts to emerge. A focus on providing challenge alongside support, in an environment emphasizing that effort in itself is rewarding, seems to encourage the development of grit in students (e.g., Schreiner, 2017). Seeing as learning communities are in an especially relevant position to provide just such an environment, it seems like a natural match to explore grit in the context of just such communities.

The Theory Behind the Passion Concept

Thematically, *passion* has been a controversial point of discussion throughout most of history. The argument of whether passion is something to be avoided for its tendency to drive impulsive behaviour, or if it is to be seen as a natural part of being human, has sharply divided the philosophical world for ages. Where Plato (428 – 348 B.C.E.) argued passion to be the downfall of reason and self-control, philosophers like Kierkegaard (1813 – 1855) argued for the necessity of passion for life itself. Kierkegaard even went so far as to say that "to exist, if we do not mean by that only a pseudo existence, cannot take place without passion" (see Petkanič, 2013). This divide between passion as a potential source of disruption, or as a drive to live and accomplish has carried into modern research.

In the realm of educational psychology passion is a relative newcomer. It has generated a large body of research in the 2000s and beyond, but before this point it was a relatively unknown subject of study. Vallerand, a leading researcher in the field of motivation, notes that passion started to become noticed more and more as researchers started looking into what made people function at their peak, as well as what lead them to ultimately find happiness (Vallerand, 2012). This eventually led to the invention of positive psychology (Seligman & Csikszentmihalyi, 2014) in the early 2000s, which served as a springboard for further research. With that being said, passion has existed in differing forms for a much longer time, often being seen as a part of general motivation (Vallerand, 2012).

In contemporary research, passion has largely been dominated by the theories of Vallerand and the Dualistic Model of Passion (Vallerand, 2010). This model, simply put, separates the influences of passion as a motivator into two overarching categories: the harmonious and the obsessive (Vallerand, 2016). This again hearkens back to theories of Kant on passion having the possibility of spilling over into compulsive behaviour and drives if not well regulated. It invokes the philosophical divide between philosophers such as Plato and Kierkegaard, with Vallerand stating that there is room for both views of passion in research. In this model harmonious passion is the motivators that have been internalized at the individuals own free volition and judgement, with the individuals themselves judging the activity to be valuable to their own lives. In contrast, the obsessive side of passion comes from the controlled and, in some cases, pressured internalization of an activity. By making an obsessive activity a part of one's identity or self an individual might feel an obligation or forceful drive to perform a certain action, not because they find value in it.

This theory has served to give deep insights into a variety of themes relating to passion and learning. Within educational psychology the Dualistic Model of Passion has been employed regularly in research, but rarely in conjunction with the measure of Grit (Duckworth & Quinn, 2009). This is hardly surprising, given that they both seem to measure passion, though with differing approaches to the concept. After all, Duckworth already used passion as a term in order to define grit as "trait-level perseverance and passion for long-term goals" (Duckworth et al., 2007). These directions have therefore, logically enough, been treated as describing somewhat different constructs.

This was the case the case until recently when an article, written by Jachimowicz et al. (2018), indicated that the belief of passion being an inherent part of grit was somewhat erroneous. This article was spurred on by the fact that recent meta-analyses had failed to achieve anything but weak to non-significant relationships between grit and similar variables

indicative of success (Credé et al., 2017). Jachimowicz et al. concluded that this was a troublesome state for the grit construct to be in given the central role harmonious passion (Vallerand, 2010) and grit serve together, mediated by cognitive engagement, in job performance (Ho et al., 2011).

Jachimowicz et al. went about establishing a more appropriate definition of passion by looking to the Dualistic Model of Passion (Vallerand, 2010) and the research into grit by Duckworth et al. (2007). From Vallerand they integrated the view of passion being a directed force of action in one's life, and from Duckworth the concept of passion being domain specific with regard to one's motivation. With these perspectives they eventually concluded that a more appropriate definition of passion would be "a strong feeling toward a personally important value/preference that motivates intentions and behaviours to express that value/preference" (Jachimowicz et al., 2018, p. 1981).

Whether this new definition could serve as a more accurate representation of performance was further explored in three studies. Through a literature search a number of studies that employed the grit scale alongside measures of performance were found and used in a subsequent meta-analysis ($N = 45,485$). This found that passion for any given assignment could be mediated through a passion-performance relationship. In a second study Jachimowicz et al. respondents were asked to complete three questionnaires: Grit-S, Harmonious Passion Scale (Vallerand et al., 2003), and three items from a separate scale. With this they observed that grit, passion attainment, and job performance loaded to separate factors in a confirmatory factor analysis. The final study found a positive significant relationship in the interaction between passion attainment and academic performance, as well as a positive correlation in an engagement-performance relationship. A subsequent regression analysis showed that there was a significant interaction effect between grit and passion attainment on the variable immersion. Based on this they concluded that the relationship of passion and grit were necessary together to predict performance, academic or otherwise.

In the time since Jachimowicz et al. (2018) published their findings, a tool for the measurement of passion alongside grit was created. This was developed by Sigmundsson et al. (2020a), and was named the Passion Scale. This tool was developed as an 8-item scale with a 5-point Likert scale (Likert, 1932). The items chosen to reflect the definition of passion given includes "I work hard enough to fulfil my goals" and I have an area/theme/skill I am really passionate about" (see Appendix B, Table B4).

Sigmundsson et al. (2020a) performed a study to check for the presence of any correlations between the grit and passion measures, and simultaneously checking for

construct validity. This measure showed good homogeneity, indicating that related but different aspects of the same construct were measured (passion). When comparing the Passion Scale to Grit-S they achieved a moderate construct validity (Cronbach, 1951; Cronbach & Meehl, 1955). Consequently, Sigmundsson et al. concluded that the Passion Scale was suitable to capture individual levels of passion in ages 18 to 47, whilst Grit-S was suitable to measure individual perseverance (Sigmundsson et al., 2020a, p. 5). This tool has later been tested on samples in the age-range of 18 to 47 years (Sigmundsson et al., 2020a), and 14 to 77 years (Sigmundsson, 2021) as well, and has in these instances shown similar levels of construct validity and shared variance.

The Common Ground of the Passion Scale and Dualistic Model of Passion

Research into the effect on passion as a force of action is wide and diverse. Although much research in this particular field has employed the Dualistic Model of Passion by Vallerand, or a variant of this, the current study used the Passion Scale designed by Sigmundsson et al. (2020a). Given that this tool used is rather new, logical inferences have been made from studies using Vallerands Dualistic Model (Vallerand, 2010). Although this might seem precarious, at least when taken at face value, these measures are not so wildly different as one might first be led to believe. In order to draw upon contemporary research regarding passion it is therefore important to establish the commonalities linking the Passion Scale (Sigmundsson et al., 2020a) and the Dualistic Model of Passion (Vallerand, 2010).

A logical place to start such a comparison would be in the definitions used by the two tools. Sigmundsson et al. (2020a), similarly to Jachimowicz et al. (2018), considered passion to be "a strong feeling toward a personally important value/preference that motivates intentions and behaviours to express that value/preference" (Sigmundsson et al., 2020a, p. 2). This can be contrasted with the definition given by Vallerand, who rather defines passion as "a strong inclination toward an activity that people like, find important, and in which they invest time and energy" (Vallerand et al., 2003, p. 757). If one compares these definitions one might notice more than a few similarities. Chiefly, these definitions both speak of passion acting as a feeling that leads to motivation for a particular course of action. This common connection is logical when one considers that Jachimowicz et al. (2018) largely based their new definition of passion on the dualistic model (Vallerand, 2010), while also combining it with the definition given for grit by Duckworth et al. (2007).

The focus of passion being a force of motivation and subsequent action can also be seen in the individual items of both questionnaires. However, how the questionnaires frame

their questions differ somewhat. Where the Dualistic Model of Passion has a focus on making a distinction between the harmonious and obsessive sides of passion (e.g., "This activity is in harmony with the other activities in my life" and "I have almost and obsessive feeling for this activity"), the Passion Scale frames the items as determinants of skills and expertise (e.g., "I think I could be an expert in one area/theme/skill"). However, if one were to look past the focus on whether passion is harmonious, obsessive, or expertise related; one could see the commonality of passion being a motivational force.

This common ground in passion as a driving force of action is reflected in the following item in the Passion scale: "I have a burning passion for some area/theme/skill". On a similar note, one can find similar themes in the Dualistic Model of Passion (e.g., "I have almost an obsessive feeling for this activity" and "I have difficulties controlling my urge to do my activity") that speak of motivation as leading to action. The leading commonality appears to be the drive to act, which then may lead to potential predictive value for the variable of learning. It can therefore be argued that contemporary research on this common ground is transferable between these tools.

Contemporary Research of Passion Relevant to the Current Study

As with the other variables covered in this paper, it becomes necessary to discuss how passion changes over the course of a student's time in school. For passion this remains a somewhat convoluted picture. Little data exists on the general development of student passion in first, second, or tertiary education, with the majority of research focuses on the passion of teachers/educators and how this affects students (e.g., Carbonneau et al., 2008; Moyles, 2001) and athletes (see Mageau & Vallerand, 2003). Some research has hinted towards the role of harmonious passion in inciting vigour and dedication in students (Stoeber et al., 2011), but little longitudinal research has been made in passion for studying.

Of note in this regard is a study by Bonneville-Roussy et al. (2013). This study looked at how support for autonomous activity, alongside dualistic passion, affected student persistence. Two studies were conducted, which found that both in highly skilled and regular music students' harmonious passion was a significant predictor of persistence. Alongside this it was also found that music students who viewed their music professor as supportive of autonomous activity had in themselves a higher degree of autonomous passion. It would therefore appear that passion (at least the harmonious sort) can predict student persistence.

Research into gender differences in passion has produced mixed results. In a study of gender differences and associations between the variables of grit, passion and mindset in

young adults from Iceland, a significant difference was found using the Passion Scale (Sigmundsson et al., 2020b) alongside other measures. The variables of grit and mindset showed no significant difference between genders, but males appeared to be significantly more passionate than females. These findings are however somewhat contradicted by Szabo et al. (2019). This study focused on the cultural aspects of passion in Hungarian and Spanish demographics. One of their findings was that Hungarian females had a significantly higher degree of harmonious passion than Spanish women, and also significantly more harmonious and obsessive passion than Hungarian men. On this basis Szabo et al. concluded that there were clear cultural influences in how genders internalize passion, in accordance with the Dualistic Model of Passion (Vallerand, 2010).

The Malleability of Passion

When it comes to the potential of students' change in passion over time, some relevant findings have been made in university students. A study by Schellenberg and Bailis (2015) indicated that, depending on a student's perceptions of life at university prior to entering, some students experienced modest to large changes in passion in their first year in university. The majority of students showed little to no change, however, meaning that these results are somewhat inconclusive.

This research is also echoed in the research by Carbonneau et al. (2008) into teacher passion, and how such passion might affect burnout symptoms and satisfaction with work. This study, involving 494 teachers working in education at differing levels, investigated potential changes in passion over a 3-month period. Of the most interest to the current study was the findings that little to no change in passion could be observed over a 3-month period. When taken together, the articles by Schellenberg and Bailis (2015) and Carbonneau et al. (2008) indicate that students and teachers generally experience little change in passion over short periods of time. Even though some experience big changes, the majority does not.

Further adding to the malleable nature of passion is the research of Forest et al. (2012) into passion for one's work and the use of signature strengths. This study explored university students over 2 measurements. After having completed a survey and given two activities meant to strengthen well-being it was found that the intervention led to increased use of respondents' signature strengths and in turn predicted an increase in harmonious passion, which together were significant predictors of well-being levels at the second measurement. Through this it was indicated that passion is a trait that is not hardcoded after childhood, and

that it remains malleable into adult age. The supposed malleability of passion through interventions has however not remained consistent across all studies (e.g., Berg et al., 2020).

The Theory Behind the Mindset Concept

The importance of the individual's worldview and how this affects learning and general functioning in society has long been a point of discussion in research and philosophy. The idea that there are different worldviews has been recognized for as long as there have been doubt as to the fundamental certainty of the world. In modern philosophy this can be correlated somewhat with the works of René Descartes (1596-1650), who debated whether we fundamentally could know anything about the world, even about our own existence. This led later philosophers to posit how such differing views of the nature of the world could affect the human experience. One such recent philosopher was Jean Piaget (1896-1980), who has become well known for his theories on the stages of cognitive development and the thinking capabilities of children. In his later years Piaget started to promote the idea that the individual's views of the world they find themselves in were an important piece in explaining the integration of experiences, and through this the growth of the individual's logic and cognition (see Piaget et al., 1988). In this context the world would either be seen as static and unchanging, or as constantly forming around the individual. In part through this, the concept of *mindset* became a common discourse in the educational and psychological sciences.

One theory which sought to further explore the ideas promoted by Piaget was the theory of all humans possessing a theory as to the malleability of central facets of their lives. A tool meant to identify the central implicit beliefs found in all individuals was developed by Dweck, Chiu and Hong in 1995. Through this they hoped to find out more on how beliefs could affect how an individual process social information and their decision making (Dweck et al., 1995a). From this mindset was defined as "the implicit theories that we believe set up a framework for analysing and interpreting human actions" (Dweck et al., 1995a, p. 1).

When exploring possible implicit beliefs found in all individuals Dweck et al. established two overarching beliefs. Firstly, was the belief that a particular attribute in oneself was stable or fixed. The opposite of this would therefore be that the attribute in question is capable of change and growth, given personal action and incentive to do so. Thus, they ended up with a distinction between having a fixed mindset and a growth mindset. They explain that, in regard to intelligence, this could help to give insight into the possible behavioural actions of meeting resistance when learning. A student with a fixed mindset of intelligence could end up blaming themselves and their inherently born level of intelligence for their

failure, whilst a student with a growth mindset rather would blame their own actions and behaviours (Dweck & Leggett, 1988). It is important to also note that Dweck and colleagues claim to have evoked reactions and actions associated with both types of mindset at different times in the same individuals, thereby showing that both can exist in unison in the same individual (Dweck et al., 1995b).

In the development of the Theories of Intelligence scale a total of six validation studies were performed (Dweck et al., 1995a). At this point the scale was called the Implicit Theories measure, and measured multiple beliefs, of which one belief later was renamed to the Theories of Intelligence scale. These six studies sought to validate the attributes of both fixed and growth mindset. The measures were designed to measure three different types of implicit theories; with a 3-item scale for the implicit theories of intelligence, morality, and the world. These were originally measured through items asking the respondent if they believed the attribute to be fixed (e.g., "You have a certain amount of intelligence and you really can't do much to change it") (Dweck et al., 1995a, p. 271). Through these items it was believed that one should be able to analyse and interpret human actions springing from implicit theories about intelligence.

Over the course of these studies a clear pattern of high internal reliability emerged for the implicit theory of intelligence. This, along with the implicit theory being significantly predicted by both the implicit intelligence theory and the implicit morality theory, showed that the tool could be considered to be both reliable and valid. The tool for implicit theories of intelligence was later reworked to be an 8-item scale (Dweck, 2000) using a 6-point Likert scale (Likert, 1932). This reworked version of the tool introduced four items each for the two types of mindset, keeping the original three items regarding fixed mindset from the previous (Dweck et al., 1995a) version with the addition of "To be honest, you can't really change how intelligent you are". In order to also cover the growth side of mindset four new items were added (see Appendix B, Table B5).

As more than 25 years have passed since the invention of the scale it has become priority to improve its reliability. Such an attempt was made by De Castella and Byrne (2015) who set out to answer whether asking a student about their beliefs of intelligence in themselves differed from asking them about their beliefs of intelligence in general. It was their belief that this switch from a third-person to a first-person perspective might assist in explaining a larger degree of variance in indicators of achievement and motivation. All items were therefore reworded to reflect this change (e.g., "To be honest, I don't think I can really

change how intelligent I am") (see Appendix B, Table B5). From this point onwards, the revised scale will be referred to as the Theories of Intelligence (self-theory) scale for clarity.

The respondents ($N = 680$) were all took the original Theories of Intelligence scale (Dweck, 2000), alongside the Theories of Intelligence (self-theory) scale (De Castella & Byrne, 2015). In order to establish which version of the scale explained the greatest amount of variance they also measured indicators of motivation and achievement. The researchers conducted a within-subject t-test as a way to compare the two scales (De Castella & Byrne, 2015). Both versions of the questionnaire showed good internal consistency, with the self-theory version having a slightly higher alpha level than the original. As further evidence of the improvements made in the self-theory version, both the fixed self-beliefs subscale ($\alpha =$ .90) and the growth self-beliefs ($\alpha = .92$) had higher values of internal consistency than their contemporaries in the original version ($\alpha = .87$ and $\alpha = .88$ respectively). Respondents also showed a significantly greater degree of growth mindset when answering the self-theory version alongside the original scale, although this was only a small effect. As a final note, both the original and the self-theory scales were able to explain a significant amount of variance, but the self-theory version was able to predict unique variance to a greater degree (1-6% more) than the original in all but one of the variables measured.

Contemporary Research of Mindset Relevant to the Current Study

Mindset is often portrayed through a goal-orientation viewpoint, meaning that one looks to the individual's personal reasoning's or implicit inferences for taking a particular course of action (Dweck et al., 1995a, 1995b). The chief concern with mapping mindset in the current demographic, the majority of which is in the age group 19-25 years (see Table 1), is whether this age-group is able to experience changes in mindset at all. Given that major cognitive developments chiefly takes place during adolescence, e.g., social cognitive (Choudhury et al., 2006), it is not unreasonable to assume that university students might be past the point of drastic changes in their views on learning and the nature of intelligence (Park et al., 2020). These students do however undergo a drastic change in daily lifestyle, exposure to new viewpoints (Lefkowitz, 2005), psychosocial well-being (Bewick et al., 2010), education attainment and persistence (Mayhew et al., 2016, pp. 378-414), and general cognitive change (Mayhew et al., 2016, pp. 109-137); which might incite change in mindset.

The original Theories of Intelligence scale has been used in a wide array of settings to examine possible pros and cons of the two mindset types, but mostly in educational settings. Mindset has been shown to have a clear effect variables critical to academic success, from

grades (Blackwell et al., 2007; Costa & Faria, 2018), achievement (Costa & Faria, 2018), self-esteem and behavioural reactions to encountering challenges (Robins & Pals, 2002), to offsetting the disadvantages inherent with low-income backgrounds (Claro et al., 2016). This might also seem to be somewhat influenced by cultural factors; with a recent meta-analysis finding that students from Asia and Oceania showed a significant positive association between growth mindset and achievement, but students from Europe having a significant positive association between fixed mindset and achievement (Costa & Faria, 2018).

A particular point of interest in contemporary research into mindset is the existence, or possible non-existence, of gender differences. For starters, some research has found slight differences in how males and females respond to setbacks when facing difficult math questions. Here it was found that females possessing more of a fixed mindset experiencing a stronger feeling of hindrance (Dweck, 2007). This is nuanced by findings that females with a higher degree of growth mindset have shown a higher degree of mathematical achievement than males (Degol et al., 2018). Although such aforementioned research seems to indicate the existence of gender differences in mindset, yet other research seems to indicate that there are no such differences between genders (Macnamara & Rupani, 2017).

Further findings by Sigmundsson et al. (2020b) shone some light on the gender differences in the relationship between grit and growth mindset. Their research showed that females had a slightly higher correlation between grit and growth mindset than males, though both of these were significant in their own right. Along the same veins research by Park, Tsukayama, Yu and Duckworth (2020) has also shown that there ought to be a positive relationship between grit and growth mindset. Their research indicated this fact by showing that these variables reciprocally predicted rank-order increase in one another, thereby strengthening the idea of them being mutually reinforcing.

The Malleability of Mindset

As pointed out by Dweck et al. on multiple occasions (e.g., Dweck et al., 1995a; Yeager & Dweck, 2012) it has always been the belief that mindset can be changed through intervention or general education. This belief has also seen backing from contemporary research.

To follow up on previous research Yeager et al. (2014) performed three studies meant to establish whether high school students in their first month of high school could change their mindset through a short intervention. As a result of this intervention, meant to change participants' mindset from fixed to growth, it was found through two separate studies at

different schools that the intervention had had a significant effect on students' responses to encountering social adversity, stress and illness 8 months later. Similar findings have also appeared in later research (Schleider & Weisz, 2018; Yeager et al., 2019).

In this context it is important to note that the interventions used in these studies are highly varied in their scope, length, and participants. Common for most of these interventions is however the focus on educating students about the concept of neuroplasticity ("the capacity of neurons and neural networks in the brain to change their connections and behaviour in response to new information, sensory stimulation, development, damage, or dysfunction") (Rugnetta, n.d.), and through this giving the students scientific backing for the malleability of their own intelligence.

Indicators of the positive effects of mindset intervention have, however, not gone undisputed. Some studies have found nonsignificant results when seeking to establish the potential results of mindset interventions, e.g., a recent large study ($N = 4,584$) where teachers in the United Kingdom were trained to give lessons in growth mindset (Foliano et al., 2019). The perceived efficacy of such intervention for the larger student population, and the resources required to perform them, have been questioned by some researchers calling for these resources to rather be spent elsewhere (Sisk et al., 2018).

As pointed out by Miller (2019) much of these findings into mindset are criticized and questioned in large part because of their relatively small effect estimate ($0.05 – 0.1$), with the classifications for what constitutes a "small" or other effect being liberally used and poorly understood amongst psychological researchers (Funder & Ozer, 2019). Effect size in the context of research indicates the strength of associations, and can therefore be used to judge how practical the findings of a study are, or it can be used in order to estimate the required sample size of an experiment (Sun et al., 2010). It is therefore troubling that Psychological research has long been plagued by an overreliance on statistical significance, while at the same time largely ignoring effect size (Fritz et al., 2012; Sun et al., 2010).

The relatively small effect size of these interventions has not been universal across all demographics, however. A common finding in multiple studies and meta-analyses covering such interventions is the positive effects it has had on academic engagement and achievement, as measured through grade point averages, especially in at-risk groups (e.g., minorities and/or low-achieving individuals) (Aronson et al., 2002; Sarrasin et al., 2018; Yeager et al., 2019; Yeager et al., 2016). Through this research it would appear that one's mindset, although not specifically relating to mindset for intelligence, can be changed as a result of intervention or personal effort to do so.

The Theory Behind the Motivation Concept

Few concepts are as widely discussed, recognized, and disagreed upon in educational psychology as the effects of motivation. Motivation is recognized by most researchers as a driving force behind central concepts in learning; like information literacy (Ross et al., 2016), the creation and consolidation of new memories (Wise, 2004), grade point averages (Robbins et al., 2004), retention (Alarcon & Edwards, 2013), as well as intelligence and school achievement (Kriegbaum et al., 2018). This is reflective of the term's Latin roots ("movere", to move), with most theories agree upon motivation being a force that encourages action or energization in the individual. It is therefore perhaps little wonder that theories concerning motivation are as plentiful as they are varied. This fact may become all the more apparent when most of the previous theories presented in this paper mention motivation to some degree or another. When describing the concept of passion motivation was presented as a driving force for actions which we find personally important, and in mindset it has been stated that one's mindset can influence motivations when meeting opposition.

Given how fundamental of a term *motivation* is in psychology, and its importance in pedagogy, it is important to establish some of the theory behind the term. One could argue that seeing motivation in light of it merely being a "driving force of action" could be considered too vague of a definition to be of meaningful use. Some space will therefore be dedicated here to explain the theoretical origins and conceptualizations of the term in the field of psychology which will be used going forward.

Two of the most influential psychologists in the field of motivation in modern times, Edward L. Deci (b. 1942) and Richard M. Ryan (b. 1953), have given a comprehensive and clear summary of motivation in the modern age. They establish that motivation as a construct, regardless of theory, is what gives humans the drive to act (Deci & Ryan, 1985). The theories of what dictates motivation as a fundamental driving force is largely defined by the theoretical field one subscribes to, from mechanistic to organismic. A mechanistic approach would assume a human to be driven based on reinforcement (e.g., reward or punishment) and the responses one accrues over time with different reinforcements (Deci, 1975, pp. 5-13). On the flipside, an organismic approach makes the assumption that humans act on both internal and external stimulus in order to satisfy their needs (Deci, 1975, pp. 13-20).

The approaches of mechanistic and organismic fall on widely different ends of the continuum of motivational theories. To exemplify this one can point out that the theories of Clack L. Hull (1884 – 1952 and Burrhus F. Skinner (1904 – 1990) would be considered mechanistic in nature, with the field of Behaviourism being a prime example. On the

organismic side one can find theorists like Fritz Heider (1896 – 1988) and Robert Winthrop White (1904-2001), who contributed to the rise of Humanistic Psychology as a scientific field. Considering the subject matter of this paper it would seem most prudent to assume a definition more in the realm of the organismic branch. For this purpose, motivation will be defined in accordance with the self-determination theory (Ryan & Deci, 2000b). As will become readily apparent the self-determination theory offers little in the way of a single concise definition of motivation, but it does give a framework for understanding motivation and the effects and internal processes which might affect said motivation.

Self-Determination Theory

The self-determination theory (Ryan & Deci, 2000b) started out as a separation between internal (intrinsic) and external (extrinsic) motivation (Deci, 1971), but this has later been greatly expanded upon to include theories of fundamental drives, general well-being, and adaptive behaviour (Deci & Ryan, 2008; Ryan & Deci, 2008). Self-determination theory is an approach to explaining human motivation, alongside why humans choose certain actions over others. As a part of this, it argues that humans have three innate psychological needs that are crucial to growth and functioning: (a) competence, (b) relatedness, and (c) autonomy (Deci & Ryan, 2000). A need in this context is defined as "innate psychological nutriments that are essential for ongoing psychological growth, integrity, and well-being" (Deci & Ryan, 2000, p. 229), with all three being necessary to obtain a high degree of functioning and psychological health. Competence refers to a "feeling of mastery, a sense that one can succeed and grow" (Ryan & Deci, 2020, p. 1); relatedness concerns "a sense of belonging and connection" (Ryan & Deci, 2020, p. 1), which often leads one to develop social connections of a secure and giving nature (Deci et al., 1991); and finally, autonomy revolves around "a sense of initiative and ownership in one's actions" (Ryan & Deci, 2020, p. 1).

The three innate psychological needs all feed into the concept of motivation. Specifically, there are two distinct types of motivation: extrinsic and intrinsic motivation (Ryan & Deci, 2000b). However, both intrinsic and extrinsic motivation are forms of motivation, meaning that these are further nuanced by situations where motivation is absent, known as amotivation. Extrinsic motivation acts as the motivation for primary drivers (e.g., fundamental needs like food and water) that can act intrusive on our awareness when not met (Deci & Ryan, 1985, p. 32; Ryan & Deci, 2000a). In contrast to this, intrinsic motivation is based on "the innate, organismic needs for competence and self-determination" which in part

drive us to find suitable challenges for ourselves (Deci & Ryan, 1985, pp. 32-33) merely because it is enjoyable, interesting or rewarding (Ryan & Deci, 2000a).

Regarding the innate psychological needs, one would have to satisfy these in order to achieve intrinsic motivation, which in turn can lead to growth (Deci & Ryan, 2000). In particular, it would appear that the needs for autonomy and competence are especially important when promoting intrinsic motivation; with autonomy being required for all types of motivation, but autonomy being a perquisite for intrinsic motivation. Based on this one might start to see the interconnected and complex model start to take shape.

The distinction between intrinsic and extrinsic motivation can, however, be drawn at a more fundamental level as well. Deci and Ryan (2000) states that the "self" part of self-determination theory stems from their view of the human self as the core of the human beings drive to act. The self dictates the integration and expression of all intrinsic and extrinsic motivation alongside our values, and acts as the core formed over the course of the human life. From birth all humans have a nascent self which dictates our innate psychological needs, the tendency of humans to act on stimulus in their environment, and the ability to integrate yet further factors into our sense of self. As the human life passes yet more aspects are integrated into one's self which, depending on how one is exposed to and integrates these aspects, can give rise to intrinsic and extrinsic motivation. As such, actions that we have not integrated into our selves cannot be considered to be self-determined, and therefore give rise to no motivation. For an overview of this model see Figure 1.

The picture of intrinsic and extrinsic motivation has been further nuanced with the introduction of the sub theory known as the cognitive evaluation theory (Deci & Ryan, 1985). This new addition sought to explain the factors which might affect intrinsic motivation. As a part of this the authors also introduced the organismic integration theory (Deci & Ryan, 1985), with the intention to differentiate between the types of extrinsic motivation. As a part of this the authors detailed the factors that might encourage or hinder successful internalization and regulation of behaviours associated with such extrinsic motivation types (see Deci & Ryan, 2000; Ryan & Deci, 2000b).

With the introduction of the organismic integration theory Deci and Ryan (1985) had established a complex and comprehensive model. In this model intrinsic and extrinsic motivation are part of a self-determination continuum ranging from controlled to autonomous (Deci & Ryan, 2008). Herein lies the distinction between actions that one engages in as a function of how one's sense of self drives volition (autonomous motivation), and the actions driven by external powers of reward and punishment (controlled motivation). The contrast

between these categories can be exemplified by how they are regulated and made manifest in the individual. Where autonomous motivation results in a feeling of purpose and eagerness, controlled motivation is driven by the need to avoid personal consequences and a sense of compliance to an outside actor or system. The entire self-determination continuum therefore stretches from the total absence of motivation (amotivation); to the motivation originating out of obligation, rewards and punishments; and finally, to the motivation stemming from pure enjoyment and interest (Ryan & Deci, 2000b) (see Figure 1).

Figure 1

The Self-Determination Continuum Model

The Self-Determination Continuum Showing Types of Motivation With Their Regulatory Styles, Loci of Causality, and Corresponding Processes

Behavior	Nonself-Determined					Self-Determined

Motivation	Amotivation		Extrinsic Motivation			Intrinsic Motivation
Regulatory Styles	Non-Regulation	External Regulation / Introjected Regulation	Identified Regulation	Integrated Regulation		Intrinsic Regulation

Perceived Locus of Causality	Impersonal	External	Somewhat External	Somewhat Internal	Internal	Internal
Relevant Regulatory Processes	Nonintentional, Nonvaluing, Incompetence, Lack of Control	Compliance, External Rewards and Punishments	Self-control, Ego-Involvement, Internal Rewards and Punishments	Personal Importance, Conscious Valuing	Congruence, Awareness, Synthesis With Self	Interest, Enjoyment, Inherent Satisfaction

Note. This figure was taken from Ryan and Deci (2000b, p. 72)

The Student Opinion Scale

Seeing as motivation is already covered indirectly by other measures in this paper it would possibly serve to gain increased insight and clarity to include a separate measure of general motivation. To fulfil this purpose the Student Opinion Scale (Sundre & Moore, 2002) was chosen. This model was designed as a development of the motivation scale created and tested by Wolf and Smith (1995), which in turn took heavy inspiration from the self-determination theory. The Wolf and Smith scale focused on measuring motivation as a single variable through a questionnaire given immediately after having completed a test. Herein the construct of student motivation in test-taking was proposed to consist of three components taken from the self-determination theory: (a) student expectancy (beliefs in one's own ability to perform a task), (b) values (how important succeeding in the task is), and (c) affect (the emotional

reaction to taking the test). This focus on one's motivation for taking a test was furthered by Sundre and Moore in their Student Opinion Scale (2002) a few years later.

This revised version made a few changes to make it more in line with contemporary research. Chiefly, it added two subscales in the form of *importance* and *effort*. For this purpose, importance was originally defined as "how important doing well on the test is to the student" and effort as "the perceived degree of work or mental taxation put forth in completing the test" (Sundre & Thelk, 2007, p. 15). It kept the 5-point Likert scale (Likert, 1932) of the previous version, but decided to add items so that each subscale consisted of five items (e.g., "I engaged in good effort throughout these tests" and "These were important tests to me"). In these items one can see the self-determination theory shine through with its focus on personal reasonings and values for action. The Student Opinion Scale was in part chosen for the current study because of its consistently good reliability ratings in college students (Sundre & Thelk, 2007) and over years of research studies (Thelk et al., 2009).

Contemporary Research of Motivation Relevant to the Current Study

One piece of research that turned out to be highly relevant to the current study was the article created by Jacobs and Newstead (2000). This article sought to map the potential motivational changes for students in a 3-year study in psychology. These respondents were all asked to provide data on both their general motivation as well as their motivation for individual course subjects. Their findings were that student motivation, both specific for particular subjects and more general, showed a downward curvature from an open day at the university (before starting the first year) throughout the second year. This was however offset by most factors (e.g., subject specific skills and personal development) increasing in the third year. Of most relevance to this study is however the score for motivation with regard to knowledge in the subject of *cognition and biology*, which showed a consistent downward development with no recovery in the third year.

Of further interest in discussing motivation is the fact that in the first semester of 2020-2021 half of all learning community meetings at NTNU were conducted digitally rather than in-person, because of the ongoing COVID-19 pandemic. Although research into the effects of the pandemic on tertiary education is still young, some preliminary studies have indicated that motivation suffered over the course of the pandemic (Reich et al., 2020; Shin & Hickey, 2020). It is however important to point out that the setup and responses of individual institutions and governments could arguably have affected this to a rather large degree.

If one were to only look at the research into the digital aspects of education then one of its apparent primary challenges would be the perceived lack of both motivation and time (Aragon & Johnson, 2008). It can be argued that both motivation and time might prove more stressed during the ongoing pandemic. Further, there are some indications that digital education might lead to lower rates of motivation in students (Carr, 2000), especially if the instructor/leader shows little presence or immediacy (Baker, 2010). This might even go so far as to make intrinsic motivation harder to achieve, whilst extrinsic motivational factors remain as pressing as ever (e.g., though exams and assignments).

One further factor that might affect learning community leaders' ability to facilitate motivation in the students is what Kunter et. al. (2008) referred to as *professional competence*. This states that if a leader lacks the necessary knowledge and/or experience base to engage the students at a suitable level one could see a net decrease in motivation, or even higher dropout rates. Depending on the learning community leaders' and students' experience with online learning, it might prove challenging for the students to express the levels of motivation they would under differing circumstances. This is a probable challenge when one considers that all community leaders are themselves students, with the individuals serving as leaders for these groups regularly changing as a result of the leaders finishing their degree or quitting for unrelated reasons.

Findings by multiple sources have also located several points on which females and males appear to differentiate themselves in motivation. Jacobs and Newstead (2000) found that females in general showed higher value ratings for motivation, and a report by the National Postsecondary Education Cooperative (NPEC) (Kuh et al., 2006) found that females were on average more engaged in academic studies and more likely to participate in learning communities. These findings might also be somewhat explained by self-selection effects (Andrade, 2007; Zhao & Kuh, 2004) in the sense that learning communities attract individuals that could be considered to be above standard in their motivation. The prevalence of self-selection effects might be generalized to most research pertaining to learning communities, with the exception being the few situations where participation is mandatory or the distribution of students is handled by an administrative entity.

Luckily, some research has been conducted on motivation in learning communities. Beachboard et al. (2011) found that a feeling of relatedness amongst learning community students could explain as much as 5% of the explained variance in academic development 9% of job preparation. Further, it was also established that relatedness was a significant mediator

of learning community participation. This helps to underpin the value of learning communities in creating an environment of intrinsic motivation, in part through relatedness.

The Malleability of Motivation

From a purely theoretical standpoint the self-determination theory makes it clear that motivation can shape itself based on the environment and experiences of the individual and internalisations into the self. The central question in this regard thus becomes if the practice aligns with the theory with regard to showing change in motivation. If such construct malleability can be established, it is also relevant to establish the circumstances under which such changes can take place in order to see potential transferable validity to the current study.

Interventions based on self-determination theory is a well-established concept in the realms of physical exercise (Teixeira et al., 2012), health programs (Gillison et al., 2019), and education (Lazowski & Hulleman, 2016). Beyond merely seeking to influence individual motivation, interventions in the self-determination sphere place much value in satisfying the individuals innate psychological needs (autonomy, competence, and relatedness). Any intervention following this framework therefore has a focus on how the individual distributing the intervention (e.g., a physician or teacher) can satisfy these needs, with a special focus on autonomy-support (Ryan et al., 2008). Through this it is believed that one can influence how an individual prioritizes their lifestyle and values.

Of most interest to this study is the effects experimental manipulations have shown in educational settings, with the separation between the effects of intrinsic and extrinsic motivation having become clearer. As an example of this one can look to research by Vansteenkiste et al. (2004), who performed three separate studies into how text material and physical exercise could affect the intrinsic and extrinsic motivation of Belgian students ($N = 620$). These studies measured intrinsic motivation through community contribution (recycling awareness), personal growth (communication styles), and personal fitness (learning a sport). The first two studies focused on a reading exercise, and the last asked the students to engage in learning Tai-bo (an Asian sport). In all three instances some participants were given information appealing to extrinsic motivation (e.g., learning Tai-bo will help you stay physically active), while others received information meant to appeal to an intrinsic motivation (e.g., learning about communication styles can help your personal development). These were presented in a controlling or autonomy-supportive fashion (e.g., "you have to vs. if you choose"). Over the course of these three studies respondents were measured on their

deep processing of information, test performance, free choice persistence, and autonomous motivation.

The study by Vansteenkiste et al. (2004) found that intrinsic motivation had a significant effect on test performance, depth of processing, and persistence in all instances. The first study found that intrinsic framing paired with autonomy support, as opposed to extrinsic framing with a controlling context, made a clear difference. These two routes gave vastly differing results in autonomous motivation for learning, alongside grades, deep processing of material, and free choice persistence. Interaction between the respondents' intrinsic goals and autonomy support was also significant for all variables, except free-choice persistence. These findings were echoed in the two latter studies, with them also finding significant effects for intrinsic goals and autonomy supporting environments. This shows how motivation for learning in both academics and physical activity can be influenced by intrinsic motivation and autonomy-support. The importance of student choice and motivation has been echoed in further studies (e.g., Patall et al., 2010), with implications for how students choose to allocate their free time (Chatzisarantis & Hagger, 2009).

Further findings have also been made with regard to the role extrinsic motivation serves in education. In a report based on a meta-analysis Deci et al. (2001) described the potential effects this might have on enhancing extrinsic motivation. In this context it is important to separate between the effects of tangible rewards (e.g., material gains or resources) and verbal rewards (e.g., positive comments or praise). Tangible rewards showed a clear pattern of reducing intrinsic motivation in students. On the basis of 162 studies, of which 92 employed free-choice measures and 70 self-report measures, it was found that tangible rewards significantly reduced self-reported interest and intrinsic motivation for learning. Besides this research has also identified potential sources of classroom autonomy maluses in the use of deadlines (Amabile et al., 1976), competition (Deci et al., 1981), and enforced rules/limits (Koestner et al., 1984). It would therefore appear that the use of rewards such as money or diplomas, alongside authoritative and enforcing methods, might actually serve to undermine students' intrinsic motivation, especially in younger students.

The Importance of Attendance

Attendance has long been used as a measure of a wide array of effects. Though the literature is somewhat inconsistent on some of these effects, such as the relationship between student attendance and academic performance (see Büchele, 2021), there are clear trends in attendance research that ought to be of interest to any study investigating variables of

learning. As an example of the relevance of attendance on can look to the research by Burd and Hodgson (2006), which based on 5 years of gathered data found a strong significant correlation between attendance and attainment (as measured through end-of-semester grades).

Research has further indicated that attendance in co-curricular activities, such as learning communities, have a significant effect on overall academic achievement (Bergen-Cico & Viscomi, 2012; Rathore et al., 2018). On a more specific basis, it appears that grit and attendance together might help predict academic success (Cosgrove et al., 2018), and that motivation seems to offer some mediating influence on learning strategies (Stegers-Jager et al., 2012). One can therefore speculate that grit and motivation, if not all variables explored in this study, could be affected by or in turn affect the variable of attendance.

The perceived reasons for why student miss lectures or other activities, such as learning community gatherings, are many and varied. It is in this regard also important to account for the effects of more practical variables which might affect attendance, such as the necessity of having a job besides studies (Ford et al., 1995; Longhurst, 1999) and other time constraints. For in some cases, attendance comes down to how the educational system is organized rather than any psychological variable affecting the students. Alongside this one also has to look at the psychological variables at play.

In the current study attendance has been treated as an indirect way by which to look at the impacts of the circumstances surrounding COVID-19. This was done by taking the attendance rates of the first semester in 2019-2020 and compare this to the same period in 2020-2021. By comparing a semester with COVID restrictions to one without one could hope to gleam how the change in circumstances have affected both the students themselves and the learning community programme as a whole.

Hypotheses

On the basis of the research and findings presented in this paper a few hypotheses relevant to the current study were formed. See the Purpose part of this paper for a reminder on the research questions which underpin these hypotheses. Below are listed the hypotheses relevant for the variables of grit, passion, mindset, motivation, and attendance.

Grit Hypotheses

Researchers have pointed towards the trend of grit increasing over the course of normal education (Bowman et al., 2015; Duckworth & Eskreis-Winkler, 2013), even without including the potentially beneficial effects of interventions or training based on grit (Alan et

al., 2019; Rhodes et al., 2018). For this reason, it is predicted that the grit scores of the respondents will show a small significant increase from the first measurement to the third. Alongside this it is also speculated that the persistence of effort aspect of grit specifically will have a small significant increase from the first measurement to the third. There might also be a small change in the levels of consistency of interest aspect in respondents, but given recent research casting doubt as to this subscales validity in regard to longitudinal measures (Bowman et al., 2015; Muenks et al., 2018) this will be judged with some scepticism.

With a basis in the research by Park et al. (2020) and Sigmundsson et al. (2020b) there have been findings that have shown a significant relationship between the constructs of grit and growth mindset. It is therefore hypothesized that there will be a significant and positive correlation between grit and growth mindset at all measurement times for the students partaking in this study. Whereas Sigmundsson et al. (2020b) found significant gender differences in grit, other studies have not found such differences (e.g., Duckworth et al., 2007). Based on this there is predicted to be no significant gender differences in grit.

Given that all students participating in this study are yet to complete their degree this might provide some useful insight into students' levels of grit. It is possible that students seeking higher degrees ought to also have more inherent grit, with those actually completing higher degrees showing elevated levels of grit (Duckworth & Eskreis-Winkler, 2013). It is therefore speculated, though somewhat anecdotal in nature, that students in the bachelor's programme will prove to have a significantly higher degree of grit than those in the one-year programme at all measurement times.

Passion Hypotheses

The research of Schellenberg and Bailis (2015), alongside that of Carbonneau et al. (2008) have given important insight into the potential of change in passion. Though there are clear theoretical grounds on which one can assume such change to be possible, this has to little degree been reflected in the research as such. This has led to the current hypothesis of there being no significant change in the respondents' passion scores over a 3-month period.

Of a more ambiguous nature is the potential gender differences in passion. Whereas Sigmundsson et al. (2020b) found males to have a higher degree of passion than females, findings by Szabo et al. (2019) indicate that this might just as well be the result of cultural differences rather than anything inherent to gender. Given the differing findings when comparing genders in passion score, the hypothesis will be that no gender differences in passion will be apparent at any measurement time.

Mindset Hypotheses

Respondents in the current study largely consists of adults in the ages of 19-25 years (see Table 1 and Table 2). This is a demographic that has experienced school and general learning through many years and might therefore be assumed to have already made up their minds when it comes to the perceived malleability of one's own intelligence. Therefore, in accordance with the research of Park et al. (2020), it is hypothesised that minor, if any, significant changes can be observed in student mindset across the three measurement points.

In mindset there have been somewhat differing findings with regard to gender differences. Some have found circumstantial indications of females being more susceptible to setbacks (Dweck, 2007), others that females with a growth mindset are better at certain skills than males (Degol et al., 2018), and yet further studies have found no such gender differences (Macnamara & Rupani, 2017). Based on the divisiveness of this research there is theorized that no significant gender differences in the mindset scores of respondents will be found at any measurement time.

Motivation Hypotheses

On the grounds of the applicable research by Jacobs and Newstead (2000) into the motivation of psychology students it is hypothesized that motivation will show a weak significant downward development from the first to the third measurement across all demographics. This hypothesis is also supported by the potential effects of emergency remote learning on motivation. When considering that the learning community leaders themselves are students, and might struggle to achieve a level of professional competence (Kunter et al., 2008) in an educational form they themselves have little experience with, it is reasonable to assume that motivation amongst the group types would show a downward trend.

Based on the same study by Jacobs and Newstead (2000), and some logical inference, it is also believed that students in the bachelor's programme will have a significantly higher degree and show a slower decline of motivation when compared to students in the one-year study at the first and last measurement. Also based on this study, alongside the study by Kuh et al. (2006), it is hypothesized that females will have a small but significantly higher degree of motivation when compared to males.

Attendance Hypotheses

Little data has been published that indicates how learning communities might be affected by the still ongoing COVID-19 pandemic. Some limited evidence supports that

learning communities can foster a sense of community and help give educational insight during a time where physical lectures and learning community activity was impossible (Anderi et al., 2020). These findings are however superficial at best and give little actual insight into how the drastic changes in structure has affected learning communities.

Given that the pandemic has led to a need for increased digital education and drastic changes in social interaction, coupled with community leaders' possibly lacking necessary experience with this form of education, reasonable inferences were made as to the potential ramifications this could have had on attendance. Community leaders' lack of experience in this regard might affect student motivation (Kunter et al., 2008), which previous research has indicated to have a strong effect on attendance in college and university students (Devadoss & Foltz, 1996). This led to the hypothesis that there will be a significantly lower overall attendance from students, alongside an increase in dropout rate, when comparing the first semester of 2019-2020 and 2020-2021.

Methods

Respondents

All respondents were students at NTNU in the first semester of the 2020-2021 academic year. They were all partaking in the introduction course subject named PSY1013 (Biological Psychology 1) and were part of the learning community groups arranged by the Department of Psychology for this subject. Given that this was an introductory subject most students were in their first year of studying psychology (see Table 1). These groups were divided by the three study programmes that participated in the psychology course (one-year study, bachelor's degree, master's degree in clinical psychology).

Each learning community group was led by a student who had previously completed the course subject which the community groups were centred around. These learning assistants were hired by the Department of Psychology based on criteria such as: insight into the curriculum and themes being taught, good cooperation skills, and problem-solving initiative (taken from the job posting provided to eligible students in the spring of 2020). Their role was to plan and hold educational activities, such as presentations and creating theoretical tasks for the students to solve, with the support of a learning community coordinator responsible for the individual leaders in the subject. These leaders were all required to have completed a mandatory course meant to give insight into the pedagogical role and activities involved with being a learning assistant (e.g., providing guidance and

feedback, creating a healthy learning environment) (NTNU, n.d.). This course could be taken in parallel with the start-up of the learning communities.

Data collection was completed in three measurements over the course of the first semester in the 2020 – 2021 academic year. The learning communities started on the 31st of August, from this point designated as week one of the study, and the last official gatherings were on the 13th of November (week eleven). Each period of data collection lasted two weeks, starting Monday and ending on Sunday of the next week. Respondents were sent a link to the questionnaire web page Nettskjema.no in the third, the eight, and the twelfth week; with the final gathering of data took starting after the learning community had completed. All data collection ceased after the third period ended 22.11.2020, 23:59 o'clock. Of all students asked, 109 signed up to participate, 94 students participated on the first measurement, 81 on the second, and 72 on the third (see Table 1). These measurements periods will henceforth be referred to as T1 (week 3 – 4), T2 (week 8 – 9), and T3 (week 12 – 13) respectively.

Throughout the current study the that the majority of respondents were in the age group 19 – 25 years (T1 $n = 91$, T2 $n = 79$, T3 $n = 70$) and were female (T1, $n = 75$; T2 $n = 65$, T3 $n = 60$) (see Table 1). Alongside this most respondents had completed Norwegian high school (T1 $n = 72$, T2 $n = 60$, T3 $n = 54$), a one-year study in tertiary education (T1 $n = 12$, T2 $n = 11$, T3 $n = 11$), or a bachelor's degree (T1 $n = 9$, T2 $n = 9$, T3 $n = 6$). The individuals were divided into learning community groups based on their chose study programme in psychology. Of these most were in the bachelor's programme (T1 $n = 54$, T2 $n = 46$, T3 $n = 40$) or one-year programme (T1 $n = 36$, T2 $n = 34$, T3 $n = 29$).

Design and Procedure

The semester started with the students voluntarily entering into learning community groups. In order to fit with the schedule of most students the groups were set up to meet at a variety of different times during the week, meaning that most students could find a time to fit their own schedule. This also opened up for students entering into the same groups as their friends. A total of 17 learning community groups were arranged in the first semester of 2020. Two of these groups were excluded from participating in the current study due to the author having a personal relation to the groups in question (see Limitations). All of these groups centred around the course subject of Biological Psychology 1 (PSY1013), which was chosen due to the researcher's four years personal experience with good attendance in these groups.

Table 1

Sociodemographic Characteristics of all Respondents

Baseline characteristic	T1		T2		T3	
	n	%	*n*	%	*n*	%
Age						
19-25 years	91	97	79	98	70	97
26-35 years	2	2	1	1	1	1
36-45 years	1	1	1	1	1	1
Gender						
Female	75	80	65	80	60	83
Male	18	19	15	19	11	15
Other	1	1	1	1	1	1
Education level						
Norwegian high school	72	77	60	74	54	75
One-year study	12	13	11	14	11	15
Bachelor's degree	9	10	9	11	6	8
Master's degree	1	1	1	1	1	1
Learning community type						
One-year programme	36	38	34	38	29	40
Bachelor's programme	54	57	46	57	40	56
Clinical programme	4	4	4	5	3	4

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Over the course of the first two weeks of the project the potential respondents were given information pertaining to the purpose, participation criteria, potential rewards, and data security of the study (see Appendix A). Interested students were sent an invitation to register for participation in the study. This link took potential respondents to a web-address that required the respondents to log in with their student ID. This was done in order to control whether respondents were indeed students at NTNU during the course of the study.

The questionnaire also asked respondents to fill in relevant demographical information, which were later used as covariates during analysis. The following covariates were measured: age, gender, education level, and learning community group type. Respondents could select from 5 age ranges: 19-25 years, 26-35 years, 36-45 years, 46-55 years, and 56-65 years. Gender could be classified as female, male, or other. The options for highest achieved education level were: Norwegian high school ("videregående skole"), college ("høyskole"), one-year study, bachelor's degree, master's degree, and doctorate's degree. Finally, they were asked to designate which of the 15 participating community groups they were a member of. The demographical data gathered can be seen in Table 1 and Table 2.

All respondents had the option to answer the questionnaire again after the last measurement in order to see their scores in the variables measured. Besides the possibility of gaining insight into their scores, all respondents who participated in all three measurements had the possibility of winning one of six gift cards to the value of 200 NOK (Norwegian kroners). An individual's participation was controlled by the final item in the last questionnaire asking if they had participated in all measurements or not.

As the final measurement (T3) saw 72 total respondents, a randomization of respondents at T1 and T2 had to take place as the analysis method chosen requires an even number of respondents at all repetitions (see Analysis). The demographical data for these randomized respondents can be seen in Table 2. T1 also included a short tool (10 items) designed in cooperation with the Department of Psychology, with the purpose of gathering data on student motivation for starting a study in psychology. Seeing as this tool is not included much the current study, this will not be commented upon further.

Table 2

Sociodemographic Characteristics of Randomized Respondents

Baseline characteristic	T1		T2		T3	
	n	%	*n*	%	*n*	%
Age group						
19-25 years	69	96	70	97	70	97
26-35 years	2	3	1	1	1	1
36-45 years	1	1	1	1	1	1
Gender						
Female	56	78	59	82	60	83
Male	15	21	12	17	11	15
Other	1	1	1	1	1	1
Education level						
Norwegian high school	54	75	55	76	54	75
One-year study	11	15	10	14	11	15
Bachelor's degree	6	8	6	8	6	8
Master's degree	1	1	1	1	1	1
Learning community type						
One-year programme	26	36	28	39	29	40
Bachelor's programme	43	60	41	57	40	56
Clinical programme	3	4	3	4	3	4

Note. T1 = measurement time 1, T2 = measurement time 2, T3 = measurement time 3.

Measures

Attendance Measure

       Through correspondence with the body responsible for the learning communities at The Department of Psychology attendance data for the learning communities in four course subjects (PSY1010, PSY1011, PSY1013, and PSY1018) were attained. The data was originally gathered by the individual leaders of the learning community groups in order to catalogue weekly attendance for each group. Of these only the data of PSY1013 (Biological Psychology 1) was used for further analysis, as this subject was the focus of the current study. The data covered attendance for the first semester of the study years 2019-2020 and 2020-2021. This was entered into Microsoft Office Excel, where attendance rates were calculated for further analysis in IBM SPSS. Graphs were created in SigmaPlot 14.

Grit Measure

       For this study the Grit-S (short grit scale) (Duckworth & Quinn, 2009) was employed to measure the level of grit in respondents. The items of this tool can be seen in Appendix B, Table B3. The tool uses a 5-point Likert scale (Likert, 1932), which is amongst the most used scales of its kind. This was done with the intent of comparing the different variables measured against one another, as well as against possible covariates. By answering a total of 8 items, with options ranging from 1 ("Not like me at all") to 5 ("Very much like me"), a mean grit score can be calculated for individual respondents. These 8 items are split between two subscales (consistency of interest and persistence of effort), with a total of four questions each. Questions 1, 3, 5 and 6 are reverse coded in order to ensure reduced response style bias.

Passion Measure

       The Passion Scale (Sigmundsson et al., 2020a) was used to measure passion scores of respondents in this study. To look at the individual items of the tool see Appendix B, Table B4. Despite being a rather recent addition to the field of passion research the tool by Sigmundsson et al. was chosen for this study on the following merits: (a) It was designed by testing university students in Iceland, which shares many cultural similarities with Norway; (b) It is intended as a supplement to the grit scale (Duckworth & Quinn, 2009), which is also used in this study; (c) It has shown promising data regarding internal consistency (ranging from 0.51 to 0.69), construct validity, and test-retest reliability. This scale consists of 8 items,

with options on a 5-point Likert scale. The options ranges from 1 ("not at all passionate") to 5 ("extremely passionate"), resulting in a mean score of passion across all 8 items.

Mindset Measure

The mindset scale used in this study is a variation of the updated Theories of Intelligence scale (Dweck, 2000) made by De Castella and Byrne (2015). The items of this tool are listed in Appendix B, Table B5. The Theories of Intelligence (self-theory) scale has shown slightly higher internal consistency ($\alpha = .90$) than the original scale ($\alpha = .87$), with the main difference being in the wording of the items. Where the original scale words the items in a general fashion, the variation refers to the respondents in an individual fashion. The scale is an 8-item questionnaire, with a 6-item Likert Scale ranging from 1 ("Strongly disagree") to 6 ("Strongly agree"). The scale is split between two subscales (growth mindset and fixed mindset), resulting in a mean score correlating to the respondent's level of fixed mindset (closer to 1 = more fixed mindset, closer to 5 = more growth mindset).

Motivation Measure

The Student Opinion Survey (Sundre & Thelk, 2007) is a commonly used tool for measuring student motivation for taking a particular test. The survey is a 10-item questionnaire with a 5-point Likert scale. It also consists of two subscales (effort and persistence) which can be used separately or combined into an overall motivation score. Seeing as the current study sought to cover longitudinal changes in respondents, some light adaptations had to be made. The original survey used a test as a primer to answer items regarding one's level of effort or persistence during that test, so in order to fulfil this part of the tool the framing of these items was changed to reflect the students' effort and motivation for the particular learning community subject they were partaking in.

In order to fit the overall design of this study the item wording was changed to the present tense (e.g., "I have given my best effort in this subject") and some longitudinal aspects were included (e.g., "I have engaged in good effort in this subject so far"). In order to better fit their intended use, the definition of importance was therefore changed to "how important doing well in the subject is to the student" and effort to "the perceived degree of work or mental taxation put forth in completing the subject". See Appendix B, Table B6 for the adapted items. A short section asking respondents to think of the particular course subject (PSY1013) when answering the items was also added to the introduction, which it was believed would serve as an appropriate substitute for the primer of the original tool.

Statistical Analysis

All analysis was performed in IBM SPSS Statistics (version 27). The primary analysis chosen was one-way repeated measures ANCOVA, with one analysis for each of the main variables measured (grit, passion, mindset, and motivation) for a total of four. Each of these analyses would control for the following variables as controls: Learning community type, age group, gender, and educational level. See Table 2 for an overview of these variables.

The Risk of Family-Wise Error. Given that four separate tests were performed on the same sample, the risk of family-wise error was pertinent. If the less strict criteria of $p < .05$ was followed the overall significance level would have equalled $1 - (1 - \alpha)^4 = 1 - (1 - .05)^4 = 0.185$. The type I error rate would therefore have been around 19%. In contrast with a stricter $p < .01$ criteria the overall significance level would equal $1 - (1 - .01)^4 = 0.039$, meaning a Type I error rate of approximately 4%. With this in mind it was decided that the more conservative criteria of $p < .01$ would be used for the analysis, with associated 99% confidence intervals (see Table 3). Alongside this a Bonferroni post-hoc test was employed in order to further establish the validity of the data (see Table 3).

Assumptions

In order to determine what was needed in order to achieve suitable effects (effect size ≥ 0.25) for a one-way repeated measures ANCOVA at significance levels $p < .05$ and $p < .01$ a power analysis using GPower 3.1 was used. This power analysis revealed that such an analysis, having 4 covariates and investigating the three primary groups a total sample size of 251 ($p < .05$) or 336 ($p < .01$) at a medium effect size (≥ 0.25) would be needed depending on the level of α error probability (p). Alternatively, if a large effect size (≥ 0.40) was set as the benchmark the number of respondents should be around 100 ($p < .05$) or 134 ($p < .01$). Seeing as the current study only managed to accrue 72 full and repeated measures this fell somewhat short of the large effect size benchmark, meaning that any results would have to be subject to increased scrutiny.

The analysis chosen stipulates five central assumptions to ensure results with good validity. These are: (a) all dependent variables are measured at a continuous level, (b) the independent variables consist of at least two related groups, (c) no significant outliers, (d) normal distribution of dependent variables in the related groups (normality), and (e) that between all related groups the differences of all combinations must be equal (sphericity). Assumption 1 and 2 can be argued for on a purely theoretical basis, with all scales used

employing a Likert Scale from 1-5 (grit, passion, motivation) or 1-6 (mindset), and the setup consisting of 15 measured groups with 3 separate times of measurement (T1-T3).

Outliers

A visual examination of box plots for grit, passion, mindset, and motivation at T1-T3 was performed to check for potential outliers. This examination revealed several points on which outliers were present (see Appendix C, Figure C1 – C12). These outliers were not removed from the analysis, on the grounds that this might be seen as tampering with the data. Outliers are assumed to be normal and somewhat unavoidable in social sciences given the large number of possible confounding variables (Frank, 2000). This is even more pronounced when the number of respondents used for analysis is relatively low ($N = 72$). Though research has indicated that the removal of such outliers does not seem to affect the error-rate or strength of the findings (Bakker & Wicherts, 2014), it was still deemed that running multiple analyses with and without the statistical outliers were beyond the scope of the current study.

The Assumption of Normality

The Shapiro-Wilk test of normality was used to investigate the assumption of normality for the variables of grit, passion, mindset, and motivation. The choice of employing the Shapiro-Wilk test rather than the Kolmogorov-Smirnov test was made on the grounds of it being more appropriate for smaller sample sizes and having an established record of being a more powerful test (Razali & Wah, 2011). The results of the Shapiro-Wilk tests can be seen in Table 4, Table 6, Table 8, and Table 10.

The test showed that there were regular departures from normality amongst all variables and/or their associated subscales. A visual investigation of the Q-Q plots supported this assumption to some degree (see Appendix D, Figure D1 – D3). This was however deemed to not have a large impact on the analyses to follow, given the effect of the central limit theorem (Kwak & Kim, 2017). Given this theorem, any data collected from a demographic of randomly selected respondents will after a certain point always achieve normal distribution. Some sources state that as long as the degrees of freedom exceed 30 the data will by nature be normally distributed (Kim, 2015). Given this the assumption of normality stands, despite the Shapiro-Wilk test and Q-Q plots indicating otherwise.

The Assumption of Sphericity

Mauchly's estimate of the sphericity did not indicate any violation of sphericity for grit ($\chi^2[2] = 1.93$, $p = .381$), passion ($\chi^2[2] = 0.558$, $p = .756$), mindset ($\chi^2[2] = 4.74$, $p = .094$), or motivation ($\chi^2[2] = 5.45$, $p = .066$). On this basis there will not be made any adjustments to the degrees of freedom for any of the variables measured in the current study.

Results

A one-way repeated measures ANCOVA was conducted to compare the effects of measurement time on grit, passion, mindset, and motivation; at the beginning, middle, and end of the first semester 2020 in Biological Psychology 1 (PSY1013) learning communities at NTNU. Subsequent independent and paired samples T-tests, alongside correlation analyses were performed in order to test individual hypotheses. The following paragraphs describes the results of the main analysis (one-way repeated measures ANCOVA), followed by results relevant for the hypotheses associated with each of the four main variables measured. Finally, at the end of this section is presented a brief overview of attendance data for the learning communities in the first semester of 2019 – 2020 and the same period in 2020 - 2021.

For a detailed breakdown of mean scores in grit, passion, mindset, and motivation when divided by learning community group type (study programme) see Appendix F, and the trends in the development of the variables were affected by respondents' previously attained education the descriptive statistics for this was included in Appendix G. These additions to the appendix are included to give a thorough and transparent impression of the data which might easily be used for further analyses in the future, even by other researchers.

Repeated Measure ANCOVA of Grit, Passion, Mindset, and Motivation

The main analysis consisted of four one-way repeated measures ANCOVA's, one for each of the main variables. Below follows a listing of the main results of this analysis. Following this are the results of analyses meant to investigate the hypotheses set for this study, divided by the four main variables (grit, passion, mindset, and motivation).

There was no significant main effect for Grit ($F[2] = 0.23$, $p = .792$, $\eta2 = .004$) (see Table 5). This was also supported with a pairwise comparison of grit showing no significant differences in measurement time (see Table 3). Passion had no significant main effect ($F[2] = 1.14$, $p = .324$, $\eta2 = .02$) (see Table 7). This was also supported with pairwise comparisons showing no significant differences (see Table 3) between T1 ($M = 3.86$, $SD = 0.78$) and T3

($M = 3.88$, $SD = 0.68$), and the mean scores showing a slight decrease in T2 before recovering to the levels at the start of the semester at T3 (see Table 6). Mindset had significant main effect (F [2] = 0.84, $p = .436$, $\eta2 = .01$) (see Table 9). Interestingly, a pairwise comparison of mindset revealed that there was a significant difference ($p < .05$) between mindset at T1 and mindset at T3 (see Table 3). Finally, motivation had no significant main effect (F [2 = 0.55, $p = .580$, $\eta2 = .009$) (see Table 11), which was supported with pairwise comparisons showing no significant effects (see Table 3).

Results of Grit Analyses

The mean scores of grit in the respondents ($N = 72$) experienced no increase between the first (T1) ($M = 3.30$, $SD = 0.31$) and second measurements (T2) ($M = 3.30$, $SD = 0.41$), and a small increase in the third measurement (T3) ($M = 3.41$, $SD = 0.39$). See Table 4 for a full overview of these data. Persistence of Effort experienced little change in mean score from T1 ($M = 3.57$, $SD = 0.60$) to T2 ($M = 3.55$, $SD = 0.61$), but a slight increase in T3 ($M = 3.67$, $SD = 0.51$). Consistency of interest had a very slight increase from T1 ($M = 3.04$, $SD = 0.78$), to ($M = 3.06$, $SD = 0.96$), and to T3 ($M = 3.15$, $SD = 0.93$).

Contrary to the hypothesis a paired samples T-test revealed that there was no significant difference (t[71] = -1.72, $p = .09$) in persistence of effort between T1 ($M = 3.57$, $SD = 0.60$) and T3 ($M = 3.67$, $SD = 0.51$), nor any significant difference (t[71] = -0.74, $p = .464$) between consistency of interest at T1 ($M = 3.04$, $SD = 0.78$) and T3 ($M = 3.15$, $SD = 0.93$). It is therefore assumed that neither persistence of effort nor consistency of interest experienced any meaningful change over the course of the current study.

As predicted by the hypotheses gender did not have an effect on grit at any time of measurement (see Table 5). Neither T1 (F[2] = 1.89, $p = .156$, $\eta2 = .03$), T2 (F[2] = 0.95, $p = .391$, $\eta2 = .02$), nor T3 (F[2] = 0.69, $p = .506$, $\eta2 = .01$) saw any meaningful significant effect. See Table 5 for details on the effects of all covariates in grit. This was further reinforced by an independent samples T-test showing no significant differences in grit on the basis of gender at T1 (t[69] = -0.24, $p = .810$) or T3 (t[69] = 0.30, $p = .769$). See Table 5 for details on all covariate effects in grit.

A subsequent correlation analysis did not reveal any significant correlation between grit and mindset at T1 (r[70] = .11, $p = .356$), T2 (r[70] = .04, $p = .713$) , or T3 (r[70] = .183, $p = .123$). The hypothesis that there would be some reciprocal relationship between grit and mindset did therefore not hold.

Table 3

Pairwise Comparisons (Bonferroni) and 99% Confidence Intervals of Difference for Grit,

Passion, Mindset, and Motivation

Comparison				
Variable	Variable	*M* change	*p*	99% *CI*
Grit				
Grit T1	Grit T2	0.00	1.000	[-0.17, 0.7]
Grit T1	Grit T3	0.11	.299	[-0.30, 0.09]
Grit T2	Grit T3	0.11	.327	[-0.31, 0.09]
Passion				
Passion T1	Passion T2	-0.08	1.000	[-0.30, 0.46]
Passion T1	Passion T3	0.02	1.000	[-0.37, 0.33]
Passion T2	Passion T3	0.10	1.000	[-0.45, 0.26]
Mindset				
Mindset T1	Mindset T2	0.09	.107	[-0.23, 0.04]
Mindset T1	Mindset T3	0.15	.027	[-0.32, 0.02]
Mindset T2	Mindset T3	0.06	1.000	[-0.23, 0.12]
Motivation				
Motivation T1	Motivation T2	0.01	1.000	[-0.14, 0.13]
Motivation T1	Motivation T3	-0.01	1.000	[-0.12, 0.15]
Motivation T2	Motivation T3	-0.02	1.000	[-0.15, 0.19]

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

A following T-test showed that there was no significant difference in grit scores when comparing students in the one-year study communities and the bachelor's communities. At T1 there was no significant difference ($t[67] = 0.621$, $p = .537$) between the one-year study groups ($n = 26$, $M = 3.34$, $SD = .29$) and the bachelor's groups ($n = 43$, $M = 3.29$, $SD = .33$). The same held true at T2 with no discernible significant difference ($t[67] = 0.104$, $p = .917$) between the one-year ($n = 28$, $M = 3.31$, $SD = .44$) and bachelor's groups ($n = 41$, $M = 3.30$, $SD = .40$). This trend also persisted at T3 with no significant differences ($t[67] = 1.025$, $p = .309$) between the one-year ($n = 29$, $M = 3.47$, SD = .45) and bachelor's groups ($n = 40$, $M = 3.38$, $SD = .35$), thereby rejecting the hypothesis.

Table 4

Descriptive Statistics for Grit, With Subscales Persistence of Effort and Consistency of Interest, Alongside Shapiro-Wilk test of Normality

Variable	*n*	*M*	*SD*	*W*
Grit_T1	72	3.30	0.31	.97*
PoE_T1	72	3.57	0.60	.98
CoI_T1	72	3.04	0.78	.97
Grit_T2	72	3.30	0.41	.96*
PoE_T2	72	3.55	0.61	.96*
CoI_T2	72	3.06	0.96	.96*
Grit_T3	72	3.41	0.39	.97
PoE_T3	72	3.67	0.51	.96*
CoI_T3	72	3.15	0.93	.96*

Note. $* = p < .05$, $** = p < .01$. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3. PoE = Persistence of Effort, CoI = Consistency of Interest

Table 5

Within-Group Effects for Grit (Sphericity Assumed) and Wilks' Lambda Value

Predictor	Sum of Squares	*df*	Mean Square	*F*	*p*	η_p^2	Wilks' Lambda
Grit	.064	2	0.032	0.233	.792	.004	.99
Community group type							
Grit*T1	.333	2	0.167	1.224	.298	.020	.96
Grit*T2	.105	2	0.053	0.387	.680	.007	.99
Grit*T3	.095	2	0.047	0.348	.707	.006	.99
Age							
Grit*T1	.126	2	0.063	0.462	.631	.008	.98
Grit*T2	.101	2	0.051	0.372	.690	.006	.99
Grit*T3	.150	2	0.075	0.552	.578	.009	.98
Gender							
Grit*T1	.514	2	0.257	1.887	.156	.031	.94
Grit*T2	.258	2	0.129	0.948	.391	.016	.97
Grit*T3	.187	2	0.093	0.685	.506	.011	.98
Educational level							
Grit*T1	.110	2	0.055	0.405	.668	.007	.99
Grit*T2	.393	2	0.197	1.444	.240	.024	.96
Grit*T3	.037	2	0.019	0.137	.872	.002	.99

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Results of Passion Analyses

The mean scores of passion experienced a slight downward trend from T1 ($M = 3.86$, $SD = 0.78$) to T2 ($M = 3.78$, $SD = 0.70$), but this seems to have bounced back in T3 ($M = 3.88$, $SD = 0.68$). See Table 6 for an overview of this.

The findings of there being no significant main effect for passion (see Table 7), along with the pairwise comparison of passion finding no significant difference in T1-T3 passion (see Table 3), reflected the hypothesis of there being no significant change in students participating in learning communities over the course of the 3-month period. The hypothesis that there would be a small significant decrease in Motivation form T1 to T3 was however disproven.

As predicted by the hypotheses gender had no significant effect in passion at any time of measurement, neither T1 ($F[2] = 2.54$, $p = .083$, $\eta2 = .04$), T2 ($F[2] = 0.39$, $p = .678$, $\eta2 = .01$), nor T3 ($F[2] = 0.05$, $p = .947$, $\eta2 = .001$). This conclusion was once more reinforced by an independent samples T-test sorting for gender showing no significant difference at T1 ($t[69] = 0.52$, $p = .608$) or T3 ($t[69] = -1.31$, $p = .195$). See Table 7 for details on the effects of all covariates in passion.

Table 6

Descriptive Statistics for Passion and Shapiro-Wilk Test of Normality

Variable	n	M	SD	W
Passion_T1	72	3.86	0.78	.95*
Passion_T2	72	3.78	0.70	.97
Passion_T3	72	3.88	0.68	.96*

Note. * = $p < .05$, ** = $p < .01$. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table 7

Within-Group Effects for Passion (Sphericity Assumed) and Wilks' Lambda Value

Predictor	Sum of Squares	df	Mean Square	F	p	η_p^2	Wilks' Lambda
Passion	1.170	2	0.585	1.138	.324	.019	.96
Community group type							
Passion*T1	0.718	2	0.359	0.698	.499	.012	.98
Passion*T2	0.323	2	0.161	0.314	.731	.005	.99
Passion*T3	1.941	2	0.970	1.886	.156	.031	.94
Age							
Passion*T1	0.681	2	0.341	0.662	.518	.011	.98
Passion*T2	1.216	2	0.608	1.182	.310	.020	.96
Passion*T3	0.580	2	0.290	0.563	.571	.009	.98
Gender							
Passion*T1	2.610	2	1.305	2.537	.083	.041	.92
Passion*T2	0.401	2	0.201	0.390	.678	.007	1.00
Passion*T3	0.056	2	0.028	0.054	.947	.001	.98
Educational level							
Passion*T1	0.857	2	0.428	0.833	.437	.014	.97
Passion*T2	0.894	2	0.447	0.869	.422	.015	.97
Passion*T3	2.361	2	1.181	2.295	.105	.037	.92

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Results of Mindset Analyses

The mean scores of mindset had a slight but steady increase towards growth mindset from T1 ($M = 3.38$, $SD = 0.27$), to T2 ($M = 3.47$, $SD = 0.27$), and T3 ($M = 3.53$, $SD = 0.37$). See Table 8 for an overview of these data.

A paired samples T-test revealed that, contrary to the established hypothesis, students experienced a small significant increase ($t[71] = -2.74$, $p < .01$) in Mindset from T1 ($M = 3.38$, $SD = .27$) to T3 ($M = 3.35$, $SD = .37$). The effect size of this analysis ($d = -0.32$) can by Cohen's (Cohen, 1992) estimates be categorized as a small effect ($d < 0.50$). This was also supported by the pairwise comparison of mindset showing a significant difference ($p < .05$) between T1 mindset and T3 mindset, with a relatively low but significant ($p < .05$) Wilks' Lambda ($\Lambda = .87$). The hypothesis of there being no significant change between any of the measurement times of Mindset was therefore rejected.

As predicted by the hypotheses gender did not have an effect on student mindset at any time of measurement, neither T1 ($F[2] = 0.42$, $p = .661$, $\eta2 = .01$), T2 ($F[2] = 2.43$, $p = .093$, $\eta2 = .04$), nor T3 ($F[2] = 0.79$, $p = .457$, $\eta2 = .01$) (see Table 9). This conclusion was

reinforced by an independent samples T-test showing no significant difference in mindset on the grounds of gender at T1 (t[69] = -0.34, p = .734) or T3 (t[69] = 0.71, p = .483).

Table 8

Descriptive Statistics for Mindset and Shapiro-Wilk Test of Normality

Variable	n	M	SD	W
Mindset_T1	72	3.38	0.27	.91*
Mindset_T2	72	3.47	0.27	.92*
Mindset_T3	72	3.53	0.37	.90*

Note. * = p < .05, ** = p < .01. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table 9

Within-Group Effects for Mindset (Sphericity Assumed) and Wilks' Lambda Value

Predictor	Sum of Squares	df	Mean Square	F	p	η_p^2	Wilks' Lambda
Mindset	0.165	2	0.082	0.837	.436	.014	.96
Community group type							
Mindset*T1	0.525	2	0.263	2.666	.074	.043	.98
Mindset*T2	0.062	2	0.031	0.317	.729	.005	.99
Mindset*T3	0.176	2	0.088	0.895	.411	.015	.94
Age							
Mindset*T1	0.037	2	0.018	0.185	.831	.003	.98
Mindset*T2	0.132	2	0.066	0.669	.514	.011	.96
Mindset*T3	0.063	2	0.032	0.322	.725	.005	.98
Gender							
Mindset*T1	0.082	2	0.041	0.416	.661	.007	.92
Mindset*T2	0.478	2	0.239	2.425	.093	.039	1.00
Mindset*T3	0.155	2	0.078	0.789	.457	.013	.98
Educational level							
Mindset*T1	0.074	2	0.037	0.377	.687	.006	.97
Mindset*T2	0.002	2	0.001	0.010	.990	.000	.97
Mindset*T3	0.018	2	0.009	0.093	.911	.002	.92

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Results of Motivation Analyses

      There was little to no change in mean scores of motivation from T1 (M = 3.36, SD = 0.26), to T2 (M = 3.37, SD = 0.30), nor T3 (M = 3.35, SD = 0.30) (see Table 10). The findings of no significant main effect for motivation (see Table 11), alongside a pairwise

comparison of T1 – T3 motivation showing no significant differences went against the hypothesis of there being a small significant downward change in students over the course of the 3-month period. A further paired samples T-test revealed that there was no significant difference ($t[71] = 0.32$, $p = .748$) between student motivation scores at T1 ($M = 3.36$, $SD = .26$) and T3 ($M = 3.35$, $SD = .30$).

Contrary to the hypotheses gender did not have an effect on motivation at any time of measurement, neither T1 ($F[2] = 1.03$, $p = .362$, $\eta2 = .02$), T2 ($F[2] = 0.07$, $p = .937$, $\eta2 = .001$), nor T3 ($F[2] = 0.06$, $p = .938$, $\eta2 = .001$) (see Table 11). This was further investigated in an independent samples T-test. Here it was found that there no significant difference between females and males in motivation scores at T1 ($t[69] = -0.36$, $p = .720$), T2 ($t[69] = -0.32$, $p < .752$), or T3 ($t[69] = -1.45$, $p = .147$). The hypothesis of there being significant gender differences, with females showing a higher degree of motivation, did not hold.

A correlation test (with a split file for group type) was used to test the motivation scores at T1 in the one-year groups ($M = 3.32$, $SD = 0.28$) and bachelor's groups ($M = 3.36$, $SD = 0.25$), compared to the scores at T3 in one-year groups (3.35, $SD = 0.30$) and bachelor's groups ($M = 3.33$, $SD = 0.31$). This analysis showed no significant correlation ($r[24] = .01$, $p = .963$) between Motivation scores at T1 and T3 for one-year groups, and much the same ($r[41] = .24$, $p = .130$) for bachelor's groups. The hypothesis that there would be a significant difference between these groups, with bachelor's students supposedly showing a higher degree of motivation, was therefore disproven.

The hypothesis that bachelor's groups would have a slower decline in motivation when compared to one-year groups was disproven through a closer look at the descriptive statistics (split file for group type). Through this it was found that at T1 bachelor's groups ($M = 3.90$, $SD = 0.25$) were comparatively higher on motivation than one-year groups ($M = 3.32$, $SD = 0.28$). This trend evened out at T2, with bachelor's groups ($M = 3.38$, $SD = 0.33$) and one-year groups ($M = 3.33$, $SD = 0.25$) being similar in their motivation scores. Finally, at T3 the trend was reversed with bachelor's groups ($M = 3.30$, $SD = 0.32$) showing a lower mean motivation than one-year groups ($M = 3.38$, $SD = 0.26$). The development of motivation between the group types was therefore the stark opposite of the previously stated hypothesis.

Table 10

Descriptive Statistics for Motivation, with subscales Effort and Importance, and Shapiro-Wilk Test of Normality

Variable	n	M	SD	W
Motivation_T1	72	3.36	0.26	.98
Effort_T1	72	3.43	0.33	.95*
Importance_T1	72	3.29	0.35	.97
Motivation_T2	72	3.37	0.30	.99
Effort_T2	72	3.39	0.37	.96*
Importance_T2	72	3.34	0.36	.95
Motivation_T3	72	3.35	0.30	.97*
Effort_T3	72	3.38	0.37	.95*
Importance_T3	72	3.31	0.34	.95*

Note. * = p < .05, ** = p < .01. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table 11

Within-Group Effects for Motivation (Sphericity Assumed) and Wilks' Lambda Value

Predictor	Sum of Squares	df	Mean Square	F	p	η_p^2	Wilks' Lambda
Motivation	0.090	2	0.045	0.547	.580	.009	.99
Community group type							
Motivation*T1	0.125	2	0.062	0.757	.471	.013	.96
Motivation*T2	0.104	2	0.052	0.633	.533	.011	.99
Motivation*T3	0.034	2	0.017	0.204	.816	.003	.99
Age							
Motivation*T1	0.273	2	0.137	1.660	.195	.027	.98
Motivation*T2	0.030	2	0.015	0.181	.835	.003	.99
Motivation*T3	0.120	2	0.060	0.731	.484	.012	.98
Gender							
Motivation*T1	0.169	2	0.084	1.026	.362	.017	.94
Motivation*T2	0.011	2	0.005	0.065	.937	.001	.97
Motivation*T3	0.010	2	0.005	0.064	.938	.001	.98
Educational level							
Motivation*T1	.074	2	.037	.451	.638	.008	.99
Motivation*T2	.397	2	.198	2.411	.094	.039	.96
Motivation*T3	.238	2	.119	1.447	.239	.024	.99

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Results of Attendance Analyses

There was a roughly equal number of students attending learning communities in the first semester of 2019 – 2020 ($N = 336$) and 2020 – 2021 ($N = 343$) (see Appendix E, Table E1, for more details). In the first semester of 2019 – 2020 there were 7 programme-sorted groups, and 17 groups in the same period the following academic year. Average attendance was calculated by taking the number of students who signed up for each group and divided these by the number who attended each week. Both years the learning communities lasted for 11 weeks. See Figure 2 and 3 for a graphical breakdown of week-to-week attendance.

A paired samples T-test of attendance percentages in the first semester of 2019 – 2020 ($M = 56.37$, $SD = 5.79$) and 2020 - 2021 ($M = 76.24$, $SD = 8.42$) revealed that there was a significant difference ($t[10] = -7.97$, $p < .01$) between these years. Contrary to the hypothesis it became apparent that attendance was significantly better in the first semester of 2020 - 2021 rather than 2019 - 2020, with a mean attendance difference of 20%. The effect size ($d = 0.27$) of this would by Cohen's (Cohen, 1992) estimate be considered small ($d < 0.5$).

Somewhat contrary to the hypothesis, an increased dropout rate in the first semester of 2020-2021 as compared to 2019-2020, the opposite seems to have taken place. If one investigates the overall attendance patterns (see Figure 2) one can clearly see that the average attendance in the first semester of 2020 never dipped as low as the same period of 2019. This still mostly held true if one were to consider the different group types (see Figure 3).

The general trend of the overall attendance would appear to be that in 2019 the attendance followed a trend of decline from week 1 to 8, but with levels recovering to the levels of week 1 over the course of week 9 to 11. Attendance in 2020 in comparison seems to have a constant downward development from week 1 to 11. In this context it is important to point out that during week 7 and 8 of both semesters the clinical master's students attended mandatory activities which kept them from participating in their learning communities, alongside there being no scheduled community gathering in week 7 of 2020 -2021 due to Easter holiday, but some leaders performed normal gatherings despite this. This might help to explain the dip in attendance seen during these weeks.

It is relevant to see what the development in attendance would look like when considering group type. Even when excluding the clinical master's students, whose attendance was not constant, the trends mentioned above still held. Overall the first semester of the 2019 – 2020 academic year showed a decline towards the mid-point of the learning communities but recovered at the end, whilst the same period in 2020 – 2021 experienced a steadier decrease with no recovery at the end.
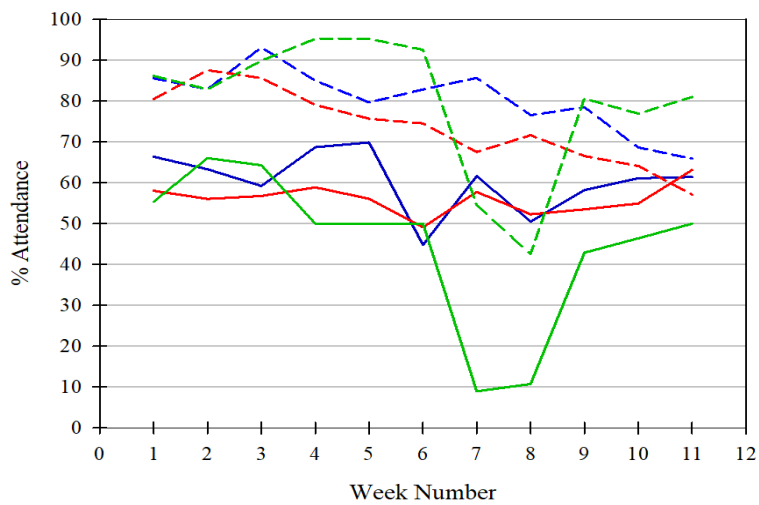
Figure 2

Attendance Percentages in Learning Communities for PSY1013, Autumn 2019 & Autumn

2020

Average Attendance PSY1013
(Autumn 2019 & Autumn 2020)
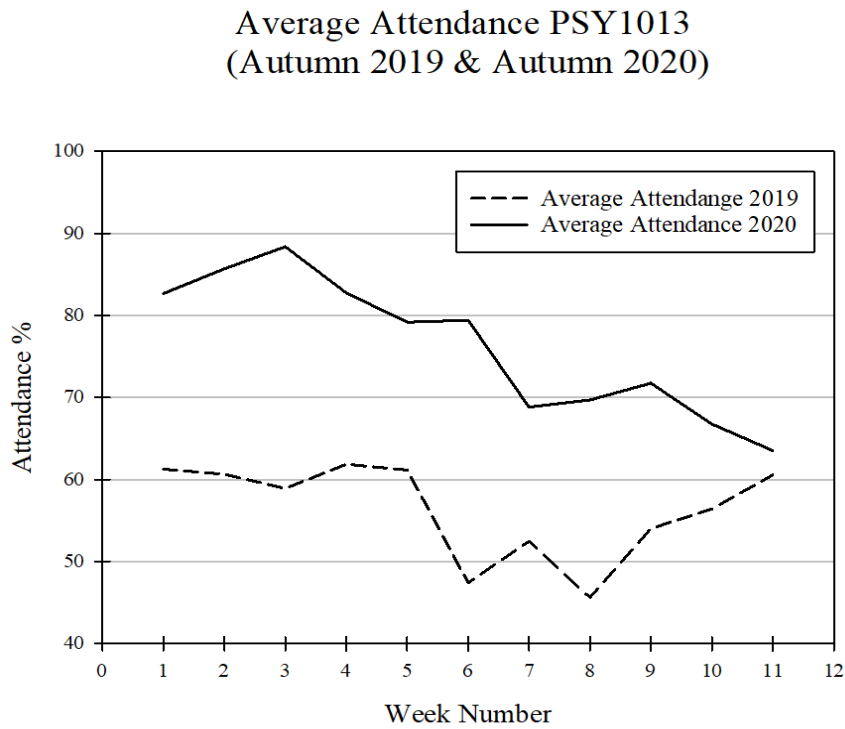
Figure 3

Attendance Percentages Divided by Learning Community Group Type for PSY1013, Autumn

2019 & Autumn 2020

Average Attendance PSY1013 by Learning Community Type
(Autumn 2019 & Autumn 2020)

Discussion

The analyses revealed that there was no significant change in grit, passion, or motivation between T1, T2, and T3. There was however a significant ($p < .05$) increase in mindset between T1 and T3 (see Table 3), as well as significantly better ($p < .05$) attendance in the first semester of 2020-2021 than the same period in 2019-2020. There were also no gender differences in any of the variables measured. Despite the lack of significant findings, there were trends in the development of all these variables worthy of further discussion (see Table 3), especially when dividing by group type (see Appendix F, Table F1 – F4) and previously attained education (see Appendix G, Table G1 – G4).

The discussion and extrapolations of the data accrued over the course of the current study is discussed below. In order to give this segment of the paper a meaningful structure it was divided into segments corresponding to each of the three research questions underpinning the study. As a refresher, these research questions were:

- Is there a relationship between participation in a learning community and changes in grit, passion, mindset, and motivation? If so: are there trends in the development of these variables?
- Are there gender differences in grit, passion, mindset, and motivation, and will these possible differences become more pronounced over the course of learning community activity?
- How has the COVID-19 pandemic affected learning communities in regard to participation?

Learning Communities and Changes in Grit, Passion, Mindset, and Motivation

Before proceeding to discussing the potential effects of a learning communities on the variables measured it is important to point out that the current study did not employ control groups of students not in the learning community programme or individuals who are outside the educational system. For this reason any changes, or potential lack thereof, might broadly speaking be the cause of three factors: participation in a learning community, participation in tertiary education, and/or more fundamental human development. As the setup of the current study mostly gives room for discussion within the realm of learning communities this will be the main focus of the following discussion. Alongside this it is also worth noting the statistical assumptions mentioned above, alongside the fact that the data-gathering took place over a relatively short time span (3-months) and with a limited number of respondents.

The Nonsignificance of Grit, Passion, and Motivation

The current study found no significant change for grit, passion, or motivation in learning community students. For grit this was somewhat surprising given the research stating that grit increases over the course of normal education, and such change has been observed in students in tertiary education (Bowman et al., 2015; Duckworth & Eskreis-Winkler, 2013). It is worth pointing out that research that has seen positive changes in grit as a result of education have generally not been of a longitudinal design and has generally had larger respondents sizes in order to achieve appropriate predictive power (e.g., Bowman et al., 2015; Duckworth & Eskreis-Winkler, 2013). If no significant change occurred this might well indicate that there simply was not enough time to establish such an effect. For this reason, it can be argued that the current study reinforces the idea that such developments rarely happen over short periods of time, at least not unless the individual or associate institution makes a concerted effort (e.g., through interventions) to make it so.

The fact that there were no significant changes in passion was hardly surprising when considering contemporary research. As indicated by the studies of Schellenberg and Bailis (2015) and Carbonneau et al. (2008) there ought to be little change in passion scores over the first months of university. This is relevant given that by far the largest bulk of respondents were relatively young (19-25 years) and/or had no previous degree from tertiary education (see Table 2). In this way the current study gives further evidence of the relative stability of the passion measure, at least when it comes to first-time students in tertiary education.

The variable of motivation, similar to grit and passion, saw no change leading to a significant difference over the course of the current study. When comparing the current findings to the apt research of Jacobs and Newstead (2000) into how motivation and perceived importance develops over three years for students in a psychology course, some transferable value is present. In a similar vein to this research the current study found a very small downward trend in overall motivation across the semester. The relative stability of this measure in the current does however indicate that this downward development might happen after the first semester, meaning it is possible that over a full three-year period there might have continued to be a steady decline in overall motivation. It is also possible that the learning community programme to some capacity was able to offset or mitigate the negative downwards developments in motivation, especially if recent findings into motivation during the COVID-19 pandemic are to be believed (Reich et al., 2020; Shin & Hickey, 2020). Supporting this is how learning communities does not offer physical rewards, but rather

encourage verbal rewards, which has shown itself to positively affect the growth of intrinsic motivation (Deci et al., 2001).

In the interest of discussion it is important to point out the potential influences of self-selection effects in curating a respondent base of students with above-average cores grit, passion, mindset, and motivation, alongside how this might create a somewhat skewed impression of these variables during an ongoing pandemic (Andrade, 2007). Other potential influencing factors on the variables of grit, passion, and motivation are the concepts of Zoom fatigue and pandemic fatigue. With the introduction of an emergency remote learning model, blended with partial physical attendance, this opened the respondents up for lower levels of engagement, increased cognitive strain, and potential feelings of aversion from the learning communities (Nadler, 2020; Wiederhold, 2020). With these effects it is logical to assume that the circumstances the students found themselves in could hardly be called optimal in regard to the development of grit, passion, and motivation. This alone might go a long way towards explaining the lack of significant change in these variables. For these reasons care has to be taken when generalising these findings to the general student base.

Learning Communities and the Significance of Mindset

Unlike grit, passion, and motivation the variable of mindset did see some degree of significant change. This significance was at the $p < .05$ level and therefore, as detailed in the limitations segment, must be treated with some degree of scepticism. Even so, no other variable in the current study experienced as much consistent change as mindset (see Table 3). Of special note here is how this growth was especially prominent amongst the students in the learning communities for one-year students (see Appendix F, Table F3). The possible reasons for this are discussed further in the segments detailing the trends in the variables' development.

The finding of a positive change towards more of a growth mindset for intelligence over the course of the first semester at a university gives credence to the standpoint of how mindset can be changed as a result of education or interventions (Dweck et al., 1995a; Yeager & Dweck, 2012; Yeager et al., 2014). Although no direct intervention was performed as a part of the current study a central tendency of such interventions were still followed with the learning of neuroplasticity and long-term potentiation. As previously mentioned the students learned of these concepts as a part of the subject the learning communities chosen for the current study were based on (Biological Psychology 1).

These findings can thusly be interpreted in one of more ways; (a) that the students saw a positive growth in mindset because of the tertiary education programme; (b) that the positive development came from engagement in the learning communities themselves; (c) this was because of them learning about the principles of neuroplasticity; or (d) that all of these effects together were instrumental in creating the growth in mindset. With the intervention angle in mindset having met some resistance in recent years (Foliano et al., 2019; Sisk et al., 2018) this might tip the scales more towards these effects being the result of learning communities and/or tertiary education.

An additional explanation for the positive growth in grit scores might once again lie in Zoom and pandemic fatigue research. With the current study seeing a constant dropout of respondents (see Table 2), and the learning communities seeing much the same in attendance (see Figure 2, Figure 3, and Appendix E), this might have been the result of these feelings of fatigue. Although calling the COVID-19 pandemic merely a "challenge" might be a somewhat disingenuous and reductive there is research into mindset that shows how this variable can predict student self-esteem and behavioural reactions to challenges (Robins & Pals, 2002). In light of this it is fully possible that a portion of the students who fell out of the learning community programme were those with more of a fixed mindset, with these students losing more self-esteem and having more of a negative emotional reaction to the ongoing pandemic than their peers. These findings give incentive for further research into the effects of learning communities, as well as how feelings of fatigue might have affected these.

Trends in the Developments of Grit, Passion, Mindset, and Motivation

None of the variables measured over the course of the current study showed significant change within the $p < .01$ criteria, although there was a significant change in mindset at $p < .05$. As for apparent patterns in the developments there are some valuable findings. See Table 3 for an overview of the development of mean scores in grit, passion, mindset, and motivation. For a detailed breakdown of mean scores in these variables when divided by learning community group type (study programme) and respondents' previously attained education see Appendix F and G.

General Trends in Grit

Grit experienced a small total increase from T1 to T2, with the mean scores remaining stable into T3 (see Table 3 and Table 4). One likely explanation of this is the falloff of students from T2 to T3. By looking at mean attendance for all group types (see Appendix E)

one can see that at T1 (week 3-4) attendance numbers had kept increasing since the beginning and were actually at their highest levels throughout the entire semester. At this point the mean grit scores had not changed at all, but it was after this point, in the transition from T2 (week 8-9) to T3 (Week 12-13) that a change in grit could be measured.

The change in mean grit might well be explained by the less gritty students dropping out of the learning communities, at least for the particular course subject in question. The result of this would be that the mean grit scores would increase, if only slightly. Of interest in this regard is that the positive growth in grit was seen with both the one-year groups and the bachelor's groups. A table of variable mean scores divided by group type can be found in Appendix F, Table F1. If one were to postulate that student dropout would lead to higher mean scores, then the development in grit makes a lot of sense as all groups saw a small rise in overall mean grit scores. It is a somewhat curious development that one-year students did not see a smooth development, but rather downturn from T1 to T2 before seeing a large increase from T2 to T3.

Why these groups experienced different developmental trends is up for debate. Both groups were in the same learning community programme, alongside having the same curriculum and lectures. It is possible that these demographics had different degrees of academic motivation and engagement, with research having indicated that these factors are linked to grit (Hodge et al., 2018; Reraki et al., 2015). With these demographics having to spend a different number of semesters in order to finish their degrees the variable of goals and expectations also becomes a relevant explanation of these trends. This angle has been hinted at by Alhadabi and Karpinski (2020), possibly indicating that one's goals when entering into a programme, course, or study might well affect the one's gains or losses in grit.

On a similar note it would seem that students who had limited or no experience with tertiary education gained increased grit over the course of the study. Students who had only completed Norwegian high school or a single year in tertiary education saw a net growth from T2 to T3 (see Appendix G, Table G1). Students who had completed a full bachelor's degree saw no such growth in grit. This might indicate that inexperienced students see more growth in their tenacity than those who have already gone through the same development. It is however hard to speculate into the potential effects of previous degrees when these were such a small part of the total respondents (see Table 2).

General Trends in Passion

Passion saw little mean change from T1 to T3, with a mere net increase of 0.02. Of most interest here is the small dip in mean passion score from T1 to T2. This pattern held true when splitting by learning community group type (see Appendix F, Table F2). In so doing it became apparent that there was a small difference between the developments of one-year and bachelor's students. The bachelor's students saw an overall positive change in mean passion score consistent with the overall pattern, whilst one-year groups saw a negative development.

The potential causes for the differences in these group types are interesting, although difficult to interpret. One potential reason might lie in the student's motivations for seeking a degree in psychology. As previously mentioned, data on this was gathered as a part of the first measurement in the current study. Although not technically a part of the current study, this data showed a clear trend of bachelor's students being more motivated to finish a full degree, contrary to one-year students who were more motivated to study something while awaiting a different course of study. This might underpin the idea that bachelor's students were more future oriented, and that they therefore saw a jump in mean passion towards the middle and end of the semester.

One can also speculate into how this connects to the study by Bonneville-Roussy et al. (2013). The chosen education was different in the current study (psychology vs. music), but it could be argued that the weak growth in mean passion scores reflect the positive effects of the learning community programme and its ability to facilitate the growth of harmonious passion. This is further supported by how the learning community programme is centred around a healthy learning environment, active learning, and autonomous activity in general (Andrade, 2007; Matthews et al., 2012). These factors might together help to increase students' levels of harmonious passion and general passion alongside giving an explanation as to why students who had already completed a one-year study saw the largest rise in passion from T1 to T3, whilst the fresh students started with higher levels of passion but saw little change in this score over the course of the study (see Appendix G, Table G2).

General Trends in Mindset

Amongst the main variables measured for the current study mindset again continues the weak positive growth in both one-year students and bachelor's students. Somewhat unique to this particular variable was how it developed over time in these groups (see Appendix F, Table F3). Whereas one-year groups experienced a relatively steady positive development across the measurements, bachelor's groups hardly experienced any such

development. This positive growth of the one-year students was so large that they even outgrew bachelor's students by the last measurement, despite starting out with lower mean scores of mindset.

One potential explanation of the relative longitudinal growth of mindset in this study might lie in the interventional research of Sarrasin et al. (2018). All respondents in the current study were participating in learning community group gatherings centred around the course subject of Biological Psychology 1. As a part of this subject all students learned about the principles of neuroplasticity and long-term potentiation. Seeing as the learning of this principle has been used as the tool of interventions into mindset (see Sarrasin et al., 2018) it could be argued that the course subject itself served much the same purpose an intervention. From this one would expect respondents to show an increase in mean mindset. On a similar note, the fact that both grit and mindset saw a small overall net growth from T1 to T3 might be explained by the supposed mutually reinforcing nature of these variables (Park et al., 2020; Sigmundsson et al., 2020b).

Interestingly it would seem that students with a no experience from tertiary education had a lower starting level of mindset than those with some experience, but that these inexperienced students saw a relatively large increase in mindset from T1 to T3 that took them to a similar level as their experienced counterparts (see Appendix G, Table G3). This could possibly indicate that the individual student's level of passion increases to a similar level as a result of learning about the concept of neuroplasticity or participation in tertiary education (Dweck et al., 1995a; Yeager & Dweck, 2012; Yeager et al., 2014).

As for the reasons why one-year students saw more growth than bachelor's groups this might be explained somewhat by the cultural research of Costa and Faria (2018). This research showed that European students showed a positive association between a fixed mindset and achievement. Further adding to this is the extra data gathered at T1 showing that the majority of one-year students takes a course in psychology whilst awaiting entry into another study, but bachelor's students were more motivated by finishing a degree. It can therefore be argued that the bachelor's students ought to have a stronger association between fixed mindset and achievement (Costa & Faria, 2018), which might explain why this demographic saw less positive growth.

General Trends in Motivation

Of all the variables measured as a part of the current study, none were as stable as motivation, regardless of learning community group type (see Appendix F, Table F4). The

slight difference between one-year students and bachelor's students might also be consistent with the conclusion of Jacobs and Newstead (2000) of there being two general types of students in psychology: the one's motivated by the discipline itself (e.g., bachelor's students) and those motivated by the acquisition of more general knowledge/skills (e.g., one-year students). However, in order to establish if there are such motivational differences between these student demographics further research would be needed.

As for why one-year students saw a very small net growth of 0.05 in motivation from T1 to T2, alongside an overall net growth of 0.03 from T1 to T3, is hard to speculate in. This does not appear to be the result of previously attained education, with this showing much the same stability as the overall measure (see Appendix G, Table G4). It is probable that a clearer development might have been seen in other years, especially if the preliminary evidence about the struggles in motivation amongst students during the COVID pandemic is to be believed (Reich et al., 2020; Shin & Hickey, 2020).

It is possible that the online elements of education during the current study contributed to the near non-existent changes in motivation, especially when considering the added responsibilities in providing quality learning facilitation for community leaders in a medium that was, at the time, unfamiliar to most. This lack of knowledge and experience in the medium used can be argued to have affected the leaders' ability to create an engaging learning environment capable of creating motivation in students (Baker, 2010). Besides this the lack of knowledge and experience might also have resulted in clearer time constraints, which also could have negatively affected the potential growth of motivation (Aragon & Johnson, 2008; Carr, 2000). All of this, coupled with the effects of zoom and pandemic fatigue (Nadler, 2020; Reicher & Drury, 2021; Wiederhold, 2020), might explain why student motivation remained as stable as it did over the course of the semester.

Gender Differences in Grit, Passion, Mindset, and Motivation

Before proceeding to discuss the results and potential implications of the analyses into differences in the variables of grit, passion, mindset, and motivation it is first important to establish some context. In the current study a large portion of the respondents were female, varying from 78% to 83% of the total respondents (see Table 2). This context is important seeing as such a large imbalance might have made the findings less generalizable. See Limitations for more in-depth information concerning gender balance.

Despite the gender imbalance in the sample there can still be some discourse as to how this compares to contemporary research. The findings of no significant gender

differences in grit remains consistent with the research of Bazelais et al. (2016), Hodge et al. (2018), and Sigmundsson et al. (2020b); whilst at the same time going against the research of Jaeger et al. (2010) and Christensen and Knezek (2014). It is also worth noting that the Jaeger et al. (2010) study found large fluctuations in the consistency of interest subscale specifically, which has shown itself to be somewhat dubious as to its predictive value (Bowman et al., 2015; Jiang et al., 2019; Muenks et al., 2018; Tang et al., 2019). The overall conclusion to this was perhaps said the most eloquently by Hodge et al. (2018): "gender based differences in grit among students may be either so small that they are inconsequential, or be situation-specific and, therefore, potentially reflect other underlying variables that differ systematically across available studies".

Similarly, there was no significant difference on the basis of gender in passion. Despite sharing many similarities with the study of Sigmundsson et al. (2020b) in regard to respondent cultural background and educational level the current study was not able to achieve similar findings. This is relevant to point out because of the relative recency of the Passion Scale (Sigmundsson et al., 2020a), with the 2020 study being one of the few that has employed it as a core measure. It also puts some degree of doubt as to the veracity of the cultural focus of the Szabo et al. (2019) study when Norwegian and Icelandic (Sigmundsson et al., 2020b) university students are not congruent in their supposed gender differences.

Because relatively little research has been done into how the passion measure interacts with gender, using either the Passion Scale (Sigmundsson et al., 2020a) or the Dualistic Model of Passion (Vallerand, 2010), it becomes complicated to pinpoint potential influencing variables. On this note, it is possible that the lack of a significant finding was the result of the context in which respondents were recruited, with learning community groups potentially introducing some degree of self-selection effects (see Zhao & Kuh, 2004; Zobac et al., 2014). It is possible that learning communities as a setting attracts individuals with above-average levels of passion, and that the differences that normally would exist between genders became lessened by this. Alternatively, the lack of a significant finding could be the cause of the general uneven gender balance in the respondents. On this basis it remains difficult to say conclusively whether there are inherent gender differences in passion.

Consistent with the hypotheses there were no significant gender differences in mindset. As the only variable to achieve a significant enough change from T1 to T3 this is perhaps the strongest finding in the current study. Although lacking the same level of statistical power as contemporary research, the current study does put the research of Dweck (2007) and Degol et al. (2018) into question. These studies researched mindset in the very

specific setting of mathematics, which the current study did not. This might indicate that the gender effects of mindset only appear in mathematical and similar settings. This does still put some doubt as to whether gender actually has a significant influence on mindset, or if this is merely the result of some yet to be determined confounding variable(s).

In a similar fashion to the studies already discussed, the current study found no significant correlation between grit and growth mindset as indicated by Sigmundsson et al. (2020b) and Park et al. (2020). This is relevant given that the Sigmundsson et al. study also found that females had a higher degree of correlation between these variables than males. To firmly establish the potential correlations between gender, the aforementioned variables, and learning community participation more studies are needed to explore the potential nuances. The current study does, on the other hand, fit in nicely with the research of Macnamara and Rupani (2017) of there being no significant differences in mindset on the grounds of gender. With most of the significant effects in gender differences being found specifically in the realm of mathematics this might be a little too niche to generalize to the wider student base.

In finding no significant gender differences in motivation this results in some interesting implications. Chiefly, this does lend some degree of doubt as to the findings of Jacobs and Newstead (2000), which spoke of females showing higher value ratings for motivation and higher engagement. If one considers the possibility of self-selection bias it is entirely possible that these gender differences became less clear because of the theoretically high levels of motivation in these demographics, but without any point of reference or previous data to draw upon this remains as speculation.

However, entirely consistent with the report of Kuh et al. (2006) was that females were more attracted to the learning community programme. Even with females accounting for approximately 66% of the student base in the first semester of 2020-2021 this demographic made up 78% to 83% of the respondents for the current study. This indicates that females were indeed more likely to participate in learning communities. As for the reasons behind this it might be that females were more drawn to the educational programme offered through learning communities (e.g., active learning and a more open learning environment). On the other hand, this might also be because the lower number of males made it more difficult for males to create a social environment in which they themselves felt comfortable, thereby making it harder to persist in a programme that relies so heavily upon cooperation and social interaction.

In order to establish the potential existence of gender differences future studies would have to take some precautions. Such studies ought to strive for as even of a gender balance as

possible, while also including control groups for regular students. Additionally, it is important that such research does not end up only investigating a single setting or specific demographic as this opens up for the possibility of mistaking confounding variables for actual gender differences. If research into learning communities is to continue, then these variables ought to be mapped over consecutive years to give a clear picture as to the effects gender can have in this specific academic setting.

How the COVID-19 Pandemic Affected the Current Study

The outbreak of COVID-19 worldwide offered several challenges for the current study. Firstly, the respondents were all partaking in learning community groups arranged by the Department of Psychology at NTNU. These communities had to change from being solely based on physical attendance to having a 50/50 split between physical and digital. Similarly, most lectures hosted by the Department of Psychology switched to a similar model, resulting in less interaction between students and, arguably, a more trying educational environment whilst lecturers and students got accustomed to the new model.

Secondly, the research project itself had to change somewhat before launch. The original plan was to collect data from respondents at the start or end of their respective community gatherings. If the original plan had been followed it is possible that more accurate data could have been achieved, as the students would have had the relevant concepts freshly in mind. This was especially relevant to the Student Opinion Scale (Sundre & Thelk, 2007), which originally required respondents to take a few tests as a primer to the questionnaire itself. Instead, this tool had to be reworked to specifically refer to the PSY1013 subject and its corresponding learning communities.

Student Attendance in Learning Communities

The current study found a significant difference in student attendance, alongside reduced dropout, for learning communities when comparing the autumns of 2019 and 2020. The rather surprising fact here was how these communities actually experienced significantly better attendance during a global pandemic than in the previous year where no such situation was present. The reasonings for these can be many, but some of these are worth discussing in brief detail in order to better understand the data. Before discussing this further it is important to point out that data regarding how COVID has affected attendance is still hard to come by, seeing as the pandemic is at this point still ongoing. For this reason, the following discussion will base itself on the closest approximates available in contemporary research.

The Effects of Group Size on Attendance. Researchers have long studied and debated what effects the student-instructor ratio has on a variety of variables from attendance, dropout, learning gain, etc. In the current study respondents were organize in community groups of no more than 27 students to a single community leader, with the average of such groups being around 20 (see Appendix E). This is a vastly better student-instructor ratio than traditional lectures, with these gatherings sometimes numbering close to 300 students with one lecturer present. This is important because research has consistently hinted at the negative correlation between class size and attendance in traditional education (Friedman et al., 2001). One can argue that for as long as there is a physical component present in education then the student-instructor ratio will still relevant.

One of the possible reasons for the increase in learning community attendance is the effort and time required to physically attend. Research has previously hinted at this being a significant hurdle for students in traditional education (Kirby & McElroy, 2003), especially for those with jobs on the side (Ford et al., 1995; Longhurst, 1999). Whereas in previous years the learning communities had no established offer for remote participation, this became the norm in the first semester of the 2020-2021 academic year. This became so well integrated that most learning communities made it possible to attend digitally through Zoom even when the community group was supposed to be meeting in-person. This can be argued to have lowered the barrier of attending to such a degree that it alone might account for the increase in attendance as compared to the same semester in 2019 – 2020.

Besides the purely practical issues of travel, it can be argued that students generally experienced a larger degree of spare time during COVID than they normally would. This was in most instances probably not voluntary, however. This spare time most likely came about as a result of students loosing part-time jobs or being less likely to get one, and less availability to recreational activities (Onyema et al., 2020). This increase in available time might however have made students more willing to participate in educational activities, with this often being one of the few constants in a period of uncertainty. In this context the role of learning communities as social arenas, a commodity in short supply during COVID, might also have stimulated students to attend.

The Effects of Emergency Remote Learning on Attendance. A major issue raised by research into educational programmes integrating aspects of online learning is the perceived high rate of dropout for this type of education (Onah et al., 2014). All forms of dropout logically lead to some degree of resource waste (Kim et al., 2017), which in some

instances might outweigh the potential educational course in its entirety. An important distinction to make is that there are some differences between pure online education and the emergency remote learning that respondents experienced over the course of the current study.

Though the development of a digitalized alternative to traditional education has long been underway (Matthews, 1999) and has in recent years reached new heights with the developments of virtual meeting places, alongside file sharing becoming widely available (Muzyleva et al., 2019). As with any development researchers have been divided on how and why this might affect everything from learning to general attendance. Some are positive to the development and see the potential for increased interaction between student and teacher (e.g., Dhawan, 2020). Other researchers point out that this might lead to reduced socialization as interaction moves away from a physical classroom, especially when looking to underdeveloped countries (e.g., Anwar & Adnan, 2020).

Although still poorly understood, the umbrella term of Zoom fatigue might help to understand the steady downward trend of attendance in the current study. The lack of direct human interaction, reduced contextual information from body-language, and increased cognitive load might over time have created a sense of aversion in the students (Nadler, 2020; Wiederhold, 2020). If this was the case, then the steady reduction in participation of both the learning community gatherings and in the current study might make more sense (see Figure 2, Figure 3, and Appendix E). Alongside this the feeling of fatigue could potentially also explain why there was no similar upturn in attendance towards the end of the learning communities in the first semester of 2020-2021 as there was in 2019-2020. In order to further elaborate on this point more research into the potentially negative and/or positive effects of Zoom fatigue is needed.

Regarding the current study, it can be argued that the sudden implementation of emergency remote learning actually helped the overall attendance rate of students. Though data from the COVID period is still in its infancy, there are some indications that students actually had a high rate of attendance when engaging in emergency remote learning (Gares et al., 2020). The reasons for this are unclear, but one can speculate that this is similar to the increase in attendance commonly found in blended models (Hakala & Myllymäki, 2011; López-Pérez et al., 2011). Though not explicitly the same, the similarities in organization and tools between blended learning and the form of emergency remote learning employed over the course of the current study might help shed light on this phenomenon.

Strengths and Limitations

The Ever-Growing Database

From the onset the current study was envisioned to focus on a specific demographic in a study programme of psychology. By focusing on the narrow window of psychology students in their first year, whilst also looking at how learning communities might affect them, the current study contributes an important perspective rarely seen in contemporary research. Although the students' chosen programme of study was rarely important to the overall design of the current study this is nonetheless a unique research angle. By contributing research into this demographic future researchers and educators can hopefully implement programmes and make decisions that will further benefit the students themselves.

It is also the case that although learning communities are still commonplace in tertiary education the drive for research into these programmes have, at least to the authors knowledge, slowed down somewhat in recent years. Stagnation because an educational programme has seen validation in research is normal, but this should not dampen the drive for innovation. Education is an ever-evolving concept which must see constant revision to meet with the requirements of the day. By drawing upon contemporary research and investigating this in the learning community setting the current study offers a new impetus for research. It is this author's hope that new angles of research will be considered so that the learning community programme continues to see improvement, thereby offering students continued support and tools on their way to learning.

Although few truly conclusive findings can be drawn from the current study, it nonetheless gives important insight and counterpoints to established research. As previously mentioned, little research or care has been put into establishing the longitudinal patterns of how grit, passion, mindset, and motivation in students and non-students. Somewhat the exception to this is research that has found a unilateral increase in grit over the course of education and as one grows older (Bowman et al., 2015; Duckworth & Eskreis-Winkler, 2013). Especially when looking to grit it is surprising that there appears to be so little interest in the field for the longitudinal aspects of grit, given that it is a central part of its definition and items. It appears that most research is more concerned with establishing individuals grit scores in the now, rather than their development over time. There is also, at least to this authors knowledge, no other study that has investigated the combination of grit, passion, mindset, and motivation in the learning community setting. All this makes the current study unique in its focus, thereby adding a new perspective and value to the field.

By employing a varied set of tools together in a longitudinal design a rare insight into how these variables develop together has also been given. By doing this, one can better see how the constructs one seeks to measure interact and potentially correlate. For every study measuring a multitude of variables together one can hope to see how these relate to one another, and even how these together might explain more than they do on their own. This gives future researchers the opportunity to reach more accurate and valuable conclusions, be they in favour of the variables measured in the current study or not.

Taking the First Steps Towards General Developmental Patterns

As more and more longitudinal research is conducted with the intent of looking into the development of the variables studied in this paper the field can seek to establish more and more generalizable paths of development for these variables. By doing so it would arguably become easier and easier to predict crucial developmental periods in which intervention is most effective, when and where individuals might need more or less support, and in what fashion associated methods/initiatives are best employed. In being able to better predict when a student in tertiary education might struggle more with e.g., passion or motivation, resources might be better applied and learning improved. By doing so one can create students more suited to endure the hardships they encounter through grit and mindset, as well as gain an internalized and driven way of studying through passion and motivation. In this way the current research into these variables can be an important contributing factor to the creation of future initiatives for educators and administrators.

The longitudinal design also offers value in lieu of the time in which it took place. The COVID pandemic is an event which is likely to be defining of the 2020's and beyond, likely leaving its mark on multiple generations. By studying students engaging in tertiary education at a time when COVID restrictions were commonplace this offers a unique snapshot of a time in which new systems were tested and social phenomena arose. In so doing, the current study gives valuable data into how student development might be affected by events outside of their own control and dramatic societal changes.

Design Limitations

Perhaps the clearest limitation with the current study is the relatively low number of respondents. Ideally the setup and analysis performed in the current study ought to have a total sample size of 100 to 134 in order to achieve a $p < .05$ and $p < .01$ (effect size ≥ 0.40) respectively. Because the methodological approach of the current study opened up for some

risk of familywise-error (0.95^4 = .815 alpha level) (0.99^4 = 0.961 alpha level) a more conservative $p < .01$ had to be employed. With the current study only achieving 72 consistent respondents, this was 62 respondents too few of this benchmark. Because of this the potential predictive value of the current study should be interpreted accordingly.

A further limitation in the current study was the lack of a control variable for individual learning community group belonging. With learning communities being facilitated by individual leaders there is some room for an individual leader's abilities and experience to affect the development of relevant variables. Alongside not controlling for group leaders there was no control group for the current study. This makes it hard to assign any degree of external validity or generalizable value to the wider student population. These were however accepted shortcomings of the study with little contemporary research directly measuring learning communities in this way. The current study was therefore explorative in nature, and was primarily meant to give cursory insight on which future research could be based.

In the context of respondents it is worth pointing out that there is a general gender imbalance between the genders partaking in tertiary education in Scandinavia, with 60% of all tertiary students in Sweden being females in 2018 (Eurostat, 2020b). This is not unique to Scandinavia but is a trend in Europe in general, with 45% of all females aged 30-34, as opposed to 34% of all men, having completed tertiary education as of 2018 (Eurostat, 2020a). This trend can also be seen at NTNU. According to the Norwegian Database for Statistics About Higher Education; of all students at NTNU's Department of Psychology, where this study took place, there was in the first semester of 2020-2021 approximately 460 female (66%) to 155 male students divided amongst the one-year study and the bachelor's programme (Database for Statistikk om Høgre Utdanning, n.d.). This data can be found thorugh filtering by registered students, divided by campus, for the autumn semester of 2020 - 2021, and selecting either gender. Because of these somewhat uneven gender rates the data might be somewhat skewed.

A potential limitation can also be found in the personal involvement of the author in the learning community programme at NTNU. The author has personally led learning community groups in the course subjects of Biological Psychology 1 (PSY1013) and Cognitive Psychology 1 (PSY1012) over four years, from the second semester of the 2016-2017 school year to the second semester of the 2020-2021 school year. This means that the author was actively involved with the learning communities over the course of the current study. To avoid any direct influence and conflict of interest no group personally led by the author was eligible for participation in the current study. The author was however in regular

contact with the other community leaders as a part of the job and conferred with them regarding recruiting potential respondents in the groups they were responsible for.

Practical and Theoretical Implications

In a practical sense the current study shows that a longitudinal study into the effects of learning communities is very much a feasible course of research. Any future research seeking to cover this particular demographic would do well to keep in mind that response rates in any longitudinal study is paramount and that, although inevitable, respondent fallout is a very real risk. With this in mind it might be beneficial to promote the benefits of such research even clearer to potential respondents, so that they too might be more driven to stay with the study the entire way. Although in the current study no respondents chose to take the questionnaire again in order to receive their scores in the variables, this might be a participation incentive that appeals to many students.

The current study brings with it some theoretical implications for future research. It has helped to reinforce the findings of some previous research into grit (Bowman et al., 2015; Jiang et al., 2019), passion (Szabo et al., 2019), mindset (Dweck et al., 1995b; Yeager & Dweck, 2012; Yeager et al., 2014), and motivation (Jacobs & Newstead, 2000; Reich et al., 2020). At the same time, it has been unable to replicate previous findings of research into grit (Duckworth & Eskreis-Winkler, 2013; Park et al., 2020), passion (Bonneville-Roussy et al., 2013), mindset (Dweck et al., 1995a), and motivation (Kuh et al., 2006). Perhaps most notably when it comes to being unable to replicate previous findings was the lack of supposed gender differences in these variables (e.g., Bazelais et al., 2016; Degol et al., 2018; Hodge et al., 2018; Sigmundsson et al., 2020b). The finding of no gender differences speaks to there perhaps being little actual difference between genders in these variables, or if there is a difference that this is too small to make a difference. It is however important to keep in mind the limitations of the current study when seeking to apply it to contemporary or future research.

Encouragements for Future Research

For any researcher who wishes to investigate learning communities or similar programmes there are, in this author's opinion, several factors which should be kept in mind. Firstly, it would be beneficial to give all respondents a specific participation number. This would serve to give insight into the characteristics of individuals who drop out of the study partway, given that the study follows a longitudinal design. A potential follow-up

questionnaire or additional items meant to investigate why individuals drop out of the study or learning communities as a whole could give valuable data for furthering the developments of the learning community programme or similar programmes. The ability to track individual respondents would also help with creating a clearer picture of individual development over the course of learning community gatherings, especially if this could be paired with data into the development of students who choose not to participate or drop out of the learning communities. However, to gain meaningful insight into the development of such variables a longitudinal design is needed.

Through the collection of a diverse set of data into the variables of grit, passion, mindset, and motivation a more complete picture as to how these affect learning, academic performance, attendance, etc. can be created. By establishing a general developmental path or trend for students in tertiary and lower education better predictions and programmes can be implemented and created, thereby furthering the positive development of educational procedures. By adopting designs stretching over multiple semesters, or even whole degrees, even clearer developmental trends could be achieved. It is therefore important that future research into these and related variables are made available to the wider research and educator community through open sources and databases, whilst all the while accounting for changes in learning community setup and practice. The creation of models, tools, and programmes based on such research might prove invaluable to both researchers and educators, who together serve to create the next generation of academics and specialized work force.

There are also paths left unexplored in the current study that might prove valuable to the field. An example of this is if and how the developments seen in the current study and contemporary research potentially fits with research into how the personality traits of Big Five model correlates to the factors of learning and academic achievement. A further factor that potentially could add to the value already inherent in the learning community structure is research into the optimal community sizes and how these affects both the variables measured and student learning. If the future of learning communities lies in the digital, or if this development is set to continue beyond the current COVID pandemic, it would also be beneficial to establish what group sizes work best in learning communities employing a digital or blended model.

Conclusion

The current study sought to consolidate and concretize the theory surrounding the variables of grit, passion, mindset, and motivation; whilst also investigating how participation in learning communities affected these variables. A focus was put on potential gender differences, alongside how the current COVID pandemic might have affected participation and attendance in these groups. Through this it was found a significant ($p < .05$) increase in mindset over the course of the semester, as well as there being significantly better attendance over the course of the first semester 2020 – 2021 than the same period in the previous academic year. No significant findings were made in the other variables or any gender differences therein.

With research into grit, passion, mindset, and motivation having reached sometimes conflicting results the field is divided on multiple central themes. With the research presented in the current study some validation was made for research stating that the variables of grit, passion, and motivation are relatively stable; alongside lending credence to the notion that there might be no gender differences in these variables. Further, these variables do not appear to change overly much over a short amount of time for university students. There are some indications that students who are new to tertiary education, with no previously attained degrees, experience a sizable growth in mindset over a semester in university

The developmental trends in the variables measured serves as valuable first steps towards the creation of general developmental patterns of students' grit, passion, mindset, and motivation. Alongside this, the current study also offers a snapshot into how the educational programme of learning communities operated during the COVID-19 pandemic and how this fit in with previous research into emergency remote learning.

In order to establish further findings based on the current study future research is needed. Alongside continued research it would also be highly beneficial to introduce regularly scheduled measurements in the variables of grit, passion, mindset, motivation, and related variables in learning communities. In this regard, it would also be of paramount importance that these data be made available to future researchers through a joint database or an open science framework. By doing this it is hoped that the potential benefits of educational programme can be further expanded upon, and thereby offer a powerful tool to facilitators and educators in tertiary education.

Reference list

Alan, S., Boneva, T., & Ertac, S. (2019). Ever Failed, Try Again, Succeed Better: Results from a Randomized Educational Intervention on Grit. *The Quarterly Journal of Economics*, *134*(3), 1121-1162. https://doi.org/10.1093/qje/qjz006

Alarcon, G. M., & Edwards, J. M. (2013). Ability and motivation: Assessing individual factors that contribute to university retention. *Journal of Educational Psychology*, *105*(1), 129-137. https://doi.org/10.1037/a0028496

Alhadabi, A., & Karpinski, A. C. (2020). Grit, self-efficacy, achievement orientation goals, and academic performance in University students. *International Journal of Adolescence and Youth*, *25*(1), 519-535. https://doi.org/10.1080/02673843.2019.1679202

Alqahtani, A. Y., & Rajkhan, A. A. (2020). E-Learning Critical Success Factors during the COVID-19 Pandemic: A Comprehensive Analysis of E-Learning Managerial Perspectives. *Education Sciences*, *10*(9), 216. https://doi.org/10.3390/educsci10090216

Amabile, T. M., DeJong, W., & Lepper, M. R. (1976). Effects of externally imposed deadlines on subsequent intrinsic motivation. *Journal of Personality and Social Psychology*, *34*(1), 92-98. https://doi.org/10.1037/0022-3514.34.1.92

Anderi, E., Sherman, L., Saymuah, S., Ayers, E., & Kromrei, H. T. (2020). Learning Communities Engage Medical Students: A COVID-19 Virtual Conversation Series. *Cureus*, *12*(8), e9593-e9593. https://doi.org/10.7759/cureus.9593

Anderson, J. R. (1995). *Learning and memory: An integrated approach.* (1st ed.). John Wiley & Sons.

Andrade, M. S. (2007). Learning Communities: Examining Positive Outcomes. *Journal of College Student Retention: Research, Theory & Practice*, *9*(1), 1-20. https://doi.org/10.2190/E132-5X73-681Q-K188

Angelo, T. A. (1997). Seven promising shifts and seven powerful levers: Developing more productive learning (and writing) communities across the curriculum. *Language and Learning Across the Disciplines*, *2*(2), 56-75.

Anwar, K., & Adnan, M. (2020). Online learning amid the COVID-19 pandemic: Students perspectives. *Journal of Pedagogical Research*, *1*, 45-51. https://doi.org/10.33902/JPSP.2020261309

Aragon, S., & Johnson, E. (2008). Factors Influencing Completion and Noncompletion of Community College Online Courses. *American Journal of Distance Education*, *22*, 146-158. https://doi.org/10.1080/08923640802239962

Arnold, K. (2012). Didactics, Didactic Models and Learning. In N. M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 986-990). Springer US. https://doi.org/10.1007/978-1-4419-1428-6_1833

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the Effects of Stereotype Threat on African American College Students by Shaping Theories of Intelligence. *Journal of Experimental Social Psychology*, *38*(2), 113-125. https://doi.org/10.1006/jesp.2001.1491

Ayebi-Arthur, K. (2017). E-learning, resilience and change in higher education: Helping a university cope after a natural disaster. *E-Learning and Digital Media*, *14*(5), 259-274. https://doi.org/10.1177/2042753017751712

Baker, C. (2010). The impact of instructor immediacy and presence for online student affective learning, cognition, and motivation. *Journal of Educators Online*, *7*(1), n1. https://doi.org/10.9743/JEO.2010.1.2

Baker, S., & Pomerantz, N. (2000). Impact of Learning Communities on Retention at a Metropolitan University. *Journal of College Student Retention: Research, Theory & Practice*, *2*(2), 115-126. https://doi.org/10.2190/62p5-cq2u-ntuw-dm1c

Bakker, M., & Wicherts, J. M. (2014). Outlier removal and the relation with reporting errors and quality of psychological research. *PloS one*, *9*(7), e103360-e103360. https://doi.org/10.1371/journal.pone.0103360

Barefoot, B. O. (2000). The First-Year Experience: Are We Making It Any Better? *About Campus*, *4*(6), 12-18. https://doi.org/10.1177/108648220000400604

Barrick, M. R., & Mount, M. K. (1991). The Big Five personality dimensions and job performance: A meta-analysis. *Personnel Psychology*, *44*(1), 1-26. https://doi.org/10.1111/j.1744-6570.1991.tb00688.x

Bazelais, P., Lemay, D., & Doleck, T. (2016). How Does Grit Impact College Students' Academic Achievement in Science? *European Journal of Science and Mathematics Education*, *4*, 33-43.

Beachboard, M. R., Beachboard, J. C., Li, W., & Adkison, S. R. (2011). Cohorts and Relatedness: Self-Determination Theory as an Explanation of How Learning Communities Affect Educational Outcomes. *Research in Higher Education*, *52*(8), 853-874. https://doi.org/10.1007/s11162-011-9221-8

Berg, S., Forest, J., & Stenseng, F. (2020). When Passion Does Not Change, but Emotions Do: Testing a Social Media Intervention Related to Exercise Activity Engagement. *Frontiers in Psychology*, *11*(71). https://doi.org/10.3389/fpsyg.2020.00071

Bergen-Cico, D., & Viscomi, J. (2012). Exploring the Association between Campus Co-Curricular Involvement and Academic Achievement. *Journal of College Student Retention: Research, Theory & Practice*, *14*(3), 329-343. https://doi.org/10.2190/CS.14.3.c

Bewick, B., Koutsopoulou, G., Miles, J., Slaa, E., & Barkham, M. (2010). Changes in undergraduate students' psychological well-being as they progress through university. *Studies in Higher Education*, *35*(6), 633-645. https://doi.org/10.1080/03075070903216643

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: a longitudinal study and an intervention. *Child Dev*, *78*(1), 246-263. https://doi.org/10.1111/j.1467-8624.2007.00995.x

Bonneville-Roussy, A., Vallerand, R. J., & Bouffard, T. (2013). The roles of autonomy support and harmonious and obsessive passions in educational persistence. *Learning and Individual Differences*, *24*, 22-31. https://doi.org/10.1016/j.lindif.2012.12.015

Bowman, N. A., Hill, P. L., Denson, N., & Bronkema, R. (2015). Keep on Truckin' or Stay the Course? Exploring Grit Dimensions as Differential Predictors of Educational Achievement, Satisfaction, and Intentions. *Social Psychological and Personality Science*, *6*(6), 639-645. https://doi.org/10.1177/1948550615574300

Branch, R., & Dousay, T. A. (2015). *Survey of instructional design models* (D. Walling, Ed. 5 ed.). Association for Educational Communications and Technology. https://aect.org/survey_of_instructional_design.php

Brower, A. M., & Inkelas, K. K. (2010). Living-learning programs: One high-impact educational practice we now know a lot about. *Liberal Education*, *96*(2), 36-43.

Burd, E., & Hodgson, B. (2006). Attendance and Attainment: a five year study. *Innovation in Teaching and Learning in Information and Computer Sciences*, *5*(2), 1-12. https://doi.org/10.11120/ital.2006.05020004

Büchele, S. (2021). Evaluating the link between attendance and performance in higher education: the role of classroom engagement dimensions. *Assessment & Evaluation in Higher Education*, *46*(1), 132-150. https://doi.org/10.1080/02602938.2020.1754330

Carbonneau, N., Vallerand, R. J., Fernet, C., & Guay, F. (2008). The Role of Passion for Teaching in Intrapersonal and Interpersonal Outcomes. *Journal of educational psychology*, *100*(4), 977-987. https://doi.org/10.1037/a0012545

Carr, S. (2000). As distance education comes of age, the challenge is keeping the students. *Chronicle of Higher Education*, *46*(23), A39-A41. https://www.chronicle.com/article/As-Distance-Education-Comes-of/14334

Chatzisarantis, N. L. D., & Hagger, M. S. (2009). Effects of an intervention based on self-determination theory on self-reported leisure-time physical activity participation. *Psychology & Health*, *24*(1), 29-48. https://doi.org/10.1080/08870440701809533

Choudhury, S., Blakemore, S.-J., & Charman, T. (2006). Social cognitive development during adolescence. *Social Cognitive and Affective Neuroscience*, *1*(3), 165-174. https://doi.org/10.1093/scan/nsl024

Christensen, R., & Knezek, G. (2014). Comparative Measures of Grit, Tenacity and Perseverance. *International Journal of Learning, Teaching and Educational Research*, *8*, 16-30.

Ciarrochi, J., Heaven, P. C. L., & Davies, F. (2007). The impact of hope, self-esteem, and attributional style on adolescents' school grades and emotional well-being: A longitudinal study. *Journal of Research in Personality*, *41*(6), 1161-1178. https://doi.org/10.1016/j.jrp.2007.02.001

Claro, S., Paunesku, D., & Dweck, C. S. (2016). Growth mindset tempers the effects of poverty on academic achievement. *Proceedings of the National Academy of Sciences*, *113*(31), 8664. https://doi.org/10.1073/pnas.1608207113

Cohen, J. (1992). A power primer. *Psychol Bull*, *112*(1), 155-159.

Conditioning. (n.d). Merriam-Webster.com dictionary. https://www.merriam-webster.com/dictionary/conditioning

Cosgrove, J. M., Chen, Y. T., & Castelli, D. M. (2018). Physical Fitness, Grit, School Attendance, and Academic Performance among Adolescents. *BioMed Research International*, *2018*, 9801258. https://doi.org/10.1155/2018/9801258

Costa, A., & Faria, L. (2018). Implicit Theories of Intelligence and Academic Achievement: A Meta-Analytic Review. *Frontiers in Psychology*, *9*(829). https://doi.org/10.3389/fpsyg.2018.00829

Cox, C. M. (1926). *Genetic studies of genius. II. The early mental traits of three hundred geniuses*. Stanford University Press.

Credé, M., Tynan, M. C., & Harms, P. D. (2017). Much ado about grit: A meta-analytic synthesis of the grit literature. *Journal of Personality and Social Psychology*, *113*(3), 492. https://doi.org/10.1037/pspp0000102

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297-334. https://doi.org/10.1007/BF02310555

Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, *52*(4), 281-302. https://doi.org/10.1037/h0040957

Cross, K. P. (1998). Why Learning Communities? Why Now? *About Campus*, *3*(3), 4-11. https://doi.org/10.1177/108648229800300303

Czerniewicz, L., Trotter, H., & Haupt, G. (2019). Online teaching in response to student protests and campus shutdowns: academics' perspectives. *International Journal of Educational Technology in Higher Education*, *16*(1), 43. https://doi.org/10.1186/s41239-019-0170-1

Database for Statistikk om Høgre Utdanning. (n.d.). *Registerte studenter fordelt på campus*. Kunnskapsdepartementet. Retrieved January 5, 2021 from https://dbh.nsd.uib.no/statistikk/kategori_studenter.action

De Castella, K., & Byrne, D. (2015). My intelligence may be more malleable than yours: the revised implicit theories of intelligence (self-theory) scale is a better predictor of achievement, motivation, and student disengagement. *European Journal of Psychology of Education*, *30*. https://doi.org/10.1007/s10212-015-0244-y

Deary, I. J., Strand, S., Smith, P., & Fernandes, C. (2007). Intelligence and educational achievement. *Intelligence*, *35*(1), 13-21. https://doi.org/10.1016/j.intell.2006.02.001

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, *18*(1), 105-115. https://doi.org/10.1037/h0030644

Deci, E. L. (1975). *Intrinsic Motivation* (1st ed. 1975. ed.). Springer US : Imprint: Springer. https://link.springer.com/book/10.1007%2F978-1-4613-4446-9

Deci, E. L., Betley, G., Kahle, J., Abrams, L., & Porac, J. (1981). When Trying to Win: Competition and Intrinsic Motivation. *Personality and Social Psychology Bulletin*, *7*(1), 79-83. https://doi.org/10.1177/014616728171012

Deci, E. L., Koestner, R., & Ryan, R. M. (2001). Extrinsic Rewards and Intrinsic Motivation in Education: Reconsidered Once Again. *Review of Educational Research*, *71*(1), 1-27. https://doi.org/10.3102/00346543071001001

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior* (1st ed. 1985. ed.). Springer US : Imprint: Springer. https://link.springer.com/book/10.1007%2F978-1-4899-2271-7

Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry*, *11*(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie canadienne*, *49*(3), 182-185. https://doi.org/10.1037/a0012801

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and Education: The Self-Determination Perspective. *Educational Psychologist*, *26*(3-4), 325-346. https://doi.org/10.1080/00461520.1991.9653137

Degol, J. L., Wang, M.-T., Zhang, Y., & Allerton, J. (2018). Do Growth Mindsets in Math Benefit Females? Identifying Pathways between Gender, Mindset, and Motivation. *Journal of Youth and Adolescence*, *47*(5), 976-990. https://doi.org/10.1007/s10964-017-0739-8

Devadoss, S., & Foltz, J. (1996). Evaluation of Factors Influencing Student Class Attendance and Performance. *American Journal of Agricultural Economics*, *78*(3), 499-507. https://doi.org/10.2307/1243268

Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5-22. https://doi.org/10.1177/0047239520934018

Duckworth, A. L., & Eskreis-Winkler, L. (2013). True grit. *The Observer*, *26*(4).

Duckworth, A. L., Kirby, T. A., Tsukayama, E., Berstein, H., & Ericsson, K. A. (2011). Deliberate Practice Spells Success:Why Grittier Competitors Triumph at the National Spelling Bee. *Social Psychological and Personality Science*, *2*(2), 174-181. https://doi.org/10.1177/1948550610385872

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, *92*(6), 1087-1101. https://doi.org/10.1037/0022-3514.92.6.1087

Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the Short Grit Scale (GRIT–S). *Journal of personality assessment*, *91*(2), 166-174. https://doi.org/10.1080/ 00223890802634290

Durlak, J. A., Weissberg, R. P., & Pachan, M. (2010). A Meta-Analysis of After-School Programs That Seek to Promote Personal and Social Skills in Children and Adolescents. *American Journal of Community Psychology*, *45*(3), 294-309. https://doi.org/10.1007/s10464-010-9300-6

Dweck, C., Chiu, C., & Hong, Y. (1995a). Implicit Theories and Their Role in Judgments and Reactions: A Word From Two Perspectives. *Psychological Inquiry*, *6*(4), 267-285. https://doi.org/10.1207/s15327965pli0604_1

Dweck, C., Chiu, C., & Hong, Y. (1995b). Implicit theories: Elaboration and extension of the model. *Psychological Inquiry*, *6*(4), 322-333. https://doi.org/10.1207/s15327965pli0604_12

Dweck, C. S. (2000). *Self-theories : their role in motivation, personality, and development*. Psychology Press.

Dweck, C. S. (2007). Is Math a Gift? Beliefs That Put Females at Risk. In *Why aren't more women in science?: Top researchers debate the evidence.* (pp. 47-55). American Psychological Association. https://doi.org/10.1037/11546-004

Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, *95*(2), 256-273. https://doi.org/10.1037/0033-295X.95.2.256

Edmiston, R. W., & Jackson, L. A. (1949). The relationship of persistence to achievement. *Journal of Educational Psychology*, *40*(1), 47-51. https://doi.org/10.1037/h0054509

Eurostat. (2020a). *Gender statistics*. Statistics Explained. Retrieved February 23, 2021 from https://ec.europa.eu/eurostat/statistics-explained/index.php/Gender_statistics#Education

Eurostat. (2020b). *Tertiary education statistics*. Statistics Explained. Retrieved February 23, 2021 from https://ec.europa.eu/eurostat/statistics-explained/index.php/Tertiary_education_statistics#Participation_of_men_and_women _in_tertiary_education

Feather, N. T. (1961). The relationship of persistence at a task to expectation of success and achievement related motives. *The Journal of Abnormal and Social Psychology*, *63*(3), 552-561. https://doi.org/10.1037/h0045671

Fernald, G. G. (1912). An achievement capacity test: A preliminary report. *Journal of Educational Psychology*, *3*(6), 331-336. https://doi.org/10.1037/h0073155

Flick, L. (1998). Teaching Practices That Provide Cognitive Scaffolding for Classroom Inquiry. *ERIC*. https://eric.ed.gov/?id=ED442640

Foliano, F., Rolfe, H., Buzzeo, J., Runge, J., & Wilkinson, D. (2019). *Changing mindsets: Effectiveness trial*. https://www.niesr.ac.uk/publications/changing-mindsets-effectiveness-trial

Ford, J., Bosworth, D., & Wilson, R. (1995). Part-time work and full-time higher education. *Studies in Higher Education*, *20*(2), 187-202. https://doi.org/10.1080/03075079512331381693

Forest, J., Mageau, G. A., Crevier-Braud, L., Bergeron, É., Dubreuil, P., & Lavigne, G. L. (2012). Harmonious passion as an explanation of the relation between signature strengths' use and well-being at work: Test of an intervention program. *Human Relations*, *65*(9), 1233-1252. https://doi.org/10.1177/0018726711433134

Frank, K. A. (2000). Impact of a Confounding Variable on a Regression Coefficient. *Sociological Methods & Research*, *29*(2), 147-194. https://doi.org/10.1177/0049124100029002001

Friedman, P., Rodriguez, F., & McComb, J. (2001). Why Students Do and Do Not Attend Classes. *College Teaching*, *49*(4), 124-133. https://doi.org/10.1080/87567555.2001.10844593

Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: Current use, calculations, and interpretation. *Journal of Experimental Psychology: General*, *141*(1), 2-18. https://doi.org/10.1037/a0024338

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science*, *2*(2), 156-168.

Gares, S. L., Kariuki, J. K., & Rempel, B. P. (2020). Community Matters: Student–Instructor Relationships Foster Student Motivation and Engagement in an Emergency Remote Teaching Environment. *Journal of Chemical Education*, *97*(9), 3332-3335. https://doi.org/10.1021/acs.jchemed.0c00635

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, *7*(2), 95-105. https://doi.org/10.1016/j.iheduc.2004.02.001

Gibney, A., Moore, N., Murphy, F., & O'Sullivan, S. (2011). The first semester of university life; 'will I be able to manage it at all?'. *Higher Education*, *62*(3), 351-366. https://doi.org/10.1007/s10734-010-9392-9

Gillison, F. B., Rouse, P., Standage, M., Sebire, S. J., & Ryan, R. M. (2019). A meta-analysis of techniques to promote motivation for health behaviour change from a self-

determination theory perspective. *Health Psychology Review*, *13*(1), 110-130.
https://doi.org/10.1080/17437199.2018.1534071

Goldberg, B., & Finkelstein, M. (2002). Effects of a First-Semester Learning Community on
Nontraditional Technical Students. *Innovative Higher Education*, *26*(4), 235-249.
https://doi.org/10.1023/A:1015876829313

Goldman, C. A. (2012). A Cohort-based Learning Community Enhances Academic Success
and Satisfaction with University Experience for First-Year Students. *The Canadian
Journal for the Scholarship of Teaching and Learning*, *3*(2).
https://doi.org/10.5206/cjsotl-rcacea.2012.2.3

Haimovitz, K., & Dweck, C. S. (2017). The Origins of Children's Growth and Fixed
Mindsets: New Research and a New Proposal. *Child Development*, *88*(6), 1849-1859.
https://doi.org/10.1111/cdev.12955

Hakala, I., & Myllymäki, M. (2011). A Blended Learning Solution and the Impacts on
Attendance and Learning Outcomes. *International Journal of Emerging Technologies
in Learning (iJET)*, *6*(2011).

Ho, V. T., Wong, S.-S., & Lee, C. H. (2011). A Tale of Passion: Linking Job Passion and
Cognitive Engagement to Employee Work Performance. *Journal of Management
Studies*, *48*(1), 26-47. https://doi.org/10.1111/j.1467-6486.2009.00878.x

Hochanadel, A., & Finamore, D. (2015). Fixed And Growth Mindset In Education And How
Grit Helps Students Persist In The Face Of Adversity. *Journal of International
Education Research*, *11*, 47. https://doi.org/10.19030/jier.v11i1.9099

Hodge, B., Wright, B., & Bennett, P. (2018). The Role of Grit in Determining Engagement
and Academic Outcomes for University Students. *Research in Higher Education*,
59(4), 448-460. https://doi.org/10.1007/s11162-017-9474-y

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between
emergency remote teaching and online learning. *Educause review*, *27*, 1-12.

Huerta, J. C., & Bray, J. J. (2013). How Do Learning Communities Affect First-Year Latino
Students? *Learning Communities: Research & Practice*, *1*(1), 5.
https://washingtoncenter.evergreen.edu/lcrpjournal/vol1/iss1/5/

Inkelas, K. K., & Weisman, J. L. (2003). Different by design: An examination of student
outcomes among participants in three types of living-learning programs. *Journal of
College Student Development*, *44*(3), 335-368. https://doi.org/10.1353/csd.2003.0027.

Jachimowicz, J. M., Wihler, A., Bailey, E. R., & Galinsky, A. D. (2018). Why grit requires
perseverance and passion to positively predict performance. *Proceedings of the*

National Academy of Sciences, *115*(40), 9980-9985.
https://doi.org/10.1073/pnas.1803561115

Jacobs, P. A., & Newstead, S. E. (2000). The nature and development of student motivation. *British Journal of Educational Psychology*, *70*(2), 243-254. https://doi.org/10.1348/000709900158119

Jaeger, B., Freeman, S., Whalen, R., & Payne, R. (2010). Successful Students: Smart Or Tough? *American Society for Engineering Education*, 1-21. https://10.18260/1-2--16281

Jiang, W., Xiao, Z., Liu, Y., Guo, K., Jiang, J., & Du, X. (2019). Reciprocal relations between grit and academic achievement: A longitudinal study. *Learning and Individual Differences*, *71*, 13-22. https://doi.org/10.1016/j.lindif.2019.02.004

Johnson, J. L. (2000). Learning Communities and Special Efforts in the Retention of University Students: What Works, What Doesn't, and is the Return Worth the Investment? *Journal of College Student Retention: Research, Theory & Practice*, *2*(3), 219-238. https://doi.org/10.2190/v0pa-bl4b-1x2l-w5vt

Johnson, N., Veletsianos, G., & Seaman, J. (2020). US Faculty and Administrators' Experiences and Approaches in the Early Weeks of the COVID-19 Pandemic. *Online Learning*, *24*(2), 6-21. https://doi.org/10.24059/olj.v24i2.2285

Kannangara, C. S., Allen, R. E., Waugh, G., Nahar, N., Khan, S. Z. N., Rogerson, S., & Carson, J. (2018). All That Glitters Is Not Grit: Three Studies of Grit in University Students. *Frontiers in Psychology*, *9*(1539). https://doi.org/10.3389/fpsyg.2018.01539

Kant, I. (1900). *On Education (über Pädagogik).* Heath and Co. Translation Annette Churton. Retrieved February 9, 2021 from https://oll.libertyfund.org/title/davids-kant-on-education-uber-padagogik

Kappe, R., & van der Flier, H. (2010). Using multiple and specific criteria to assess the predictive validity of the Big Five personality factors on academic performance. *Journal of Research in Personality*, *44*(1), 142-145. https://doi.org/10.1016/j.jrp.2009.11.002

Kim, T., Yang, M., Bae, J., Min, B., Lee, I., & Kim, J. (2017). Escape from infinite freedom: Effects of constraining user freedom on the prevention of dropout in an online learning context. *Computers in Human Behavior*, *66*, 217-231. https://doi.org/https://doi.org/10.1016/j.chb.2016.09.019

Kim, T. K. (2015). T test as a parametric statistic. *Korean J Anesthesiol*, *68*(6), 540-546. https://doi.org/10.4097/kjae.2015.68.6.540

Kirby, A., & McElroy, B. (2003). The Effect of Attendance on Grade for First Year Economics Students in University College Cork. *The Economic and Social Review*, *34*, 311-326. http://hdl.handle.net/2262/61584

Koestner, R., Ryan, R. M., Bernieri, F., & Holt, K. (1984). Setting limits on children's behavior: The differential effects of controlling vs. informational styles on intrinsic motivation and creativity. *Journal of Personality*, *52*(3), 233-248. https://doi.org/10.1111/j.1467-6494.1984.tb00879.x

Kriegbaum, K., Becker, N., & Spinath, B. (2018). The relative importance of intelligence and motivation as predictors of school achievement: A meta-analysis. *Educational Research Review*, *25*, 120-148. https://doi.org/10.1016/j.edurev.2018.10.001

Kuh, G. D., Kinzie, J. L., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). *What matters to student success: A review of the literature* (Vol. 8).

Kunter, M., Tsai, Y.-M., Klusmann, U., Brunner, M., Krauss, S., & Baumert, J. (2008). Students' and mathematics teachers' perceptions of teacher enthusiasm and instruction. *Learning and Instruction*, *18*(5), 468-482. https://doi.org/10.1016/j.learninstruc.2008.06.008

Kwak, S. G., & Kim, J. H. (2017). Central limit theorem: the cornerstone of modern statistics. *Korean J Anesthesiol*, *70*(2), 144-156. https://doi.org/10.4097/kjae.2017.70.2.144

Laursen, E. K. (2015). The Power of Grit, Perseverance, and Tenacity. *Reclaiming Children and Youth*, *23*(4), 19-24. https://www.proquest.com/scholarly-journals/power-grit-perseverance-tenacity/docview/1655359246/se-2?accountid=12870

Lazowski, R. A., & Hulleman, C. S. (2016). Motivation Interventions in Education:A Meta-Analytic Review. *Review of Educational Research*, *86*(2), 602-640. https://doi.org/10.3102/0034654315617832

Lear, J. (1988). *Aristotle: The Desire to Understand*. New York: Cambridge University Press. https://doi.org/10.1017/CBO9780511570612

Lefkowitz, E. S. (2005). "Things Have Gotten Better": Developmental Changes Among Emerging Adults After the Transition to University. *Journal of Adolescent Research*, *20*(1), 40-63. https://doi.org/10.1177/0743558404271236

Lent, R. W., Brown, S. D., & Larkin, K. C. (1984). Relation of self-efficacy expectations to academic achievement and persistence. *Journal of Counseling Psychology*, *31*(3), 356-362. https://doi.org/10.1037/0022-0167.31.3.356

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, *22 140*, 55.

Lochner, L., & Moretti, E. (2004). The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports. *American Economic Review*, *94*(1), 155-189. https://doi.org/10.1257/000282804322970751

Longhurst, R. J. (1999). Why Aren't They Here? Student absenteeism in a further education college. *Journal of Further and Higher Education*, *23*(1), 61-80. https://doi.org/10.1080/0309877990230106

López-Pérez, M. V., Pérez-López, M. C., & Rodríguez-Ariza, L. (2011). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education*, *56*(3), 818-826. https://doi.org/10.1016/j.compedu.2010.10.023

Macnamara, B. N., & Rupani, N. S. (2017). The relationship between intelligence and mindset. *Intelligence*, *64*, 52-59. https://doi.org/10.1016/j.intell.2017.07.003

Mageau, G. A., & Vallerand, R. J. (2003). The coach–athlete relationship: a motivational model. *Journal of Sports Sciences*, *21*(11), 883-904. https://doi.org/10.1080/0264041031000140374

Matthews, D. (1999). The Origins of Distance Education and Its Use in the United States. *T.H.E. Journal*, *27*(2).

Matthews, R. S., Smith, B. L., & MacGregor, J. (2012). The evolution of learning communities: A retrospective. *New Directions for Teaching and Learning*, *2012*(132), 99-111. https://doi.org/10.1002/tl.20039

Mayhew, M., Rockenbach, A., Bowman, N., Seifert, T., Wolniak, G., Pascarella, E., & Terenzini, P. (2016). *How College Affects Students: 21st Century Evidence that Higher Education Works* (Vol. 3). Jossey-Bass.

McCaslin, M., & Hickey, D. T. (2001). Educational Psychology, Social Constructivism, and Educational Practice: A Case of Emergent Identity. *Educational Psychologist*, *36*(2), 133-140. https://doi.org/10.1207/S15326985EP3602_8

Michalos, A. C. (2017). Education, Happiness and Wellbeing. In *Connecting the Quality of Life Theory to Health, Well-being and Education: The Selected Works of Alex C. Michalos* (pp. 277-299). Springer International Publishing. https://doi.org/10.1007/978-3-319-51161-0_12

Michie, S., West, R., & Harvey, N. (2020). The concept of "fatigue" in tackling covid-19. *BMJ*, *371*, m4171. https://doi.org/10.1136/bmj.m4171

Miller, D. I. (2019). When do growth mindset interventions work? *Trends in cognitive sciences*, *23*(11), 910-912. https://doi.org/10.1016/j.tics.2019.08.005

Moyles, J. (2001). Passion, Paradox and Professionalism in Early Years Education. *Early Years*, *21*(2), 81-95. https://doi.org/10.1080/09575140124792

Muenks, K., Yang, J. S., & Wigfield, A. (2018). Associations between grit, motivation, and achievement in high school students. 158-176. https://doi.org/10.1037/mot0000076

Muzyleva, I., Yazykova, L., & Penkov, V. (2019, November 20-22). Digitalization of the University - What is It? 1st International Conference on Control Systems, Mathematical Modelling, Automation and Energy Efficiency, 335-337. https://doi.org/10.1109/SUMMA48161.2019.8947511

Nadler, R. (2020). Understanding "Zoom fatigue": Theorizing spatial dynamics as third skins in computer-mediated communication. *Computers and Composition*, *58*, 102613. https://doi.org/10.1016/j.compcom.2020.102613

NTNU. (n.d.). *LAOS*. Innsida NTNU. Retrieved April 5, 2021 from https://innsida.ntnu.no/wiki/-/wiki/Norsk/LAOS+-+Oppl%C3%A6ring+for+l%C3%A6ringsassistenter

Onah, D. F., Sinclair, J., & Boyatt, R. (2014). *Dropout rates of massive open online courses: behavioural patterns* EDULEARN14 Proceedings. https://doi.org/10.13140/RG.2.1.2402.0009

Onyema, E., Nwafor, C., Obafemi, F., Sen, S., Atonye, F., Sharma, A., & Alsayed, A. (2020). Impact of Coronavirus Pandemic on Education. *Journal of Education and Practice*, *11*, 108-121. https://doi.org/10.7176/JEP/11-13-12

Oreopoulos, P., & Salvanes, K. G. (2011). Priceless: The nonpecuniary benefits of schooling. *Journal of Economic perspectives*, *25*(1), 159-184. https://doi.org/10.1257/jep.25.1.159

Oriol, X., Miranda, R., Oyanedel, J. C., & Torres, J. (2017). The Role of Self-control and Grit in Domains of School Success in Students of Primary and Secondary School. *Frontiers in Psychology*, *8*(1716). https://doi.org/10.3389/fpsyg.2017.01716

Park, D., Tsukayama, E., Yu, A., & Duckworth, A. L. (2020). The development of grit and growth mindset during adolescence. *Journal of Experimental Child Psychology*, *198*, 104889. https://doi.org/10.1016/j.jecp.2020.104889

Patall, E. A., Cooper, H., & Wynn, S. R. (2010). The effectiveness and relative importance of choice in the classroom. *Journal of Educational Psychology*, *102*(4), 896-915. https://doi.org/10.1037/a0019545

Pedagogy. (n.d). Merriam-Webster.com dictionary. https://www.merriam-webster.com/dictionary/pedagogy

Perkins-Gough, D. (2013). The significance of grit: A conversation with Angela Lee Duckworth. *Educational Leadership*, *71*(1), 14-20.

Petkanič, M. (2013). Passion as a Will to Existence in Kierkegaard. *Kierkegaard Studies Yearbook*, *2013*(1), 325-342. https://doi.org/10.1515/kier.2013.2013.1.325

Piaget, J., Garcia, R., & Feider, H. (1988). Psychogenesis and the History of Science.

Pike, G. R., Kuh, G. D., & McCormick, A. C. (2011). An Investigation of the Contingent Relationships Between Learning Community Participation and Student Engagement. *Research in Higher Education*, *52*(3), 300-322. https://doi.org/10.1007/s11162-010-9192-1

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education*, *2*(3), 923-945. https://doi.org/10.1007/s42438-020-00155-y

Rathore, K., Abdul Qayyum, C., & Azad, M. (2018). Relationship between Co-curricular Activities and Exam Performance: Mediating Role of Attendance. *Bulletin of Education and Research*, *40*(1). https://eric.ed.gov/?id=EJ1210004

Razali, N. M., & Wah, Y. B. (2011). Power comparisons of shapiro-wilk, kolmogorov-smirnov, lilliefors and anderson-darling tests. *Journal of Statistical Modeling and Analytics*, *2*(1), 21-33. https://www.nrc.gov/docs/ML1714/ML17143A100.pdf

Reich, J., Buttimer, C., Fang, A., Hillaire, G., Hirsch, K., Larke, L., Littenberg-Tobias, J., Moussapour, R., Napier, A., Thompson, M., & Slama, R. (2020). Remote Learning Guidance From State Education Agencies During the COVID-19 Pandemic: A First Look. *edarxiv*. https://doi.org/10.35542/osf.io/437e2

Reicher, S., & Drury, J. (2021). Pandemic fatigue? How adherence to covid-19 regulations has been misrepresented and why it matters. *BMJ*, *372*, n137. https://doi.org/10.1136/bmj.n137

Reraki, M., Celik, I., & Saricam, H. (2015). Grit as a mediator of the relationship between motivation and academic achievement. *Ozean Journal of Social Science*, *8*(1). https://doi.org/10.13140/RG.2.2.15063.78240

Rhodes, J., May, J., Andrade, J., & Kavanagh, D. (2018). Enhancing Grit Through Functional Imagery Training in Professional Soccer. *The Sport psychologist*, *32*(3), 220-225. https://doi.org/10.1123/tsp.2017-0093

Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do Psychosocial and Study Skill Factors Predict College Outcomes? A Meta-Analysis. *Psychological Bulletin*, *130*(2), 261-288. https://doi.org/10.1037/0033-2909.130.2.261

Robins, R. W., & Pals, J. L. (2002). Implicit Self-Theories in the Academic Domain: Implications for Goal Orientation, Attributions, Affect, and Self-Esteem Change. *Self and Identity*, *1*(4), 313-336. https://doi.org/10.1080/15298860290106805

Ross, M., Perkins, H., & Bodey, K. (2016). Academic motivation and information literacy self-efficacy: The importance of a simple desire to know. *Library & Information Science Research*, *38*. https://doi.org/10.1016/j.lisr.2016.01.002

Roth, B., Becker, N., Romeyke, S., Schäfer, S., Domnick, F., & Spinath, F. M. (2015). Intelligence and school grades: A meta-analysis. *Intelligence*, *53*, 118-137. https://doi.org/10.1016/j.intell.2015.09.002

Rugnetta, M. (n.d.). *Neuroplasticity*. Britannica.com dictionary. https://www.britannica.com/science/neuroplasticity

Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*(1), 54-67. https://doi.org/10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68-78. https://doi.org/10.1037/0003-066X.55.1.68

Ryan, R. M., & Deci, E. L. (2008). A self-determination theory approach to psychotherapy: The motivational basis for effective change. *Canadian Psychology/Psychologie canadienne*, *49*(3), 186-193. https://doi.org/10.1037/a0012753

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, *61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Ryan, R. M., Patrick, H., Deci, E. L., & Williams, G. C. (2008). Facilitating health behaviour change and its maintenance: Interventions based on self-determination theory. *The European health psychologist*, *10*(1), 2-5.

Ryans, D. G. (1939). The measurement of persistence: an historical review. *Psychological Bulletin*, *36*(9), 715-739. https://doi.org/10.1037/h0060780

Sarrasin, J. B., Nenciovici, L., Foisy, L.-M. B., Allaire-Duquette, G., Riopel, M., & Masson, S. (2018). Effects of teaching the concept of neuroplasticity to induce a growth

mindset on motivation, achievement, and brain activity: A meta-analysis. *Trends in Neuroscience and Education*, *12*, 22-31. https://doi.org/10.1016/j.tine.2018.07.003

Schellenberg, B. J. I., & Bailis, D. S. (2015). Predicting longitudinal trajectories of academic passion in first-year university students. *Learning and individual differences*, *40*, 149-155. https://doi.org/10.1016/j.lindif.2015.04.008

Schleider, J., & Weisz, J. (2018). A single-session growth mindset intervention for adolescent anxiety and depression: 9-month outcomes of a randomized trial. *Journal of Child Psychology and Psychiatry*, *59*(2), 160-170. https://doi.org/10.1111/jcpp.12811

Schreiner, L. A. (2017). The Privilege of Grit. *About Campus*, *22*(5), 11-20. https://doi.org/10.1002/abc.21303

Scrivener, S., Bloom, D., Leblanc, A., Paxson, C., Rouse, C., & Sommo, C. (2008). A Good Start: Two-Year Effects of a Freshmen Learning Community Program at Kingsborough Community College. *Manpower Demonstration Research Corporation*. https://www.mdrc.org/publication/good-start

Seligman, M. E. P., & Csikszentmihalyi, M. (2014). Positive Psychology: An Introduction. In *Flow and the Foundations of Positive Psychology: The Collected Works of Mihaly Csikszentmihalyi* (pp. 279-298). Springer Netherlands. https://doi.org/10.1007/978-94-017-9088-8_18

Shin, M., & Hickey, K. (2020). Needs a little TLC: examining college students' emergency remote teaching and learning experiences during COVID-19. *Journal of Further and Higher Education*, 1-14. https://doi.org/10.1080/0309877X.2020.1847261

Sigmundsson, H. (2021). Passion, grit and mindset in the ages 14 to 77: Exploring relationship and gender differences. *New Ideas in Psychology*, *60*, 100815. https://doi.org/10.1016/j.newideapsych.2020.100815

Sigmundsson, H., Haga, M., & Hermundsdottir, F. (2020a). The passion scale: Aspects of reliability and validity of a new 8-item scale assessing passion. *New Ideas in Psychology*, *56*, 100745. https://doi.org/10.1016/j.newideapsych.2019.06.001

Sigmundsson, H., Haga, M., & Hermundsdottir, F. (2020b). Passion, grit and mindset in young adults: Exploring the relationship and gender differences. *New Ideas in Psychology*, *59*, 100795. https://doi.org/10.1016/j.newideapsych.2020.100795

Sisk, V. F., Burgoyne, A. P., Sun, J., Butler, J. L., & Macnamara, B. N. (2018). To What Extent and Under Which Circumstances Are Growth Mind-Sets Important to Academic Achievement? Two Meta-Analyses. *Psychological Science*, *29*(4), 549-571. https://doi.org/10.1177/0956797617739704

Socratic method. (n.d). Merriam-Webster.com dictionary. https://www.merriam-webster.com/dictionary/Socratic%20method

Stassen, M. L. A. (2003). Student Outcomes: The Impact of Varying Living-Learning Community Models. *Research in Higher Education*, *44*(5), 581-613. https://doi.org/10.1023/A:1025495309569

Stegers-Jager, K. M., Cohen-Schotanus, J., & Themmen, A. P. N. (2012). Motivation, learning strategies, participation and medical school performance. *Medical Education*, *46*(7), 678-688. https://doi.org/10.1111/j.1365-2923.2012.04284.x

Steinmayr, R., Crede, J., McElvany, N., & Wirthwein, L. (2016). Subjective Well-Being, Test Anxiety, Academic Achievement: Testing for Reciprocal Effects. *Frontiers in Psychology*, *6*(1994). https://doi.org/10.3389/fpsyg.2015.01994

Sternberg, R. J., Grigorenko, E. L., & Bundy, D. A. (2001). The Predictive Value of IQ. *Merrill-Palmer Quarterly*, *47*(1), 1-41. http://www.jstor.org/stable/23093686

Stoeber, J., Childs, J. H., Hayward, J. A., & Feast, A. R. (2011). Passion and motivation for studying: predicting academic engagement and burnout in university students. *Educational Psychology*, *31*(4), 513-528. https://doi.org/10.1080/01443410.2011.570251

Strayhorn, T. L. (2014). What Role Does Grit Play in the Academic Success of Black Male Collegians at Predominantly White Institutions? *Journal of African American Studies*, *18*(1), 1-10. https://doi.org/10.1007/s12111-012-9243-0

Sun, S., Pan, W., & Wang, L. L. (2010). A comprehensive review of effect size reporting and interpreting practices in academic journals in education and psychology. *Journal of Educational Psychology*, *102*(4), 989-1004. https://doi.org/10.1037/a0019507

Sundre, D. L., & Kitsantas, A. (2004). An exploration of the psychology of the examinee: Can examinee self-regulation and test-taking motivation predict consequential and non-consequential test performance? *Contemporary Educational Psychology*, *29*(1), 6-26. https://doi.org/10.1016/S0361-476X(02)00063-2

Sundre, D. L., & Moore, D. (2002). The Student Opinion Scale: A Measure of Examinee Motivation. *Assessment Update*, *14*.

Sundre, D. L., & Thelk, A. D. (2007). *The Student Opinion Scale (SOS): A Measure of Examinee Motivation: Test Manual*. https://www.jmu.edu/assessment/Visitor/SOS.shtml

Swink, R. L. (n.d). *Education*. Britannica.com dictionary. https://www.britannica.com/topic/education

Szabo, A., Griffiths, M. D., Demetrovics, Z., Vega, R., Ruíz-Barquín, R., Soós, I., & Kovacsik, R. (2019). Obsessive and harmonious passion in physically active Spanish and Hungarian men and women: A brief report on cultural and gender differences. *Int J Psychol*, *54*(5), 598-603. https://doi.org/10.1002/ijop.12517

Tang, X., Wang, M.-T., Guo, J., & Salmela-Aro, K. (2019). Building Grit: The Longitudinal Pathways between Mindset, Commitment, Grit, and Academic Outcomes. *Journal of Youth and Adolescence*, *48*(5), 850-863. https://doi.org/10.1007/s10964-019-00998-0

Taylor, K., Moore, W. S., MacGregor, J., & Lindblad, J. (2003). *Learning Community Research and Assessment: What We Know Now*. The Evergreen State College. http://wacenter.evergreen.edu/learning-community-research-and-assessment-what-we-know-now

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 78. https://doi.org/10.1186/1479-5868-9-78

Thelk, A. D., Sundre, D. L., Horst, S. J., & Finney, S. J. (2009). Motivation Matters: Using the Student Opinion Scale to Make Valid Inferences About Student Performance. *The Journal of General Education*, *58*(3), 129-151. http://www.jstor.org/stable/27798135

Thorndike, E. L. (1913a). *Educational psychology, Vol 1: The original nature of man*. Teachers College. https://doi.org/10.1037/13763-000

Thorndike, E. L. (1913b). *Educational psychology, Vol 2: The psychology of learning*. Teachers College. https://doi.org/10.1037/13051-000

Thorndike, E. L. (1914). *Educational psychology, Vol 3: Mental work and fatigue and individual differences and their causes*. Teachers College. https://doi.org/10.1037/13796-000

Tinto, V. (1997). Enhancing learning via community. *Thought & Action*, *13*(1), 53-58.

Tinto, V. (1999). Taking Student Retention Seriously: Rethinking the First Year of College. *NACADA*, *19*. https://doi.org/10.12930/0271-9517-19.2.5

Tinto, V., & Russo, P. (1994). Coordinated studies programs: Their effect on student involvement at a community college. *Community college review*, *22*(2), 16-25.

Tuckwiller, B., & Dardick, W. R. (2018). Mindset, Grit, Optimism, Pessimism, and Life Satisfaction in University Students With and Without Anxiety and/or Depression. *Journal of Interdisciplinary Studies in Education*, *6*(2), 32.

Tull, S., Dabner, N., & Ayebi-Arthur, K. (2017). Social media and e-learning in response to seismic events: Resilient practices. *Journal of Open, Flexible, and Distance Learning*, *21*(1), 63-76.

U.S. Department of Education. (2010). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. *U.S. Department of Education*, *115*.

UNICEF. (2019, October 2019). *Education overview*. UNICEF,. Retrieved March 12, 2021 from https://data.unicef.org/topic/education/overview/

Vallerand, R. J. (2010). Chapter 3 - On Passion for Life Activities: The Dualistic Model of Passion. In *Advances in Experimental Social Psychology* (Vol. 42, pp. 97-193). Academic Press. https://doi.org/10.1016/S0065-2601(10)42003-1

Vallerand, R. J. (2012). From motivation to passion: In search of the motivational processes involved in a meaningful life. *Canadian Psychology/Psychologie canadienne*, *53*(1), 42-52. https://doi.org/10.1037/a0026377

Vallerand, R. J. (2016). The Dualistic Model of Passion: Theory, Research, and Implications for the Field of Education. In W. C. Liu, J. C. K. Wang, & R. M. Ryan (Eds.), *Building Autonomous Learners: Perspectives from Research and Practice using Self-Determination Theory* (pp. 31-58). Springer Singapore. https://doi.org/10.1007/978-981-287-630-0_3

Vallerand, R. J., Blanchard, C., Mageau, G. A., Koestner, R., Ratelle, C., Leonard, M., Gagne, M., & Marsolais, J. (2003). Les passions de l'ame: on obsessive and harmonious passion. *Journal of Personality and Social Psychology*, *85*(4), 756-767. https://doi.org/10.1037/0022-3514.85.4.756

Van der Zee, K., Thijs, M., & Schakel, L. (2002). The relationship of emotional intelligence with academic intelligence and the Big Five. *European Journal of Personality*, *16*(2), 103-125. https://doi.org/10.1002/per.434

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating Learning, Performance, and Persistence: The Synergistic Effects of Intrinsic Goal Contents and Autonomy-Supportive Contexts. *Journal of Personality and Social Psychology*, *87*(2), 246-260. https://doi.org/10.1037/0022-3514.87.2.246

Vygotsky, L. S. (1978). *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press. https://doi.org/10.2307/j.ctvjf9vz4

Wiederhold, B. K. (2020). Connecting Through Technology During the Coronavirus Disease 2019 Pandemic: Avoiding "Zoom Fatigue". *Cyberpsychology, Behavior, and Social Networking*, *23*(7), 437-438. https://doi.org/10.1089/cyber.2020.29188.bkw

Wise, R. A. (2004). Dopamine, learning and motivation. *Nature Reviews Neuroscience*, *5*(6), 483-494. https://doi.org/10.1038/nrn1406

Wittrock, M. C. (1992). An Empowering Conception of Educational Psychology. *Educational Psychologist*, *27*(2), 129-141. https://doi.org/10.1207/s15326985ep2702_1

Wolf, L. F., & Smith, J. K. (1995). The Consequence of Consequence: Motivation, Anxiety, and Test Performance. *Applied Measurement in Education*, *8*(3), 227-242. https://doi.org/10.1207/s15324818ame0803_3

Yeager, D. S., & Dweck, C. S. (2012). Mindsets That Promote Resilience: When Students Believe That Personal Characteristics Can Be Developed. *Educational Psychologist*, *47*(4), 302-314. https://doi.org/10.1080/00461520.2012.722805

Yeager, D. S., Hanselman, P., Walton, G. M., Murray, J. S., Crosnoe, R., Muller, C., Tipton, E., Schneider, B., Hulleman, C. S., Hinojosa, C. P., Paunesku, D., Romero, C., Flint, K., Roberts, A., Trott, J., Iachan, R., Buontempo, J., Yang, S. M., Carvalho, C. M., Hahn, P. R., Gopalan, M., Mhatre, P., Ferguson, R., Duckworth, A. L., & Dweck, C. S. (2019). A national experiment reveals where a growth mindset improves achievement. *Nature*, *573*(7774), 364-369. https://doi.org/10.1038/s41586-019-1466-y

Yeager, D. S., Johnson, R., Spitzer, B. J., Trzesniewski, K. H., Powers, J., & Dweck, C. S. (2014). The far-reaching effects of believing people can change: Implicit theories of personality shape stress, health, and achievement during adolescence. *Journal of Personality and Social Psychology*, *106*(6), 867-884. https://doi.org/10.1037/a0036335

Yeager, D. S., Romero, C., Paunesku, D., Hulleman, C. S., Schneider, B., Hinojosa, C., Lee, H. Y., O'Brien, J., Flint, K., Roberts, A., Trott, J., Greene, D., Walton, G. M., & Dweck, C. S. (2016). Using design thinking to improve psychological interventions: The case of the growth mindset during the transition to high school. *Journal of Educational Psychology*, *108*(3), 374-391. https://doi.org/10.1037/edu0000098

Zhao, C.-M., & Kuh, G. D. (2004). Adding Value: Learning Communities and Student Engagement. *Research in Higher Education*, *45*(2), 115-138. https://doi.org/10.1023/B:RIHE.0000015692.88534.de

Zobac, S., Spears, J., & Barker, G. (2014). Identical profiles, different paths: Addressing self-selection bias in learning community cohorts. *Learning Communities Research and Practice*, *2*(1), 3. https://washingtoncenter.evergreen.edu/lcrpjournal/vol2/iss1/3/

Appendix A: Information Distributed to Potential Respondents

Below follows the information distributed to all potential participants about the purpose of the study, participation criteria, what participation entails, potential participation awards, and information regarding data security.

Effektene av deltakelse i et frivillig utdanningsopplegg på grunnleggende aspekter av læring

Før du velger å delta i denne studien så er det viktig at du forstår hvorfor denne forskningen gjøres og hva den vil innebære. Vennligst ta deg tid til å lese informasjonen gitt nedenfor nøye, og gjerne diskuter den med andre om du ønsker så. Du kan når som helst kontakte meg på jofj@stud.ntnu.no om du har spørsmål vedrørende denne forskningen. Gjerne ta deg tid til å vurdere om dette forskningsprosjektet er noe du ønsker å bidra til. For å delta kan du gå til https://nettskjema.no/a/159439 og registrere deg for deltakelse.

Hensikten med studien

Hensikten med denne studien er å kartlegge effektene et frivillig supplement til et curriculum (pensum, forelesninger, etc.) kan påvirke ens grunnleggende aspekter for læring. Dette frivillige supplementet er i denne sammenhengen kollokviene som arrangeres av Instituttet for Psykologi ved NTNU.

Læring er et begrep vi alle har et forhold til, og få ting er viktigere i livet enn vår evne til å lære. I den sammenheng føler jeg det er sentralt å kartlegge hvordan vi kan påvirke vår evne til å lære. I denne sammenheng skal jeg forsøke å kartlegge grunnleggende sider/aspekter av læring. Disse aspektene har blitt godt etablert gjennom tidligere forskning, men de har sjeldent blitt satt opp sammen, og aldri i sammenheng med å måle endringer over et semester av studier.

Målet med studien blir derfor å måle endringer i deltakeres læringsaspekter over tid. Håper er at dette vil reflektere effektene av deltakelse i kollokvier og studien generelt. De grunnleggende læringsaspektene som skal kartlegges i denne studien er: lidenskap ("passion"), utholdenhet ("grit"), tankesett om egen læringsevne ("mindset") og motivasjon ("motivation").

Kriterier for å delta

Kriteriene for å kunne delta i studien er å ha en god skriftlig forståelsa av det norske språk, være student i emnet PSY1013 (Biologisk Psykologi 1) 1.semester 2020 og være deltakende i kollokviene i PSY1013.

Hva innebærer det å delta?

Å delta i denne forskningen betyr at du takker ja til å delta på totalt tre runder med datainnsamling. Disse innsamlingene tar formen av spørreskjema, og de vil skje via et nettskjema av hensyn til person- og smittevern. Innsamlingene vil finne sted i uke 38 - 39, uke 43 – 44 og uke 46-47. Innsamlingene vil også gi deg mulighet til å gi tilbakemelding om kollokvieaktiviteten du deltar i. Det forventes at du svarer på hver av de tre rundene med undersøkelser ved deltakelse. Du kan når som helst, uten noen begrunnelse, trekke deg fra studien.

Mulige gevinster ved å delta

Alle deltakere som fullfører samtlige tre runder med spørreskjema vil være med i trekningen av 6 gavekort til en verdi på 200 kr hver. Disse gavekortene kan benyttes på ca. 250 ulike steder i Midtbyen i Trondheim. En deltaker kan kun vinne et gavekort. Utover rent materielle gevinster kan alle deltakere etterspørre å få innsikt i dataene som kommer av datainnsamlingen, samt den endelige rapporten som skapes basert på dette. Man kan også be om å få gjennomføre testene separat for å få vite sine egne skårer på de ulike læringsaspektene. Dette er en unik mulighet til å få innsikt i pedagogisk-psykologisk forskning.

Datasikkerhet

Alle svar er anonymiserte, så det er ingen risiko for at dine data skal kunne utnyttes i noen sammenhenger. Alle deltakere blir bedt om å oppgi gruppenummer for deres kollokviegruppe, alder, kjønn og utdanningsnivå, men dette er i seg selv ikke identifiserende på noen måte. Dataene skal kun behandles av masterstudenten som bestyrer prosjektet (Jo Fosby Jaavall) og eventuelt vedkommendes veileder (Hroar Klempe).

Appendix B: Items of the Combined Tool

   This part of the appendix shows the questionnaires distributed to the students over the course of the study. During the recruitment process interested participants were asked to follow a link to a web page (www.nettskjema.no) where they were asked to provide an e-mail address and designate their learning community group. The provided e-mail address was used to distribute links to the three future questionnaires over the course of the semester.

   Note that the questionnaire distributed during the first data collection (as shown in Table B2) includes a section about motivation for starting to study for a degree in psychology. This data was collected on behalf of the Psychological Institute at NTNU and was not used for the current study.

   In addition to the items shown below the participants were asked to designate what learning community group they belonged to, with the options ranging from 1 through 15. In order to assist with this the names of the learning community leaders responsible for facilitating learning in these groups were listed. In the interest of personal privacy and data security this part of the questionnaire will not be listed here.

Table B1

Items Used to Collect Sociodemographic Data (Translated from Norwegian)

Item	Options
What age group do you belong to?	19-25 years
	26-35 years
	36-45 years
	46-55 years
	56-65 years
What gender do you identify yourself with?	Female
	Male
	Other
What is your highest finished education?	Norwegian high school
	College
	One-year study
	Bachelor's Degree
	Master's Degree
	Doctorate's Degree

Table B2

Items Used to Collect Data on Motivation for Starting to Study for a Degree in Psychology

(Translated from Norwegian) in the First Data Collection

Item	Scale
I1. Complete a degree	1-5 ("Very Important" to "Not at all important")
I2. Study something whilst awaiting entry into another educational course.	1-5 ("Very Important" to "Not at all important")
I3. Getting new friendships.	1-5 ("Very Important" to "Not at all important")
I4. Pressure from family to engage in higher education.	1-5 ("Very Important" to "Not at all important")
I5. Study something whilst finding out what I want with my life.	1-5 ("Very Important" to "Not at all important")
I6. A wish to enter into the clinical master's programme (at NTNU).	1-5 ("Very Important" to "Not at all important")
I7. An inherent interest for the field.	1-5 ("Very Important" to "Not at all important")
I8. Get a job.	1-5 ("Very Important" to "Not at all important")
I9. Collecting age points in order to enter into another course.	1-5 ("Very Important" to "Not at all important")
I10. Experience what it is like to be a student.	1-5 ("Very Important" to "Not at all important")

Note. I = Item.

Table B3

Short Grit Scale Questionnaire Used for the First, Second and Third Data Collection

(Translated from Norwegian) With Corresponding Items

Items of the Grit-S (Duckworth & Quinn, 2009)
I1. New ideas and projects sometimes distract me from previous ones. * **
I2. Setbacks don't discourage me. **
I3. I have been obsessed with a certain idea or project for a short time but later lost interest. * **
I4. I am a hard worker. **
I5. I often set a goal but later choose to pursue a different one. * **
I6. I have difficulty maintaining my focus on projects that take more than a few months to complete. * **
I7. I finish whatever I begin. **
I8. I am diligent. **

Note. I = Item. Scale = 1-5, "Very much like me" to "Not like me at all".

Scores: 1 = Not at all gritty, 5 = Extremely gritty. * = Item reversed.

** = Persistence of Effort subscale. *** = Consistency of Interest subscale

Table B4

The Passion Scale Questionnaire Used for the First, Second and Third Data Collection

(Translated from Norwegian) With Corresponding Items

Items of the Passion Scale (Sigmundsson et al., 2020)
I1. I have an area/theme/skill I am really passionate about.
I2. I would like to use a lot of time to become good in that area/theme/skill.
I3. I think I could be an expert in one area/theme/skill.
I4. I have passion enough to become very good in the area/theme/skill I like.
I5. I work hard enough to fulfil my goals.
I6. I have a burning passion for some areas/theme/skills.
I7. I use lot of time on the projects I like.
I8. My passion is important for me.

Note. Scale = 1-5, "Not like me at all" to "Very much like me".

Scores: 1 = Not at all passionate, 5 = Extremely passionate.

Table B5

Implicit Theories of Intelligence (Self-Theory) Scale Used for the First, Second and Third

Data collection (Translated from Norwegian) With Corresponding Items

Items of the Implicit Theories of Intelligence (self-theory) scale (De Castella & Byrne, 2015)
I1. I don't think I personally can do much to increase my intelligence. *
I2. My intelligence is something about me that I personally can't change very much. *
I3. To be honest, I don't think I can really change how intelligent I am. *
I4. I can learn new things, but I don't have the ability to change my basic intelligence. *
I5. With enough time and effort, I think I could significantly improve my intelligence level.
I6. I believe I can always substantially improve on my intelligence.
I7. Regardless of my current intelligence level, I think I have the capacity to change it quite a bit.
I8. I believe I have the ability to change my basic intelligence level considerable over time.

Note. I = Item. Scale = 1-6, "Strongly disagree" to "Strongly agree".

Scores: 1 = Fixed Mindset, 6 = Growth Mindset. * = Item reversed.

I1-I4 = Entity self-beliefs (fixed) subscale. I5-I8 = Incremental self-beliefs (growth) subscale.

Table B6

Modified Student Opinion Scale Used for the First, Second and Third Data Collection

(Translated from Norwegian) With Corresponding Items

Items of the modified Student Opinion Scale (Sundre & Thelk, 2007)
I1. Doing well in this subject is important to me. ***
I2. I have engaged in good effort in this subject thus far. **
I3. I am not curious about how I am doing in this subject relative to others. * ***
I4. I am not concerned about the final score I receive in this subject. * ***
I5. This subject is important to me. ***
I6. I have given my best effort in this subject thus far. **
I7. While taking this subject, I could have worked harder on it. * **
I8. I would like to know how well I am doing in this subject. ***
I9. I have not given this subject my full attention thus far. * **
I10. While taking this subject thus far, I have been able to persist until fully learning particular aspects of it. **

Note. I = Item. Scale = 1-5, "Strongly disagree" to "Strongly agree".

Scores: 1 = Very low motivation, 6 = Very high motivation. * = Item reversed.
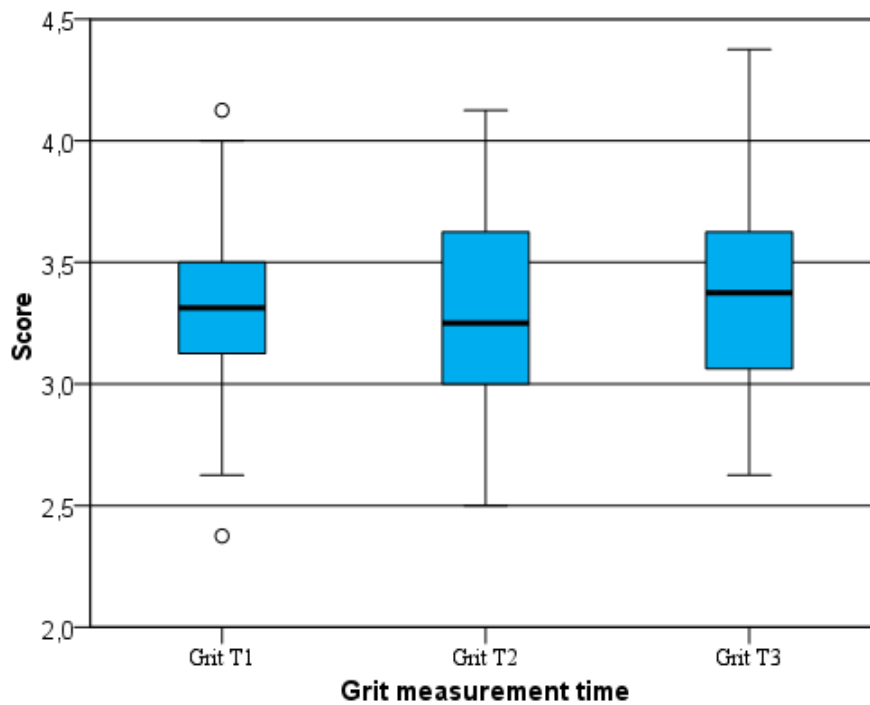
** = Importance subscale. *** = Importance subscale.

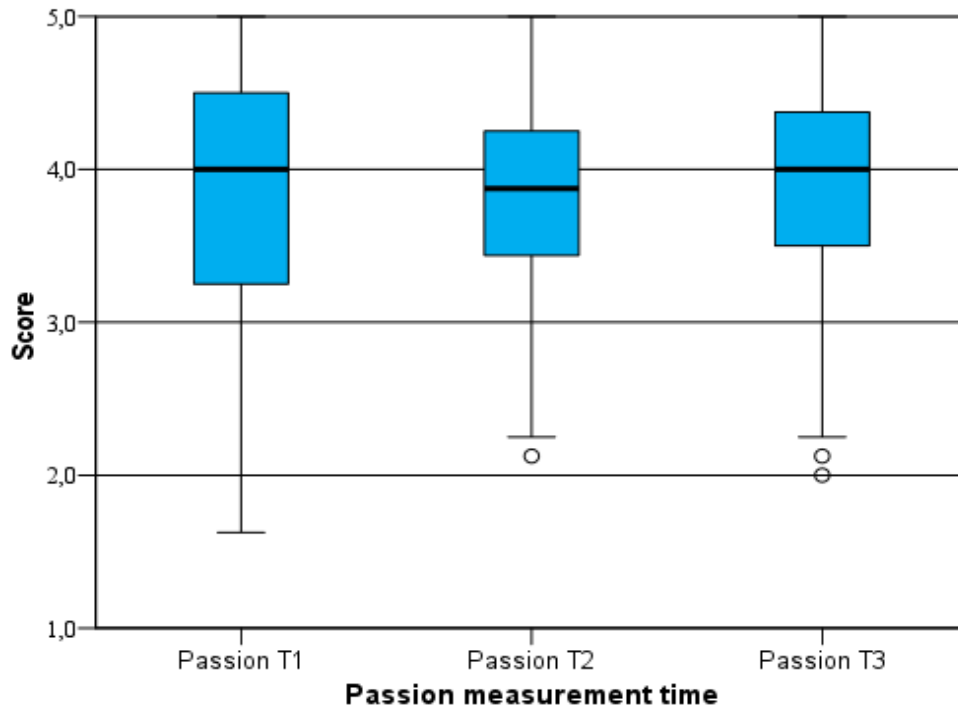**Appendix C: Box Plots of One-Way Repeated Measures ANCOVA**

One of the central assumptions in a one-way repeated measures ANCOVA is the assumption of there being no significant outliers. In order to test this box plots for the variables of grit, passion, mindset, and motivation at T1-T3 were performed. These box plots are listed below.
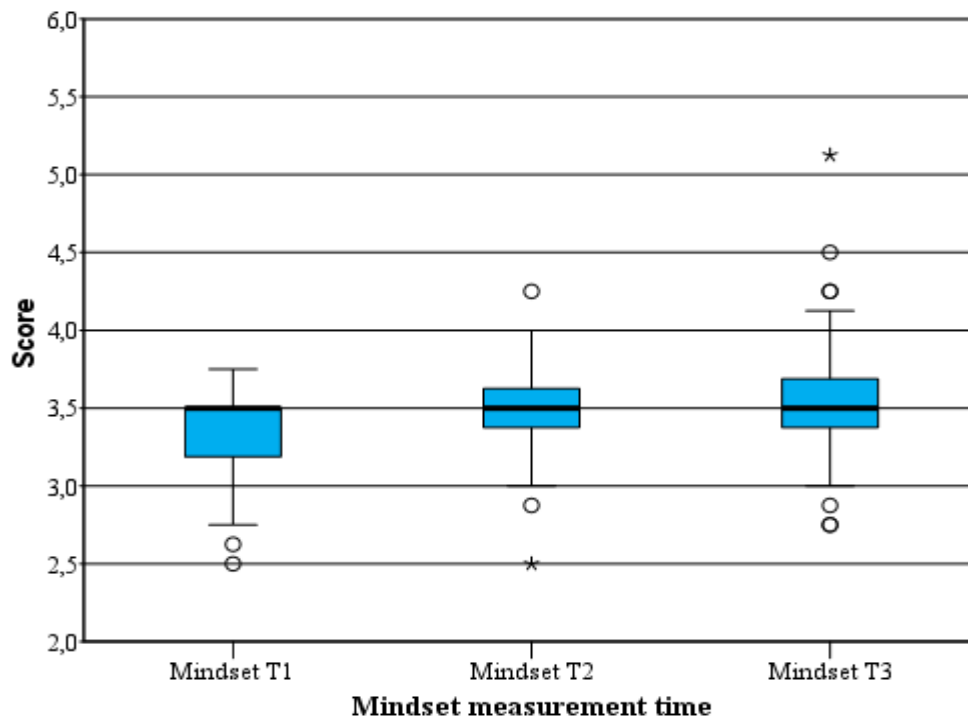
Figure C1

Box Plots for Grit Measurement Times One, Two, and Three

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Figure C2

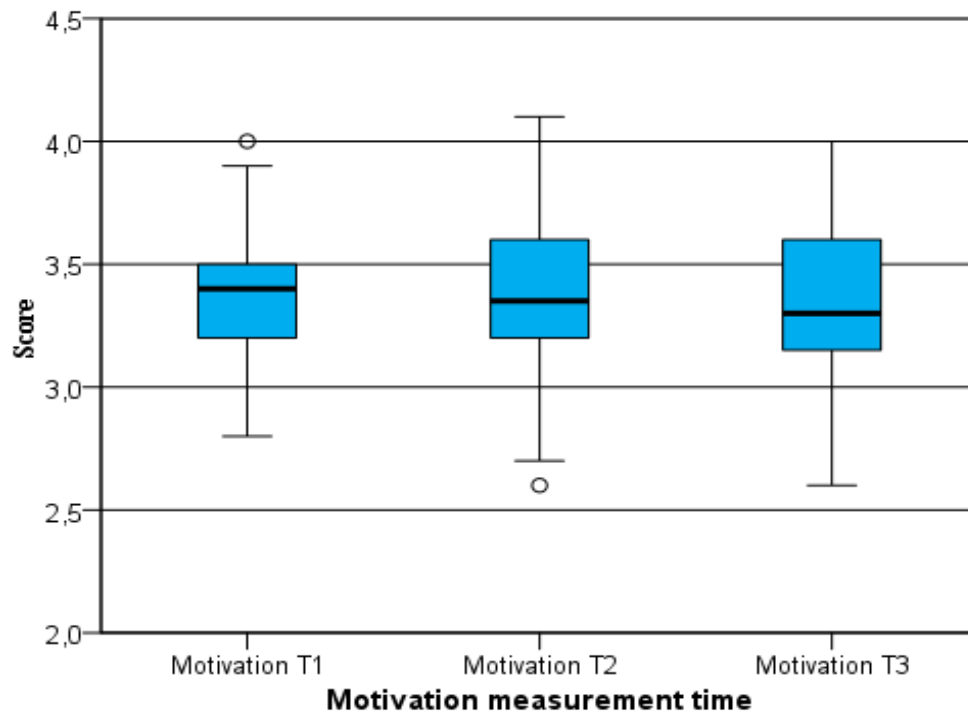*Box Plots for Passion Measurement Times One, Two, and Three*

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Figure C3

Box Plots for Mindset Measurement Times One, Two, and Three

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Figure C4

*Box Plots for Motivation Measurement Times One, Two, and Three*

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

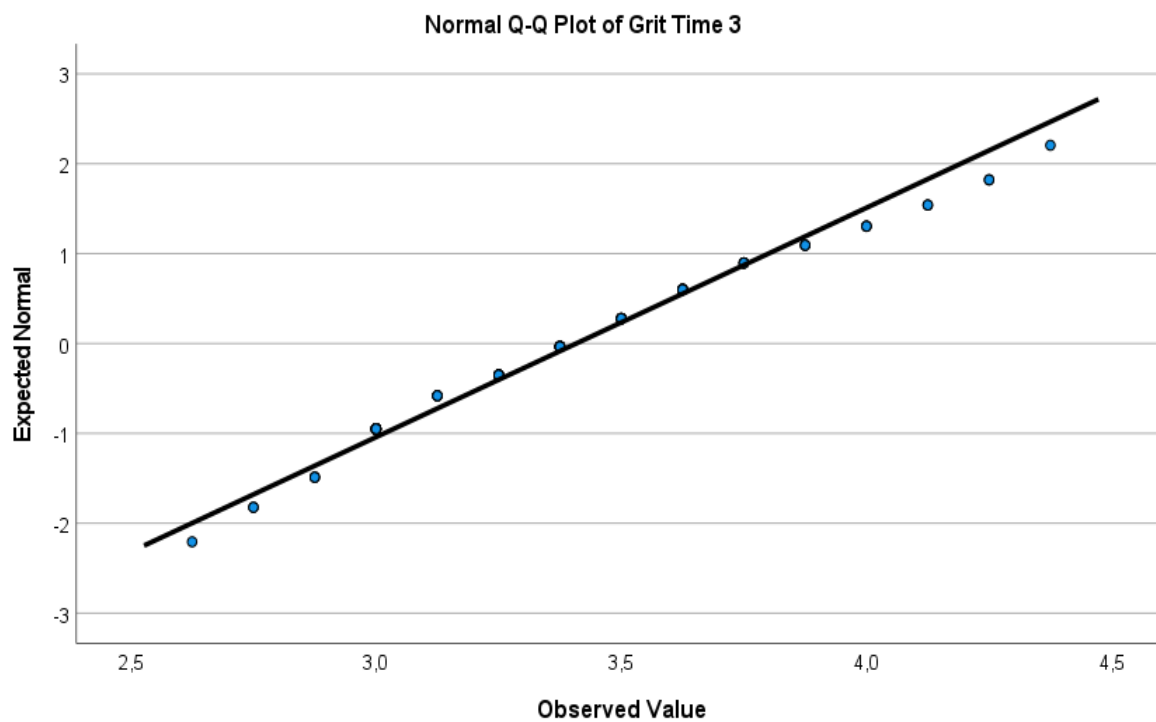**Appendix D: Q-Q Plots of One-Way Repeated Measures ANCOVA**

One of the central assumptions in a one-way repeated measures ANCOVA is the assumption of normality. In order to test this Q-Q plots for the variables of grit, passion, mindset, and motivation at T1-T3 were performed. These Q-Q plots are listed below.

Figure D1

Q-Q Plot for Grit Measurement Time One

Normal Q-Q Plot of Grit Time 1
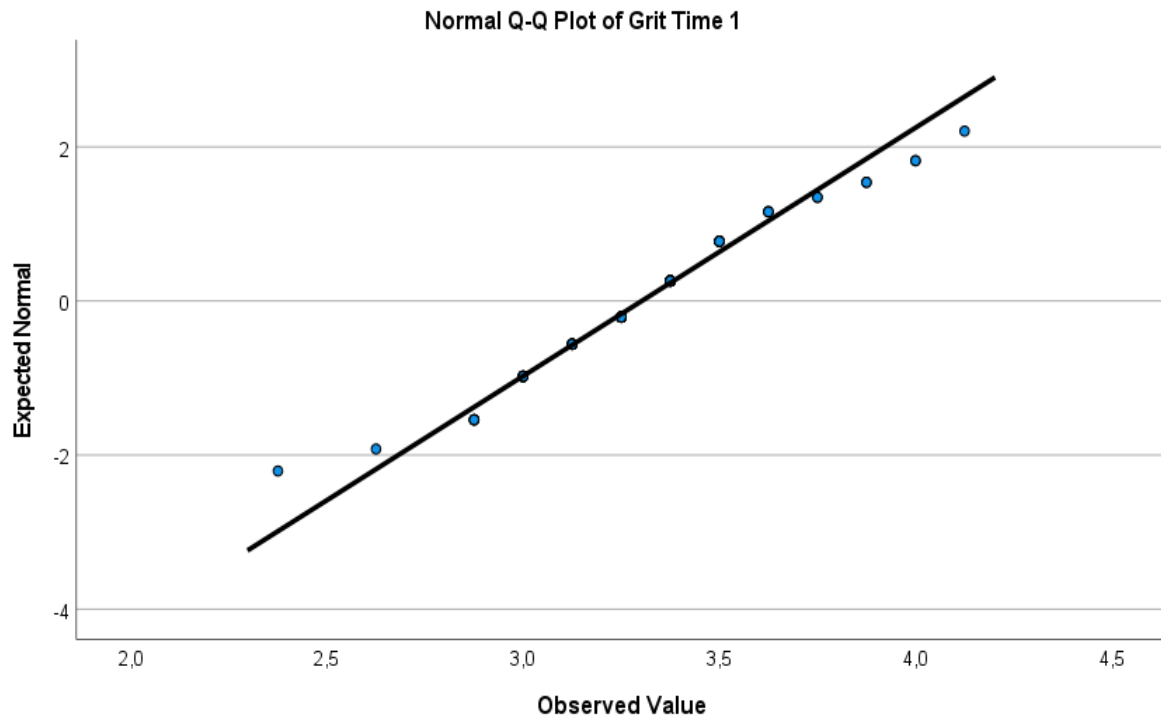
Figure D2

Q-Q Plot for Grit Measurement Time Two

Normal Q-Q Plot of Grit Time 2
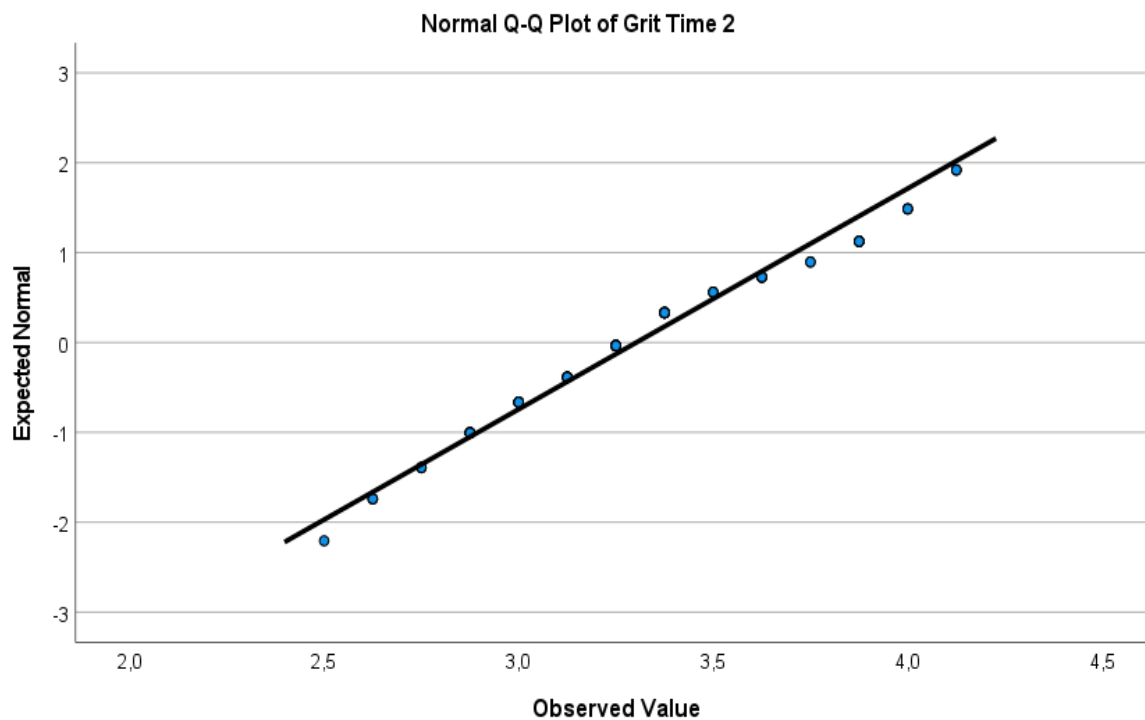
Figure D3

Q-Q Plot for Grit Measurement Time Three

Normal Q-Q Plot of Grit Time 3

Figure D4

Q-Q Plot for Passion Measurement Time One

Normal Q-Q Plot of Passion Time 1

Figure D5

Q-Q Plot for Passion Measurement Time Two

Normal Q-Q Plot of Passion Time 2
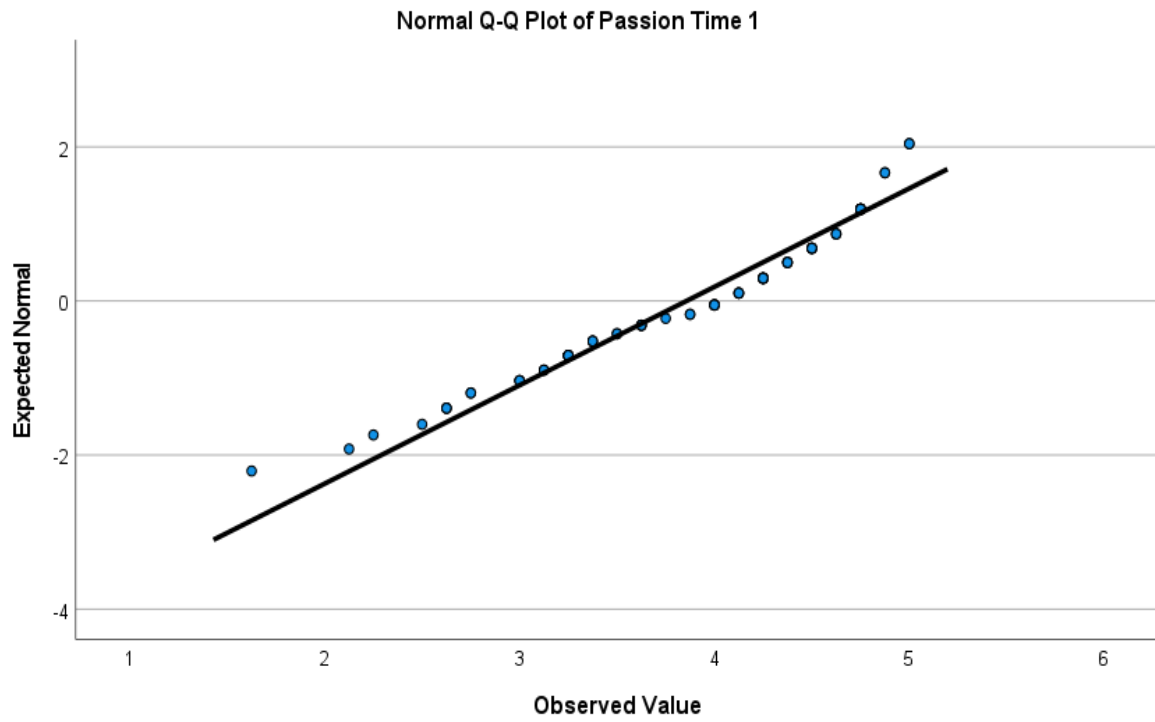
Figure D6
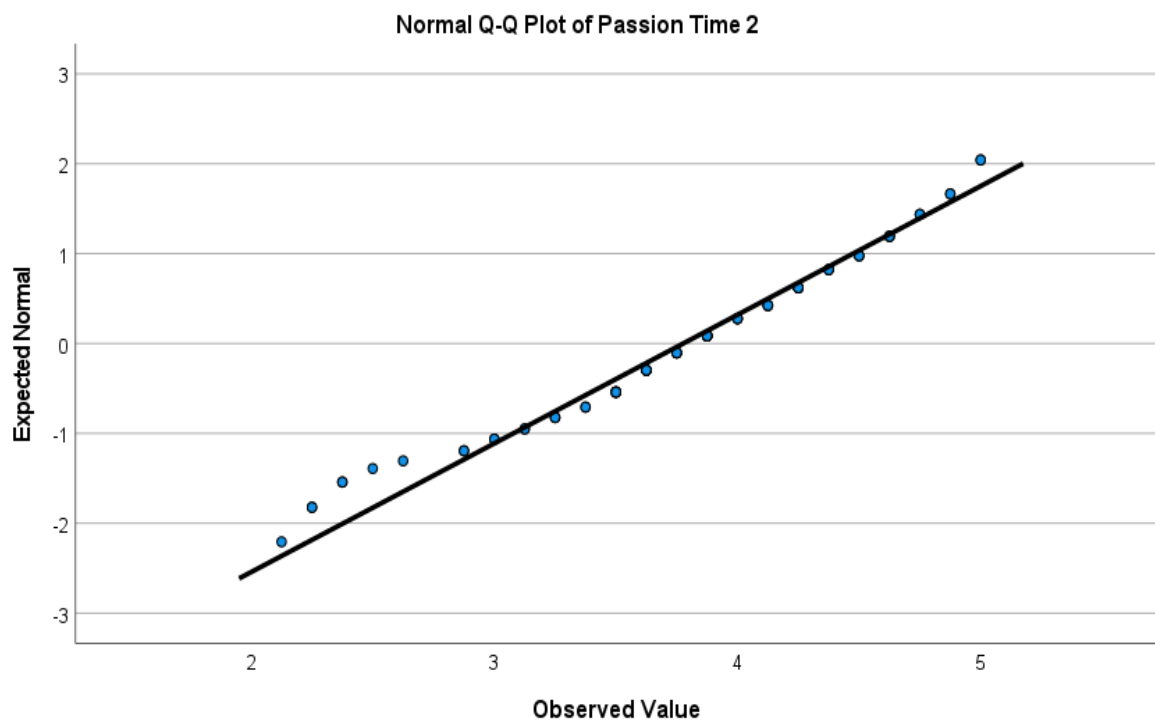
Q-Q Plot for Passion Measurement Time Three

Figure D7

Q-Q Plot for Mindset Measurement Time One

Figure D8

Q-Q Plot for Mindset Measurement Time Two

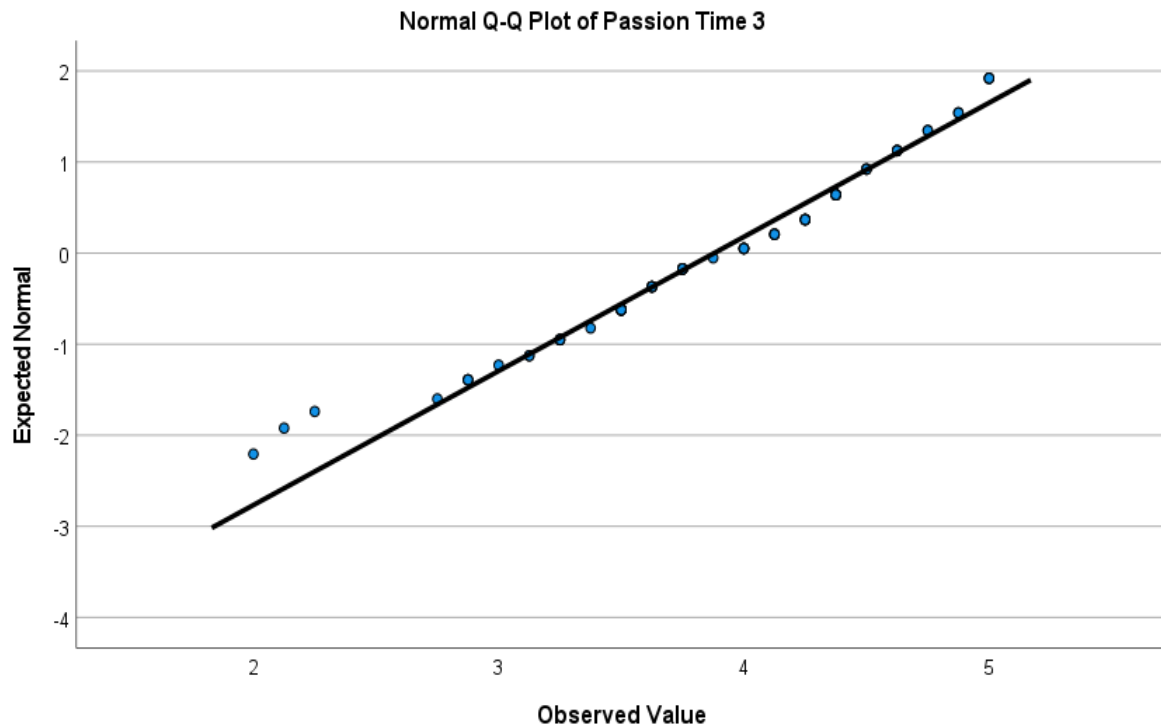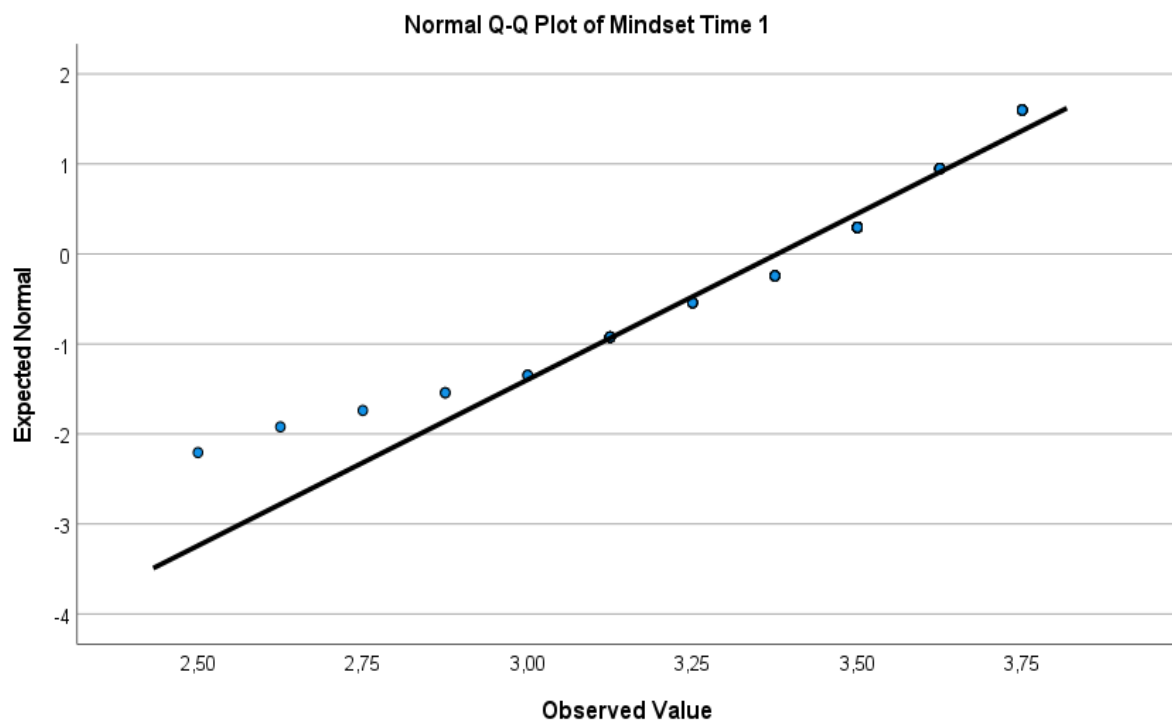Normal Q-Q Plot of Mindset Time 2
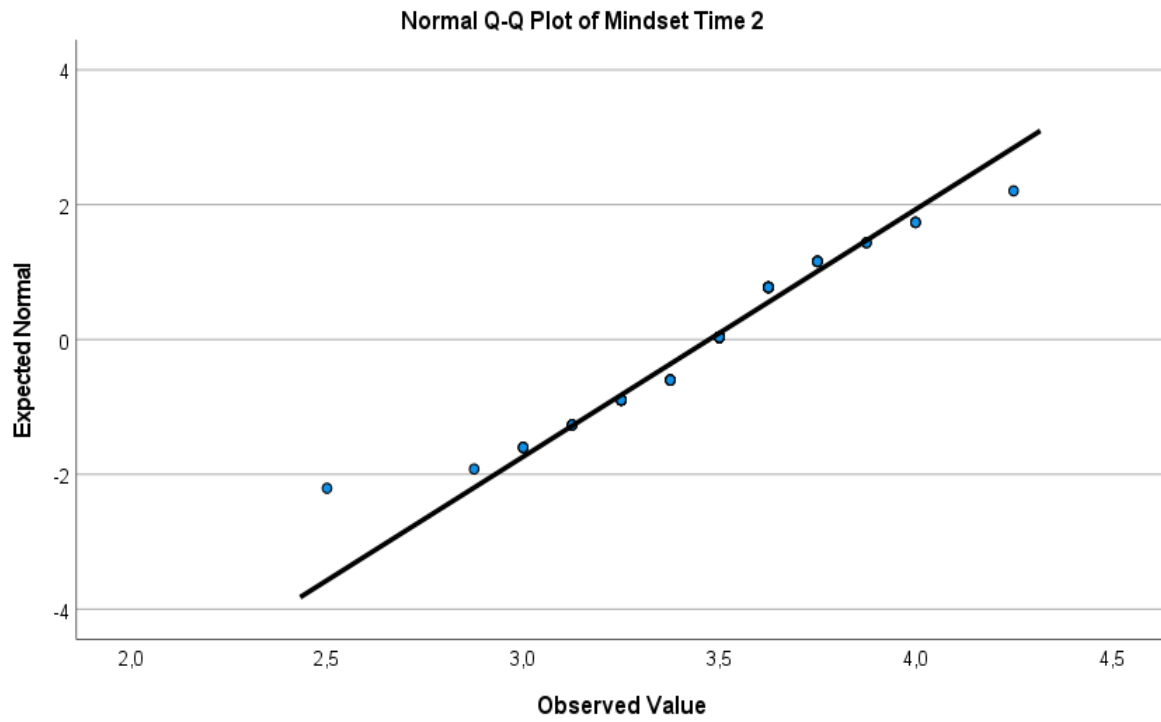
Figure D9

Q-Q Plot for Mindset Measurement Time Three

Normal Q-Q Plot of Mindset Time 3
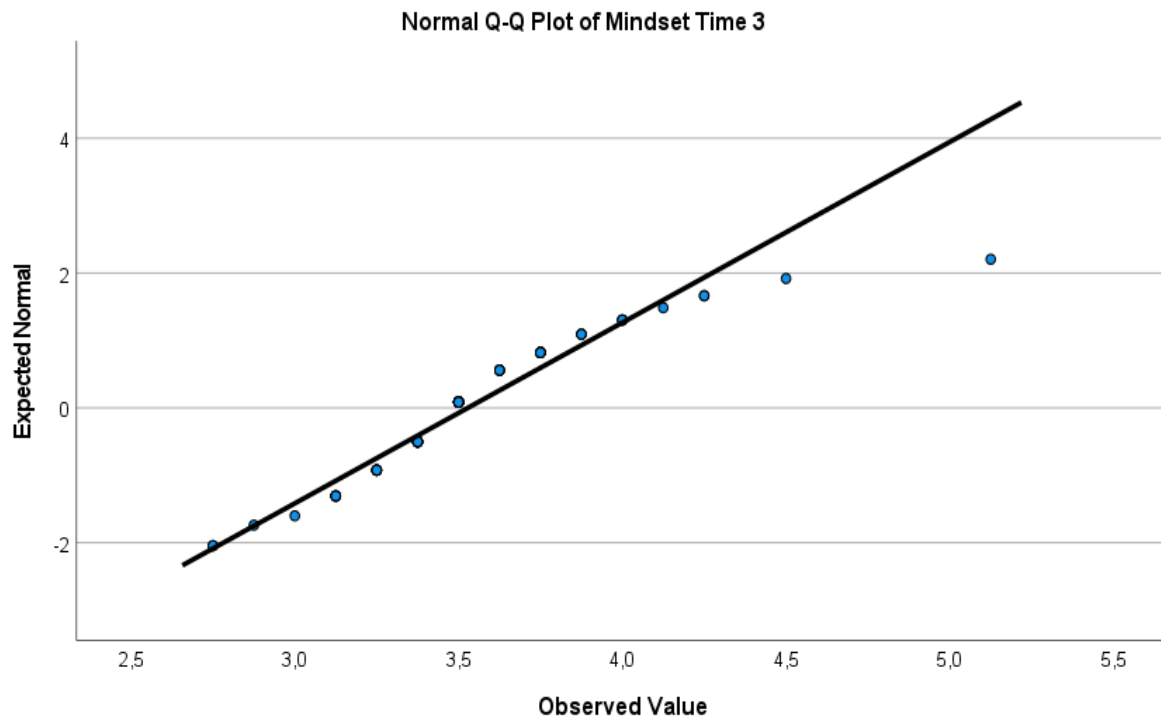
Figure D10

Q-Q Plot for Motivation Measurement Time One

Normal Q-Q Plot of Motivation Time 1
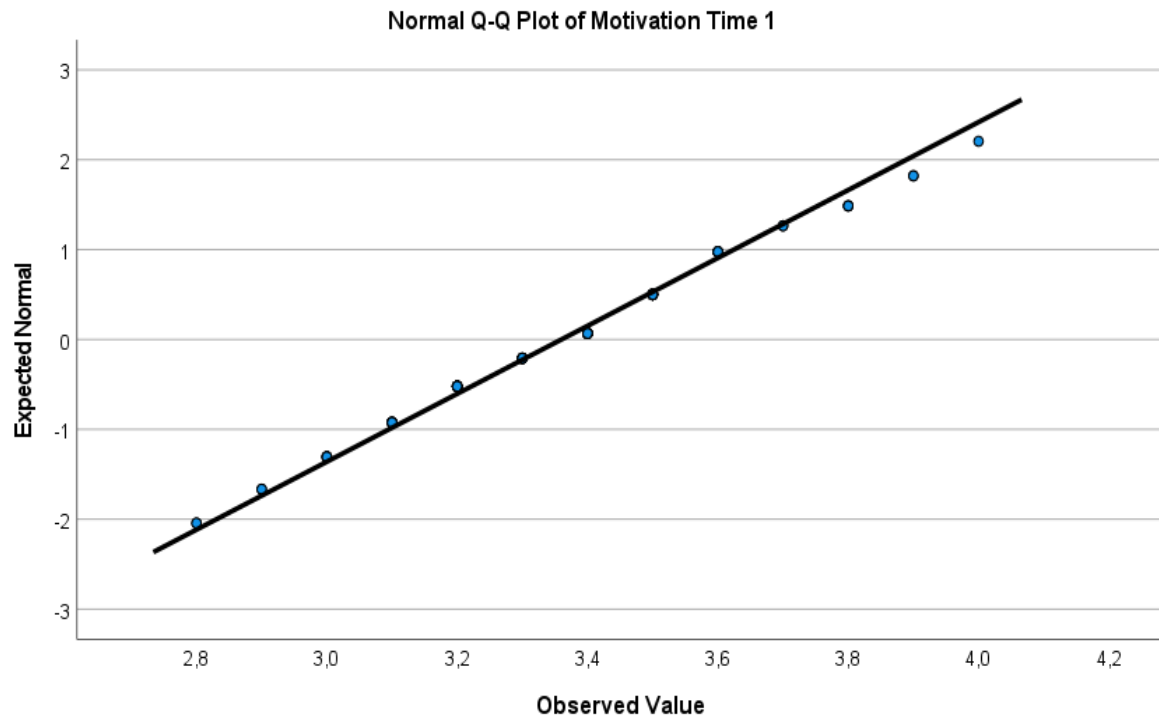
Figure D11

Q-Q Plot for Motivation Measurement Time Two

Normal Q-Q Plot of Motivation Time 2
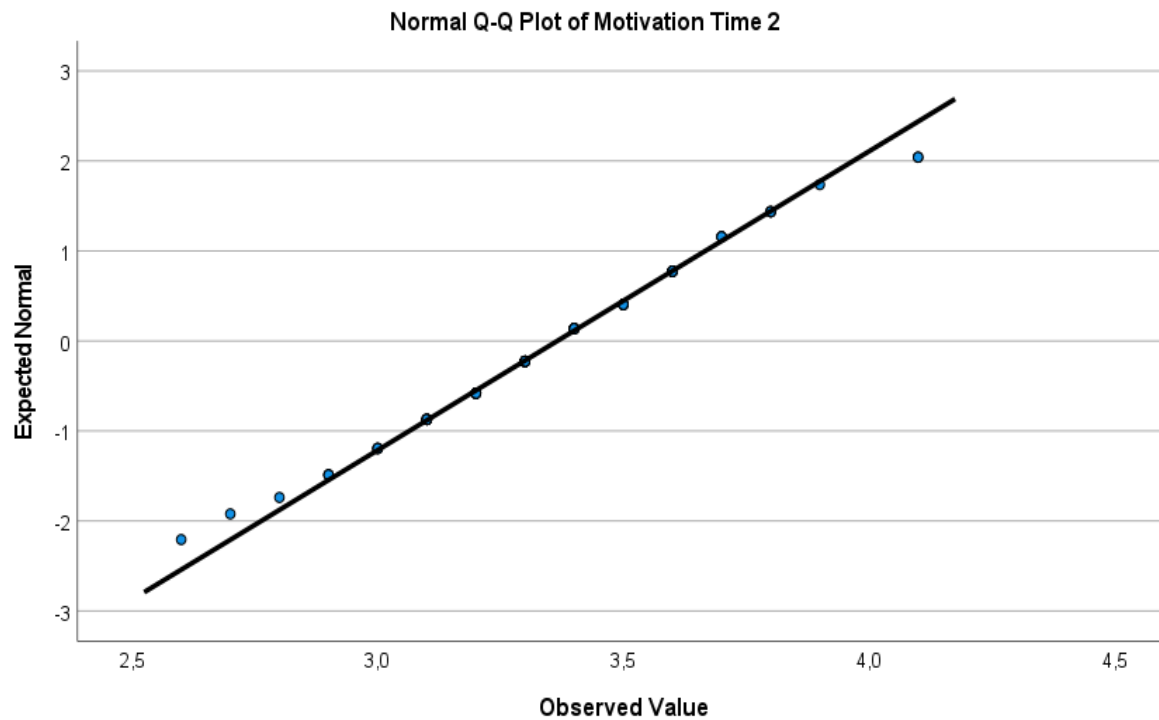
Figure D12

Q-Q Plot for Motivation Measurement Time Three
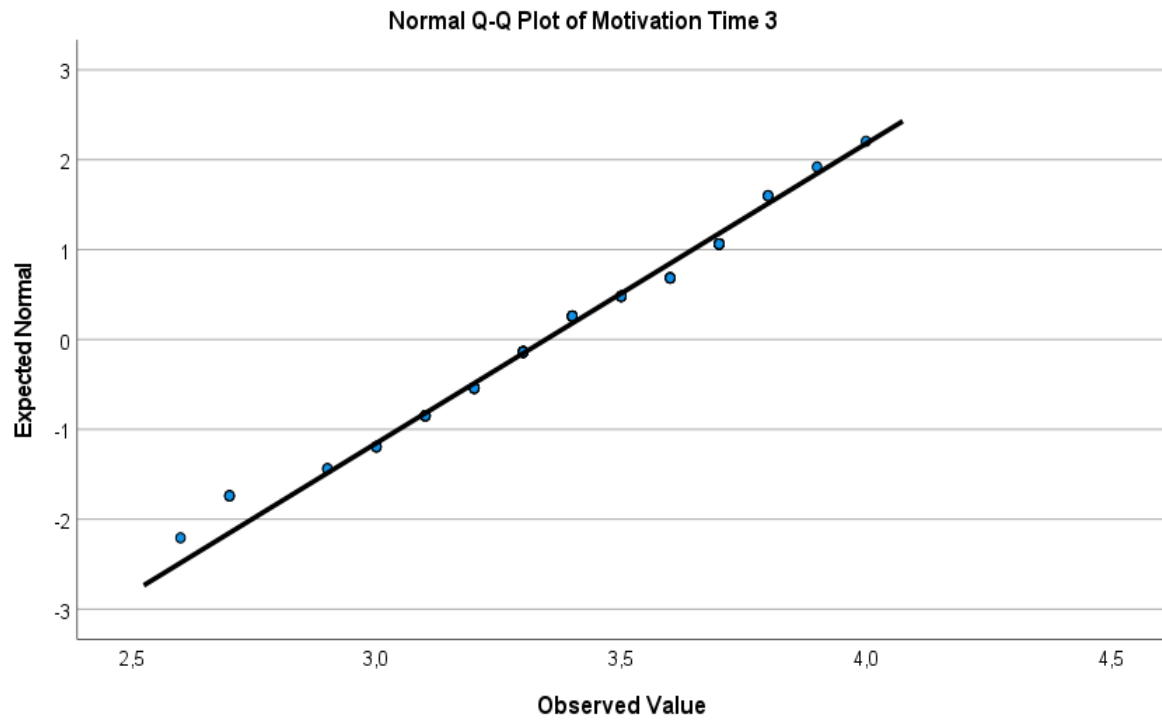
Appendix E: Community Attendance First Semester 2019 and 2020

Attendance in the learning community programme was chosen as a variable suited to compare the potential effects of COVID on the participants in the current study. Below is listed the attendance and attendance percentages of the first semester of the 2019 – 2020 and 2020 – 2021 academic years. Note that in the first semester of 2019 – 2020 only 7 learning community groups were arranged, with 17 such groups in the same period in 2020 – 2021.

Table E1

Learning Community Attendance First Semester 2019 – 2020 and 2020 – 2021

	Attendance 2019 - 2020				Attendance 2020 - 2021			
	All	One-year	Bachelor's	Clinical Master's	All	One-year	Bachelor's	Clinical Master's
Enrolled	336	137	143	56	343	98	177	49
Week 1	209 (61%)	95 (66%)	83 (58%)	31 (55%)	285 (83%)	84 (86%)	159 (81%)	42 (86%)
Week 2	207 (61%)	90 (63%)	80 (56%)	97 (66%)	293 (86%)	81 (83%)	172 (88%)	40 (83%)
Week 3	202 (59%)	85 (59%)	81 (57%)	36 (64%)	303 (88%)	91 (93%)	168 (86%)	44 (90%)
Week 4	211 (62%)	99 (69%)	84 (59%)	28 (50%)	285 (83%)	83 (85%)	156 (79%)	46 (95%)
Week 5	208 (61%)	100 (70%)	80 (56%)	28 (50%)	273 (79%)	78 (80%)	149 (76%)	46 (95%)
Week 6	160 (47%)	62 (45%)	70 (49%)	28 (50%)	258 (79%)	81 (83%)	132 (75%)	45 (93%)
Week 7	175 (52%)	88 (62%)	82 (58%)	5 (9%)	43 (69%)	18 (86%)	13 (68%)	12 (55%)
Week 8	151 (46%)	71 (51%)	74 (52%)	6 (11%)	236 (70%)	75 (77%)	141 (72%)	20 (43%)
Week 9	185 (54%)	85 (58%)	76 (54%)	24 (43%)	249 (72%)	77 (79%)	133 (67%)	39 (81%)
Week 10	191 (56%)	87 (61%)	78 (55%)	26 (46%)	204 (67%)	42 (69%)	125 (64%)	37 (77%)
Week 11	206 (61%)	88 (61%)	90 (63%)	28 (50%)	181 (64%)	83 (66%)	89 (57%)	39 (81%)
Average	191% (56%)	86% (61%)	79.8 (56%)	25% (45%)	79% (76%)	130.6 (80%)	69% (74%)	37% (80%)

Note. (X) = Attendance percentage. In week 7 and 8 all students in the clinical master's programme had mandatory activity keeping most from attending gatherings. In week 7 of autumn 2020 there was no scheduled community gathering, but some leaders performed normal gatherings despite this. Average percentages were calculated by dividing the weekly attendance percentage by the number of weeks.

Appendix F: Descriptive Statistics Divided by Community Group Type

During the analysis of the trends in the accrued data it became apparent that interesting findings might lie within the differences between the group types. For this reason, below can be seen a detailed breakdown of scores in grit, passion, mindset, and motivation divided by learning community group type/chosen course of study.

Table F1

Descriptive Statistics for Grit at Three Measurement Times, Divided by the One-Year, Bachelor's and Clinical Master's Student Demographics

Variable	n	M	SD
Grit_T1	72	3.30	0.31
One-Year	26	3.34	0.29
Bachelor's	43	3.29	0.33
Clinical Master's	3	3.21	0.19
Grit_T2	72	3.30	0.41
One-Year	26	3.17	0.42
Bachelor's	43	3.38	0.39
Clinical Master's	3	3.33	0.47
Grit_T3	72	3.41	0.39
One-Year	26	3.41	0.40
Bachelor's	43	3.42	0.40
Clinical Master's	3	3.25	0.22

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table F2

Descriptive Statistics for Passion at Three Measurement Times, Divided by the

One-Year, Bachelor's and Clinical Master's Student Demographics

Variable	n	M	SD
Passion_T1	72	3.86	0.78
One-Year	26	3.91	0.78
Bachelor's	43	3.79	0.79
Clinical Master's	3	4.25	0.87
Passion_T2	72	3.78	0.70
One-Year	26	3.88	0.66
Bachelor's	43	3.74	0.72
Clinical Master's	3	3.46	0.76
Passion_T3	72	3.88	0.68
One-Year	26	3.79	0.70
Bachelor's	43	3.93	0.66
Clinical Master's	3	3.88	0.99

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table F3

Descriptive Statistics for Mindset at Three Measurement Times, Divided by the

One-Year, Bachelor's and Clinical Master's Student Demographics

Variable	n	M	SD
Mindset_T1	72	3.38	0.27
One-Year	26	3.32	0.24
Bachelor's	43	3.42	0.29
Clinical Master's	3	3.33	0.19
Mindset_T2	72	3.47	0.27
One-Year	26	3.50	0.25
Bachelor's	43	3.49	0.27
Clinical Master's	3	3.04	0.19
Mindset_T3	72	3.53	0.37
One-Year	26	3.61	0.35
Bachelor's	43	3.48	0.39
Clinical Master's	3	3.46	0.26

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table F4

Descriptive Statistics for Motivation at Three Measurement Times, Divided by the One-Year, Bachelor's and Clinical Master's Student Demographics

Variable	*n*	*M*	*SD*
Motivation_T1	72	3.36	0.26
One-Year	26	3.32	0.28
Bachelor's	43	3.37	0.25
Clinical Master's	3	3.67	0.12
Motivation_T2	72	3.37	0.30
One-Year	26	3.37	0.29
Bachelor's	43	3.35	0.32
Clinical Master's	3	3.47	0.21
Motivation_T3	72	3.35	0.30
One-Year	26	3.35	0.30
Bachelor's	43	3.33	0.31
Clinical Master's	3	3.47	0.25

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Appendix G: Descriptive Statistics Divided by Achieved Education

Whilst analysing the trends in the accrued data it soon became clear that some additional explanative nuance might lie in the difference between a student's previously achieved education and the overall scores of grit, passion, mindset, and motivation. Because of this the split data for this has been included below.

Table G1

Descriptive Statistics for Grit at Three Measurement Times, Divided by Respondents' Previously Attained Education of Norwegian High School, One-Year Study, Bachelor's Degree, and Master's Degree

Variable	*n*	*M*	*SD*
Grit_T1	72	3.30	0.31
Norwegian high school	54	3.31	0.31
One-year study	11	3.28	0.24
Bachelor's degree	6	3.35	0.46
Master's degree	1	3.00	-
Grit_T2	72	3.30	0.41
Norwegian high school	54	3.31	0.42
One-year study	11	3.28	0.45
Bachelor's degree	6	3.27	0.32
Master's degree	1	3.50	-
Grit_T3	72	3.41	0.39
Norwegian high school	54	3.41	0.39
One-year study	11	3.47	0.45
Bachelor's degree	6	3.31	0.26
Master's degree	1	3.00	-

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table G2

Descriptive Statistics for Passion at Three Measurement Times, Divided by Respondents'
Previously Attained Education of Norwegian High School, One-Year Study, Bachelor's
Degree, and Master's Degree

Variable	*n*	*M*	*SD*
Passion_T1	72	3.86	0.78
Norwegian high school	54	3.83	0.75
One-year study	11	3.76	0.86
Bachelor's degree	6	4.10	1.01
Master's degree	1	4.75	-
Passion_T2	72	3.78	0.70
Norwegian high school	54	3.74	0.70
One-year study	11	3.84	0.81
Bachelor's degree	6	3.81	0.30
Master's degree	1	5.00	-
Passion_T3	72	3.88	0.68
Norwegian high school	54	3.85	0.71
One-year study	11	3.91	0.60
Bachelor's degree	6	3.94	0.64
Master's degree	1	4.63	-

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table G3

Descriptive Statistics for Mindset at Three Measurement Times, Divided by Respondents'
Previously Attained Education of Norwegian High School, One-Year Study, Bachelor's
Degree, and Master's Degree

Variable	*n*	*M*	*SD*
Mindset_T1	72	3.38	0.27
Norwegian high school	54	3.37	0.26
One-year study	11	3.52	0.25
Bachelor's degree	6	3.27	0.36
Master's degree	1	3.00	-
Mindset_T2	72	3.47	0.27
Norwegian high school	54	3.50	0.25
One-year study	11	3.47	0.25
Bachelor's degree	6	3.44	0.23
Master's degree	1	2.50	-
Mindset_T3	72	3.53	0.37
Norwegian high school	54	3.52	0.38
One-year study	11	3.58	0.38
Bachelor's degree	6	3.54	0.38
Master's degree	1	3.50	-

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

Table G4

Descriptive Statistics for Motivation at Three Measurement Times, Divided by Respondents'
Previously Attained Education of Norwegian High School, One-Year Study, Bachelor's
Degree, and Master's Degree

Variable	*n*	*M*	*SD*
Motivation_T1	72	3.36	0.26
Norwegian high school	54	3.35	0.27
One-year study	11	3.37	0.28
Bachelor's degree	6	3.43	0.28
Master's degree	1	3.40	-
Motivation_T2	72	3.37	0.30
Norwegian high school	54	3.37	0.31
One-year study	11	3.28	0.18
Bachelor's degree	6	3.35	0.30
Master's degree	1	4.10	-
Motivation_T3	72	3.35	0.30
Norwegian high school	54	3.32	0.30
One-year study	11	3.34	0.32
Bachelor's degree	6	3.57	0.23
Master's degree	1	3.70	-

Note. T1 = Measurement time 1, T2 = Measurement time 2, T3 = Measurement time 3.

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