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Listening to Young Children's Voices: The Evaluation of a Coding System

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Abstract

Listening to young children's voices is an issue with increasing relevance for many researchers in the field of early childhood research. At the same time, teachers and researchers are faced with challenges to provide children with possibilities to express their notions, and to find ways of comprehending children's voices. In our research we aim to provide a method for listening to, and analyzing young children's voices on educational issues. In this article we describe a new step in our research in which we are dealing with the issues of validity and reliability for the evaluation of our coding system: is our coding system for analyzing young children's voices valid and reliable?

Keywords: children's voices, educational context, coding system, validity, reliability.

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Escuchando las Voces de Niños Pequeños: Evaluación de un Sistema de Codificación

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Resumen

Escuchar las voces de niños pequeños es un tema de creciente relevancia para muchos investigadores en el campo de estudios sobre la infancia. Al mismo tiempo, profesorado y personal investigador se encuentran con retos para dar a los niños posibilidades de expresar sus nociones y encontrar formas de comprender sus voces. En nuestra investigación nos proponemos proveer un método para escuchar y analizar las voces de los niños acerca de temas educativos. En este artículo describimos un nuevo paso en nuestra investigación en la que estamos trabajando cuestiones de validez y fiabilidad para la evaluación de un sistema de codificación: Es nuestro sistema de codificación para analizar las voces de los niños válido y fiable?

Palabras clave: voces infantiles, contexto educativo, sistema de codificación, validez, fiabilidad.

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Listening to children's voices is becoming increasingly relevant for many researchers and practitioners in the field of early childhood. In addition to its practical importance, it is often related to the UN Convention on the Rights of the Child (1989) too. This convention advocates the rights of children to be heard as active citizens in all matters concerning them (e.g. Clark, Kjørholt & Moss, 2005; Formosinho & Araújo, 2006). If we want to do justice to children's perspectives in nowadays society, it is essential to listen to their voices. Researchers have to deal with many challenges and struggles in offering children possibilities to involve their perspectives in early childhood practices (Pascal & Bertram, 2009). The position ascribed to young children in society depends strongly on the prejudices and images present in society about children. In research the idea is put forward that the child we meet in our society, and hence in education as well, is in fact a construction based upon theory and prejudices (Engel, 2005; Komulainen, 2007). Research revealed that teachers particularly have strong images about 'the' child (see for instance Seifert, 2000).

In our research program we concentrate on the problem of how to relate properly to children in educational situations and we raised the question whether it is possible at all to identify young children's own voices. Through qualitative studies we wanted to provide a scientific contribution to clarify this issue. First by developing a conceptual framework which describes the elements of young children's voices, and secondly by building a valid and reliable coding system, appropriate for qualitatively analyzing their voices.

In a previous project we described the construction of a method for researching the attribution of meaning to educational issues by children, aged 5 to 6, in school. We explored the concept of young children's voices, and formulated indicators for the construct of voice and attribution of meaning. We carried out five case studies, and we set the first steps in developing a coding system for analyzing elements of young children's voices (Tertoolen, van Oers, Geldens & Popeijus, 2012). In the present article we describe a new step in our research, in which we are dealing with the issues of validity and reliability of our coding system.

Theoretical background

For a qualitative analysis of young children's voices, we first have to define the construct of voice. In this we follow Bakhtin, who states that any word uttered by an individual is essentially inter-individual. An utterance can never be attributed to a single speaker, as there is always a (real or virtual) listener involved. So the word of a speaker is always half someone else´s, according to Bakhtin (1981; see also Wertsch, 1991).

In our research on young children's voices, we focus on young children's attributions of meaning in situations and events in school. In the speaking and acting of children, in interactions with peers and adults, we can see and hear attributions of meaning. We focus on individual children, as we see each individual as a 'speaking personality', using language as a way to express himself. So listening to individual children requires a method to gain insight in these children's notions and opinions. At the same time, those children could never be isolated when we want to study them in an ecologically valid way. Hence, due attention is given in our research settings to the children's real life contexts, in which teachers, peers and parents/caregivers are included as important others.

Schematically, we summarize our conceptual framework as follows:

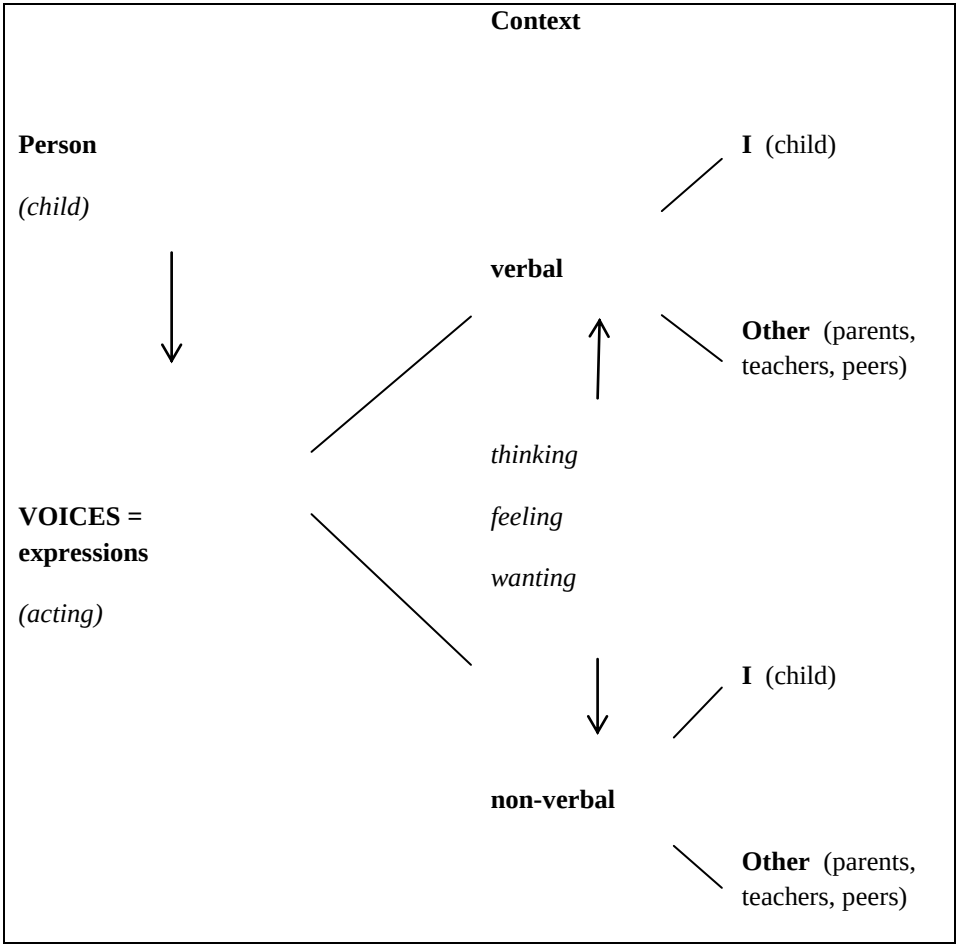

Figure 1. Conceptual framework: related elements in the construct of voice and attribution of meaning

We ground the theoretical framework of our research in the cultural-historical activity theory.

People's opinions are always influenced by social, cultural, biographical, and historical determinants (e.g. Bourdieu, 1991). Those opinions, expressed or voiced by an individual, are influenced by these determinants, as well as by actual context-related interactions. The acquisition of opinions occurs in interaction with others, in a dialogical process, in which the voices of others resound as well (Bakhtin, 1981; Wertsch, 2002). Komulainen (2007) states that children's voices are to be understood as "multidimensional social constructions that are subject to change. At the same time 'voices' manifest discourses, practices, and contexts in which they occur" (p.13).

Children's perspectives and images originate from historically developed local contexts - like the classroom or the play ground - in which others are also involved. In interpreting children's expressions, this specific context needs to be taken into account (Christopher & Bickhard, 2007; Daniels & Edwards, 2009). In our research the context is the school context, in which peers and teachers are present too. In this specific context, significant others, like parents or caregivers, are relevant as well. Children's opinions and their ways of expressing them, are influenced by children's context-related interactions, but at same time by social, cultural, biographical, and historical determinants (e.g. Bronfenbrenner, 1979; Meadows, 2010).

In our research we focus on voices, as manifested in expressions and attribution of meaning by young children, in the school context. We define attribution of meaning in this research as the way in which a child expresses his conceptions and values on three aspects he encounters in the daily practice of his educational setting: the activities, the organization in and around the classroom, and the roles of his teacher in the school context. Besides the verbal and non-verbal aspects of these voices or expressions, we also look for underlying elements like 'thinking, feeling, and wanting'. These are elements of the subject's personality and play their part in the acting person (González Rey, 2008). González Rey (2008) refers to thinking and feeling as categories of the acting personality uniting intellect and affect. Thinking and feeling can be considered as aspects of conation, a dimension of mental processes, having to do with striving and wanting (Reber & Reber, 2001). Not only the content of what people tell one another counts, but how people interact with one another is important as well, especially when it comes to feelings and motives of people (Daniels & Edwards, 2009).

All the related elements in our construct of voice and attribution of meaning, as represented in *Figure* 1, are part of our data gathering. This conceptual framework is the foundation of our coding system for data collection and analysis. All elements in our construct of voice have a theoretical basis in cultural-historical activity theory.

Research Method

Our research contains five case studies. In each case study we listened to children, aged 5 to 6, in school in several settings, and we studied the dynamics of the specific school contexts the children are involved in. Conducting more case studies means gathering more data, which enables us to articulate the issues of validity and reliability in an accountable way. Using more settings in a case study may lead to more supportive or supplementary findings by triangulating the data (Yin, 2009). According to Yin (2009; p. 116), data triangulation contributes to the strength of construct validity as well, by providing several sources of evidence for the same researched phenomenon. We decided to order our case studies sequentially. Each new case study is built on and elaborates the outcomes of a previous case study. This results in a so called multiple case study with a qualitative-interpretative approach in a flexible design, and using multiple sources of evidence (Robson, 2002).

First, we formulated sensitizing concepts with respect to major elements of the school context. In this context we considered the following concepts as our main domains for analysis: school activities, classroom organization, and teacher's roles. Secondly, we analyzed the data, collected in the different cases, in a process of open coding, focusing on emerging concepts, and looking for the relationships among them (Glaser & Strauss, 1967; Strauss & Corbin, 1998). We attributed subcategories to the categories, drawing from our empirical observations. Children's expressions (like commenting, adopting, narrating, et cetera) were considered as properties or dimensions of the subcategories. Each category, subcategory, and property has its own, written definition. Coding children's expressions is consistently based on a coherent unit of expressions from the transcribed observations of the focal children in the case studies (Miles & Huberman, 1994).

We considered the coding process as completed after analyzing five case studies, as we were unable to add new properties to our defined

subcategories, and so saturation had occurred (Glaser & Strauss, 1967; Strauss & Corbin, 1998).

Data collection

Based on the outcomes of a previous exploratory study, we planned a series of case studies with different children in different school contexts, looking for comparable as well as complementary findings (Tertoolen et. al., 2012). The child in our first, exploratory case study was Tom.

Tom is 6;5 and attends a Roman-Catholic primary school in a little village in the south of the Netherlands (Limburg). Tom is a bit older than most of the children in his class but he is small and looks a bit younger. Tom has an older brother and sister at the same school and a little brother at home. His father and his mother both work half-time.

Tom's school bases its educational philosophy on 'basic development' which means a specific form of developmental education based on Vygotskian theory (see van Oers, 2009). Tom's class has a teacher with many years of experience in educating young children, called Tessa.

After the first case study we decided to have more than one child involved at the same time, so we would be able to get more detailed insight in the way conversations with others might influence a child's expressions. Irfan and Margareta were the children in our next case studies.

Irfan is 6;0 and attends a primary school in Amsterdam. Irfan has an older sister at the same school and a baby brother at home. His parents have a Moroccan background. His father works for a transport organization and his mother is a staff member.

Margareta is 5;6 and attends the same school as Irfan. She is the only child of a Turkish father and a Dutch mother. Her father runs a local business. Her mother has an academic background.

The school of Irfan and Margareta has a mixed population. Many children have (grand)parents who are born outside the Netherlands. Each class with young children has, besides a teacher, also a part time teacher-assistant. Much attention is paid to language stimulation and independent learning

(weekly tasks). Irfan's and Margareta's class has two part time teachers. One highly experienced teacher, Jona, and a teacher, Mandy, who is recently qualified. Ayla is the teacher-assistant.

Finally we added another two case studies to our research: Lennart and Bernadette.

Lennart is 6;6 and attends a Roman-Catholic primary school in Amstelveen (a suburban city near Amsterdam). Lennart is a bit older than the other children in his class, but he is quite small and looks younger. He has two younger brothers, who don't attend school yet. His father and his mother both have an academic background. They both work half-time.

Bernadette is 5;7 and attends the same school as Lennart. Bernadette is quite young, compared to the other children in her class, but she is tall and looks older. She has a half-sister, aged 15 (her father was married before), who is living with her own mother. Her father runs a local business and her mother has an academic background. They both work full-time.

The primary school of Lennart and Bernadette has eight classes for young children (aged 4 to 6) and there are also equivalent classes for the older children. There are two school buildings on two locations. The classes for the children aged 10 to 12, are accommodated in another street, nearby the main building. Bernadette's class has two part time teachers, both with many years of experience in educating young children: Cecile and Magda. During the research Magda was present on the last day.

In the exploratory study (Tom) we used three different settings for observations, to achieve data triangulation:

- Regular classroom and school activities
- Playing school in a play area
- A semi-structured interview about school notions

By regular classroom and school activities, we refer to the current classroom projects, consisting of learning contents and educational activities. Playing school in a play area was an arranged activity, offering children the opportunity for role-play. In a semi-structured interview the children responded to questions like: If it were up to you, how would your school look like? What would you prefer to do, if you had free choice of activity?

For the purpose of strengthening the reliability of our outcomes in subsequent case studies, we decided to add another two settings for observations in the next four case studies (Irfan, Margareta, Lennart, and Bernadette):

- Taking pictures in school and discussing them
- Talking about feelings in and on school

We provided the children in our research with a single-use photo camera. Cameras offer children the possibility to respond in non-verbal ways to questions like: Can you show me what you think is important here in and around school? Thus asking explicitly for the children's opinions on the subject 'school'. The answers, consisting of series of photographs, were used later on to discuss their expressions (both verbal and non-verbal): which pictures they liked best, which pictures represented a story, which pictures showed what they didn't like at school, et cetera (Clark, 2007). We also explicitly invited the children to respond to questions about their feelings in school. The questions, offered to them as propositions, were answered by the children by selecting a picture, like smileys, that represented their feelings best. Questions like: How do you feel when the teacher is helping you to perform a difficult task, are partly based on a pictorial scale of perceived competence and acceptance (Lewis & Lindsay, 2000), and a social-emotional task of affective labeling (Formosinho & Araújo, 2006).

All observations of playing school in a play area, discussing pictures, talking about feelings, and a semi-structured interview, were videotaped.

Data analysis

All the observations of school activities and the videotapes were transcribed verbatim. Kwalitan (www.kwalitan.nl), a computer program, was used for the systematic comparative qualitative data analysis. This computer program is a tool, supporting researchers in entering, archiving and exploring data (e.g. looking for certain words), structuring documents (e.g. segmentation), organizing data (e.g. overviews of codes with frequencies), selecting extracts in documents, and describing the process of data analysis (e.g. in memos).

Based on the data of the exploratory study we started to build a coding system in Kwalitan, following the basic assumptions of the grounded theory approach (Glaser & Strauss, 1967; Strauss & Corbin, 1998; Tertoolen et. al., 2012). We defined our sensitizing concepts and labeled them as the three main categories in our coding system: school activities, classroom organization and teacher's roles. A fourth category (Relations) was needed,

for describing the relations among focal children, peers and adults, besides the teacher (see Appendix A).

After labeling the categories and subcategories of our coding system we defined properties as parts of the subcategories to code elements of young children's acting. These codes are partly derived from the contexts of the children involved (in vivo codes) and partly from the studied literature (constructed codes). Those constructed codes are based on indicators, we have formulated, as possible manifestations of young children's voices within the school context:

- expressing feelings and choices
- sharing ideas about competences and needs
- showing knowledge by pointing out, investigating, confirming, opposing
- intending to gain something related to others

(Tertoolen et. al., 2012).

Validity

In this phase of our research we have been scaffolding our coding system, and in particular we wanted to pay attention to ecological and construct validity. To achieve ecological validity, we focused on young children's attribution of meaning in situations and events in school that make sense to the children. We took care that the children were observed in their daily school context and were engaged in different naturalistic settings, e.g. daily classroom activities and (outside) play. To reach construct validity, we focused in our research on theoretically formulated constructs of young children's voices and attribution of meaning. Moreover, we used multiple sources of evidence: playing school in the play area, taking pictures and discussing them, talking about feelings in and on school, and an interview about school notions. To strengthen construct validity further, we used these multiple sources of evidence during data collection for establishing a conceptually consistent chain of evidence (Yin, 2009).

Reliability

We also strengthened our chain of evidence by inviting two independent coders to go through the same analyzing and coding processes (Yin, 2009), with the help of the coding system, including definitions of main theoretical constructs. By pattern matching -comparing the outcomes of data analysis in the different case studies -we will look for convergence between the constructs voice and attribution of meaning in our case studies (Trochim,

2011). Both coders can be considered experts in the field, as they were teacher-trainers in early childhood at a university of applied sciences.

Memos with definitions of the categories, subcategories and properties, and a written coding instruction were at the disposal of the coders. First, the two coders watched the videotapes to get acquainted with two children in their school context in different settings. Then there was a meeting in which the structure of the coding system and the written definitions were explained, and questions could be asked. Finally, examples of written observations from other case studies were presented to practice the coding procedure. We compared the outcomes of the coders with the results of the researcher's coding processes, looking for similar and rival interpretations in coding on the three levels of our coding system, described as categories, subcategories, and properties (inter-coder reliability). These results were needed to strengthen the consistency of the coding system.

To ensure reliability we also created a case study data base, consisting of the data and a case study protocol to be used for the analysis of the case studies. This protocol, consisting of notes, documents, tabular materials, et cetera, was discussed with the peer researchers every six weeks (peer debriefing).

Results

As to the issue of ecological validity, we took care that children were indeed observed in their everyday contexts and were engaged in different naturalistic settings. As for construct validation we used those different naturalistic settings as multiple sources of evidence for data triangulation, and we maintained a conceptually consistent chain of evidence during the whole process of data collection and analysis, with the help of theory-based categories and definitions that were available to the coders.

To establish inter-coder reliability, two coders separately analyzed the videotaped observations of the children in two case studies: playing school in the play area, talking about feelings, and the semi-structured interview. The researchers' theory-based coding system maximizes the chances that the coders indeed focused on phenomena that theoretically relate to the notion of voice. Comparing the results of these data analyses, we were looking for similar and rival interpretations in coding on the three levels of our coding system, described as categories, subcategories, and properties.

For the definition of reliability we follow Miles and Huberman (1994; p. 63): the total number of similarities divided by the total number of similarities and differences in coding. A first data analysis by several observers, independently using the same coding system, should generate about 70% inter-coder reliability, according to Miles and Huberman (1994). We decided we would accept 70% of overall agreement in coding among the researcher and the coders, as a result of this first analysis. In Table 1 below (the left side: before adjustments) the results of the comparison of the first round of coding processes among the researcher (A) and the two coders (B and C) are presented. Looking at the results on the left side of Table 1, we see that at first we couldn't meet our formulated standard of an overall agreement of 70%. Based on these outcomes we had to reconsider our coding system, definitely on the levels of subcategories and properties, which showed the lowest percentages of agreement.

Table 1
Comparison of the coding results among the researcher (A) and the coders (B and C)

Settings	Children	Similarities in coding among A, B, and C in average percentages							
		Before re-adjustments in the coding system				After re-adjustments in the coding system			
		A – B	A - C	B - C	A-B-C	A - B	A - C	B - C	A-B-C
Play area	Lennart	72%	73%	59%	68%				
	Bernadette	62%	64%	40%	55%	92%	92%	83%	89%
Talking about feelings	Lennart	61%	64%	56%	60%	88%	84%	77%	83%
	Bernadette	80%	56%	69%	68%				
Interviews	Lennart	68%	68%	19%	51%	88%	87%	73%	83%
	Bernadette	70%	66%	47%	61%				

To improve our coding system, we first made a qualitative analysis of the found similar and rival interpretations in coding among the researcher and the two coders.

On the first level of coding (categories) we found that the coders faced difficulties in deciding, which category was the most appropriate in coding expressions of the focal children, despite the instruction that more than one code could be assigned to a single expression of the children.

Extract 1. Child Lennart. Context: Talking about feelings in and on school. Lennart and two peers have been instructed by the researcher. Each child has three little boxes with a sticker on it, showing a glad, sad, or neutral facial expression. After each proposition, read by the researcher, the children put a small card in one of the three boxes in front of them, choosing the box with the face that represented their feelings best.
The observer starts this activity by explaining the used material and presenting an example: How do you feel about attending school?

Talking about feelings in and on school by Lennart (L), with peers Bernadette (B) and Jan (J), and the researcher			**Category + Subcat.**		**(Non) Verbal**	**C**	**Properties**	
1.	L:	(halfway the example to J.) what are you going to do?	4 1	11 01	V V		Exchanging Judging	A B
2.	L:	(gets up, sits down again, and is looking what B. is doing)						
3.	L:	I am going to do glad.	1 1 4 4	01 01 11 11	V V V V	C C C C	Demonstrating Demonstrating Exchanging Exchanging	A B A C
4.	L:	(looking at the two peers and holding his card above the box with the neutral face)						
5.	B:	I am also going to do glad						

6.	J:	me too							
		(…)							
7	L:	we all like school!	4	11	V		Exchanging	A
			4	11	V		Exchanging	B
			1	02	V		Choosing	C
			1	01	V		Judging	C

Category 4: Relations. Subcategory 11: (with) Peers.
Category 1: School activities. Subcategory 01: Knowledge & skills. Subcategory 02: Attitude
C: Conation (feeling, wanting, thinking)
Coding by researcher (A) and coders (B and C)

Especially category 4 (Relations) caused entanglement, as there were almost always others (such as peers) involved. The coders found it difficult to decide when they should, or should not, assign codes (also) to this category (see Extract 1 line 1, 3 and 7). Another difficulty occurred in assigning codes to category 3 (Teacher's roles). Codes were attributed only when the teacher was physically present and intervening in the situations the focal children were involved in. Despite the instructions, the coders were uncertain to attribute category 3 codes when the children were referring to the teacher, but the teacher was not present at the time.

On the level of subcategories we faced a similar kind of coding difficulties. Knowledge & skills (subcategory 01) is nearly always related to certain behavior of the child (subcategory 02: Attitude).

Extract 2. Child: Bernadette. Context: Playing school in the play area
Bernadette is playing with Lennart, Jan, and Eliza outside the classroom in an area, which is furnished with a table and chairs and school material as books, paper, pencils, scissors, and glue. The children have decided what they needed to play school in that area, and together with the teacher they have brought in what they wanted to play with within that specific area.
Bernadette has been busy making a drawing and asked Lennart what to do next, but Lennart walked away in the direction of the classroom.

Playing school in the play area by Bernadette (B), together with peers Lennart, Jan, and Eliza	**Category + Subcat.**	**(Non) Verbal**	**C**	**Properties**
B: (puts her drawing in a little basket with other 'finished' drawings, and takes a new piece of paper)	2 04 2 03 2 04	NV NV NV		Following A Accepting B Following C

Category 2: Classroom organization. Subcategory 03: Rules. Subcategory 04: Routines
Coding by researcher (A) and coders (B and C)

Difficulties in choosing the appropriate subcategory in category 2 (classroom organization) was even more obvious. Not knowing the specific school context, it is unfeasible for external coders to distinguish whether rules (subcategory 03) or routines (subcategory 04) are applicable (see Extract 2).

On the level of properties we found that some properties were related too closely: e.g. commenting and judging (subcategory 01), preferring and choosing in subcategory 02 (see Extract 3, line 6), and accepting and adopting (subcategory 03).

Extract 3. Child: Lennart. Context: Semi-structured interview on notions about school
During the semi-structured interview with Lennart, Bernadette, and Jan, the children are allowed to work on some activity like making a drawing. The interview took place in the play area where the children played school. Lennart sees the letter box, which is also put in the play area to play school.

Interview on notions about school by Lennart (L), with peers Bernadette and Jan, and the researcher (R)			**Category + Subcat.**		**(Non) Verbal**	**C**	**Properties**	
1.	L:	(shows the researcher the letter box)	4	13	NV		Demonstrating	A
2.	L:	this is really grade 3!	1	01	V		Commenting	A
			1	01	V		Commenting	B
3.	L:	(puts the letter case aside).						
4.	L:	this is fun!	1	02	V		Preferring	A
			1	02	V		Preferring	C
5.	R:	you could….						
6.	L:	I like coloring a car!	1	02	V		Preferring	A
			1	02	V		Preferring	B
			1	02	V		Choosing	C

Category 4: Relations. Subcategory 13: (with) Others (including the researcher)
Category 1: School activities. Subcategory 01: Knowledge & skills. Subcategory 02: Attitude
Coding by researcher (A) and coders (B and C)
Based on the results of this qualitative analysis we took the following measures.

We created the possibility to add to all codes a relational component: P (for Peers), F (for Family), O (for Others, including the researcher), or a combination of P, F, and O. As a consequence we removed the separate category ‘relations’ (see Appendix B).

We maintained the other three main categories, but redefined some subcategories. Category 1 (School activities) was transformed into ‘attitude towards school activities’, as attitude is always involved in the opinions children have about school (activities). Here we followed Vyverman and Vettenburg (2010), who advocate that affective, cognitive, as well as behavioral components are to be distinguished in using the concept attitude or opinion, referring to children. These three components became our

subcategories. Affect (subcategory 01) refers to the feelings and preferences children show. Cognition (subcategory 02) refers to the (intellectual) views and information children have. Finally, behavior (subcategory 03) refers to how children actually perform.

We also decided to create two new subcategories for category 2 (Classroom organization). Children are accepting and following rules and routines (subcategory 04: Adoption), or they re-adjust rules and routines (subcategory 05: Modification).

We added characteristics to codes in category 3 (Teacher's roles) referring to the kind of teacher's involvement in children's activities: i (child – teacher *interaction*), r (child taking the *role* of a teacher), and a (child expressing himself *about* the teacher, without the teacher being around).

On the level of properties we decided to reduce or combine those properties which caused confusion by the coders, because they were related too closely.

As a result of the re-adjustments in the coding system, we have rewritten our memos with all the definitions of the categories, subcategories, and the properties. We made a new instruction for the coders, in which we drew special attention to the intended hierarchy of the coding system.

We decided to recode the three units from the data collection of the two case studies, which showed the lowest agreement percentages in the first coding process: play in the play area by Bernadette, talking about feelings, and the interview with Lennart. Following Miles and Huberman (1994; p. 63), we decided to accept now an overall agreement of 80%, as a result of a second round of data analysis and coding.

We show the results of the recoding process in percentages on inter-coder reliability in Table 1 (after re-adjustments, on the right side).

Looking at the overall results in Table 1, we see that we met our formulated standard of an overall 80% agreement on all the recoded units. First on play in the play area by Bernadette (89%, was 55%), secondly on talking about feelings by Lennart (83%, was 60%), and finally on the interview with Lennart (83%, was 51%).

The next step in our research was to look into the content of the results of the recoding process. Is our coding system appropriate to analyze elements of young children's voices and link them to the indicators, derived from the studied literature, we have formulated before?

Extract 4. Child: Lennart. Context: Semi-structured interview about notions regarding school. The researcher is asking each child involved, what he or she would like to do most at school, and with whom. Lennart responds to the first question: 'I like coloring a car'.

Interview on notions about school by Lennart (L), with peers Bernadette and Jan (J), and the researcher (R)			**Cat. + Subcat.**		**(Non) Verbal**	**C**	**Properties and relations**		
1.	R:	and would you like to do it on your own or with other children?							
2.	L:	and we would like to do it	1	01	V	C	Preferring	P / O	A
		alone (taking a look at J.)	1	01	V	C	Preferring	P / O	B
			1	01	V	C	Preferring	P / O	C
3.	R:	the two of you together or the two of you alone?							
4.	J:	ehm… together. We alone together and nobody else							
5.	R:	the two of you, you mean							
6.	L:	yes, alone with us	1	03	V	C	Showing	P / O	A
			2	04	V	C	Accepting	P / O	B
			1	03	V	C	Showing	P / O	C

Category 1: School activities. Subcategory 01: Affect. Category 2: Classroom organization. Subcategory 03: Adoption
C: Conation (feeling, wanting, thinking)
Relations: P (Peers) / O (Others, including the researcher)
Coding by researcher (A) and coders (B and C)

In Extract 4 we see an element of underlying expressions by Lennart, labeled 'preferring' as a property of subcategory 01 (affect). In this extract Lennart is referring to himself and his friend Jan, speaking in a personal way: 'we

would like' (line 2). We see the same kind of expression in Extract 1, when Lennart is talking about going to school, including his peers Bernadette and Jan, by saying: 'we all like school' (line 7). He is referring to himself and what he likes in Extract 3: 'I like coloring a car' (line 6). At the same time Lennart expresses himself in Extract 4 about his choices, what he wants to achieve and the importance of the collaboration with peer Jan: 'we would like to do it alone with us' (line 2 and 6).

Discussion and Conclusion

In our research we had to deal with the issues of validity and reliability of a coding system for analyzing young children's voices. We formulated the following question: Is our coding system for analyzing young children's voices valid and reliable? On the basis of available data, we may conclude that we have been able to confirm the validity and reliability of the coding system. As for ecological validity, we observed children in their real school life context. As for construct validation we used multiple sources of evidence for data triangulation, and we maintained a conceptually consistent chain of evidence. The researchers reviewed drafts of the case study reports on a regular basis too (peer debriefing). The chain of evidence allowed two independent coders to go systematically through the same analyzing and coding processes (Yin, 2009). With an 80% agreement on coding among the researcher and two independent coders (see Table 1), we consider our coding system sufficiently reliable to analyze young children's voices in more detail in the future.

An important issue in researching the construct of voices, certainly with young children, is the role of the researcher and its potential bias. Most of the time during the research, the researcher remained a 'marginal' observer, registering the ways the children acted during all the occurring daily activities in school. However, the different roles of the researcher are, in fact, inseparable from the participating children in the research context (Holland, Renold, Ross & Hillman, 2010). There is not one or a simple solution to deal with this problem of potential bias. The only option is to use reflexive techniques, to explore the dynamics of the relationships between researcher and the ones involved in the research, according to Holland et al.

(2010). By arranging peer debriefing at a regular basis, cooperating with independent coders, presenting at adequate forums to develop and maintain a chain of evidence, and publishing in peer reviewed journals, we dealt with this methodological issue in the best possible way.

In the next phase of our research we plan to use the results of the coding processes to analyze the contents of the children's voices in our five case studies. What do the children in our case studies have to say about their educational contexts? What are their notions and their opinions? The outcomes of these analyses will then be used to make an overall comparative analysis on the content of the children's voices in these five case studies. For now we can conclude that we can be confident that the coding system yields data that permit reliable and valid conclusions.

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Appendixes

Appendix A

Coding system 1: Categories, subcategories, and properties used for coding children's expressions

Category	Subcategory	Properties	NV	V	C
1. School activities	01. Knowledge & skills	Commenting			
		Cooperating			
		Judging			
		Demonstrating			
		Suggesting			
	02. Attitude	Showing			
		Collaborating			
		Adjusting			
		Rejecting			
		Inviting			
		Assigning			
		Moving			
		Choosing			
		Helping			
		Persisting			
		Competing			
		Postulating			
		Preferring			
2. Classroom organization	03. Rules	Accepting			
		Adopting			
		Stepping over			
		Rebelling			
	04. Routines	Following			
		Fitting in			
3. Teacher's roles	05. Cultural Mediator	Conveying			
	06. Educator	Sanctioning			
		Confirming			
		Passing on			
		Correcting			
		Attending			
	07. Supporter	Mediating			

Category	Subcategory	Properties	NV	V	C
		Equipping			
		Connecting			
		Paying attention			
		Initiating			
		Inquiring			
		Assisting			
	08. Manager	Intervening			
		Learning			
		Adding			
		Obliging			
	09. Conversation partner	Hearing out			
	10. Designer	Devising			
		Preparing			
4. Relations	11. (With) Peers	Narrating			
		Showing			
		Demonstrating			
		Inviting			
		Role playing			
		Interchanging			
		Competing			
		Rejecting			
	12. (About) Family	Narrating			
		Showing			
		Demonstrating			
		Inviting			
		Preferring			
		Questioning			
		Accepting			
	13. (Towards) Others	Narrating			
		Showing			
		Demonstrating			
		Questioning			
		Devising			
		Mediating			
	14. (On) Specific issues	Narrating			
		Showing			
		Demonstrating			
		Preferring			

Note. Kinds of expressions: NV (non verbal) – V (verbal) – C (conation: feeling, wanting, thinking)

Appendix B

Coding system 2: Categories, subcategories, and properties used for coding children's expressions

Category	Subcategory	Properties (and relations)	P/F/O	(N)V	C
1.(Attitude towards) School activities	01.Affect	Suggesting			
		Preferring			
		Rejecting			
		Assigning			
		Revealing			
	02. Cognition	Demonstrating			
		Commenting			
		Questioning			
		Narrating			
	03. Behavior	Collaborating			
		Postulating			
		Showing			
2. Classroom organization	04. Adoption	Following			
		Accepting			
		Imposing			
	05. Modification	Ignoring			
		Adjusting			
		Opposing			
		i / r / a			
3. Teacher's roles	06. Instructor	Obliging			
		Learning			
		Adding			
	07. Facilitator	Initiating			
		Assisting			
		According			
	08. Educator	Mediating			
		Attending			
		Complimenting			
		Correcting			
		Passing on			
		Care taking			
	09. Cultural Mediator	Conveying			
		Exchanging			

Note. A relational component, or a combination of relational components, can be added to all the properties for: P (Peers) / F (Family) / O (Other(s), including the researcher, but not the own teacher of the child).
(N)V: (non) verbal. C: Conation (feeling, wanting, thinking). The kind of the child's expression, in relation to his teacher, is added to the properties in Category 3 by: i (in interaction with), r (in the role of), or a (about, without the teacher being present).

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Reviewing the Role of Cognitive Load, Expertise Level, Motivation, and Unconscious Processing in Working Memory Performance

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Abstract

Human cognitive capacity is unavailable for conscious processing of every amount of instructional messages. Aligning an instructional design with learner expertise level would allow better use of available working memory capacity in a cognitive learning task. Motivating students to learn consciously is also an essential determinant of the capacity usage. However, motivational factors are often subject to unconscious rather than conscious emotional processing. This review sets out the need for further studies to elucidate the role of motivation and unconscious processing in the use of cognitive capacity.

Keywords: cognitive effort, schema construction, expertise level, motivation, unconscious processing.

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Revisando el Papel de la Carga Cognitiva, el Nivel de Dominio, la Motivación y el Procesamiento Inconsciente en el Rendimiento de la Memoria de Trabajo

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Resumen

La capacidad cognitiva humana no está disponible para el procesamiento consciente de cada cantidad de mensajes instructivos. La alineación de un diseño instruccional con el nivel de experiencia del principiante permitiría un mejor uso de la capacidad disponible de la memoria de trabajo en una tarea de aprendizaje cognitivo. Motivar a los estudiantes a aprender conscientemente es también una esencia determinante del uso de tal capacidad. Sin embargo, los factores de la motivación son a menudo objeto de procesamiento emocional inconsciente más que consciente. Este análisis expone la necesidad de realizar más estudios para dilucidar el papel de la motivación y el procesamiento inconsciente en el uso de la capacidad cognitiva.

Palabras clave: esfuerzo cognitivo, esquema de construcción, nivel de experiencia, motivación, procesamiento inconscient

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Working memory allows for active combinations of storage and manipulations of verbal and visual elements of information (Baddeley, 2012). However, its capacity and duration for these activities are limited, processing two to four chunks of novel information for no more than a few seconds (Cowan, 2001). The limitations of working memory are essential determinants of human (conscious) learning.

To optimise working memory performance (i.e., neither over- nor under-loading the capacity for a coherent integration of novel and stored information) "Cognitive Load Theory (CLT)" has been widely applied to instructional manipulations (Sweller, Van Merriënboer, & Paas, 1998). The theory chiefly suggests aligning an instructional design with relatively lower or higher level of learner expertise (Sweller, Ayres, & Kalyuga, 2011). According to researchers (Kalyuga, 2011; Moreno, 2010; Paas, Tuovinen, Van Merriënboer, & Darabi, 2005; Schnotz, 2010; Van Merriënboer & Sweller, 2005), this alignment should also include motivational factors to explain how learners exert the necessary cognitive effort (i.e., the amount of cognitive capacity that learners devote to processing additional information germane to learning). However, an optimal alignment of an instructional design with levels of learners' expertise and motivation needs further clarification on at least two questions: Does the investment of more cognitive effort require high motivation? If it does so, is high motivation still conducive to learning when available cognitive capacity is low?

CLT has met with a rather different criticism from Schnotz and Kürschner (2007) regarding its account of conscious learning. They argued that learning takes place not only consciously, but also unconsciously, and not in working memory, but in long-term memory. Furthermore, working memory does not necessarily lead to the storage or reformation of knowledge in long-term memory. Unless the change happens, human learning does not occur. Evidence further suggests that neither a permanent nor temporary change in human memory can occur without unconscious processing (Kuldas, Ismail, Hashim, & Bakar, 2013). Therefore, to restrict human learning to conscious processing prevents seeing the facilitatory or inhibitory role of unconscious processing in the allocation of cognitive effort (Kuldas, Hashim, Ismail, Samsudin, & Bakar, 2014). To what extent

unconscious processing affects the use of working memory is the other issue that merits further attention.

Accordingly, research within the framework of CLT is expected to be comprehensive by addressing to at least another two issues: how learner motivation is related to the use of working memory and how unconscious processing facilitates or inhibits working memory performance. On one hand, pursuing the main goal of how to optimise cognitive load, the research has mostly neglected an equally important goal of how to motivate learners to use the available cognitive capacity (Kuldas, Satyen, Ismail, & Hashim, 2014). The literature shows that even if cognitive capacity is available, learners would exert little or no cognitive effort necessary for better learning when they lack motivation. On the other hand, focusing more on conscious processing, the research has also left largely unclear the role of unconscious processing. Learning and task performance can be facilitated by unconsciously constructed and automated knowledge, referred to as unconscious learning, mostly inaccessible to conscious awareness and control (deliberate and controlled attention) and thus verbally unreportable (Kuldas et al., 2013).

This narrative review presents a critical discussion about some boundaries of CLT and explains reasons for conducting further studies on the relation of motivation and unconscious processing with the use of working memory. Taking this relation into account, CLT would provide a new insight into the issue of how to use working memory better. The review falls under three main headings whereby respectively covers the three issues: (a) how cognitive load can be controlled or manipulated, (b) how the optimisation of cognitive load or learners' working memory performance is facilitated or inhibited by unconscious learning processes, including affects and motives; and (d) how learners can be stimulated to consciously exert more cognitive effort for better learning.

Optimising Learners' Working Memory Performance: Cognitive Load Theory

Better learning as the storage of knowledge structures in long-term memory (i.e., the construction of schemata — cognitive templates that enable learners

to classify multiple elements of information into a single element according to their applications), requires an optimal use of working memory, which is central to CLT (Sweller et al., 2011). The theory aims ‘‘to provide guidelines intended to assist in the presentation of information in a manner that encourages learner activities that optimise intellectual performance” (Sweller et al., 1998, p. 25). CLT concerns instructional control over the interaction between the design of verbal (spoken or written text) and visual materials (animations, figures, or diagrams), the structure of cognitive learning tasks, and learners’ cognitive characteristics. It focuses on the development of instructional methods that require less training time and less cognitive effort to attain durable and transferable learning outcomes.

According to CLT, the visual and verbal elements of information are essential cognitive loads on working memory. Cognitive load was traditionally described as consisting of three separate and additive loads – intrinsic, extraneous, and germane. As De Jong (2010) suggested “one might say that intrinsic and extraneous cognitive load concern cognitive activities that must unavoidably be performed, so they fall under cognitive load; germane cognitive load is the space that is left over that the learner can decide how to use, so this can be labelled as cognitive effort” (p.113).

Intrinsic Cognitive Load (ICL)

ICL stems from learning tasks that are intrinsically difficult or complex. Learning a subject via a large number of verbal and visual elements that are highly interacting with one another is more difficult than learning a small number of the elements having lower interaction. The interactivity is low when a single element is learned in isolation (e.g., learning individual words independently of each other), but it is high when the element is learned in relation to other elements simultaneously, such as learning concepts or procedures (Pollock, Chandler, & Sweller, 2002). ICL also depends on the characteristics of information (e.g., abstract and concrete levels of concepts); therefore, learning some information can intrinsically be more difficult than others, despite having the same level of interactivity and the same numbers of elements (Chi, 2005).

Whether or not ICL could be manipulated by an instructional design was a controversial issue; it was regarded as the fixed nature of a learning task that could not be altered at all (Paas, Renkl, & Sweller, 2003) or directly (Sweller et al., 1998). On the contrary, Van Merriënboer, Kirschner, and Kester (2003) argued that ICL is controllable; a way of the manipulation is to sequence the interacting elements in a simple-to-complex order, preventing learners from experiencing the full complexity of the interaction at the outset. A similar way to reduce ICL is to isolate highly interacting elements (i.e., isolated-interacting elements effect) in a task. Pollock et al. (2002) suggested providing learners with individual elements, instead of initially presenting with full interaction between the elements. Once the individual elements are learned, learners can thereafter learn the full interaction. Thus, learners initially learn what individual elements are, and subsequently, learn how all the elements interact.

Another way to decrease ICL, as suggested by Gerjets, Scheiter, and Catrambone (2006), is to present learners with (a) molar worked-out examples (i.e., directing their attention to problem categories and category-specific solution procedures to learn), and (b) efficient modular worked-out examples (i.e., directing their attention to an individual problem category and its modular solution steps to learn). Both the simple-to-complex approach, starting with a few interacting elements (isolating highly interacting elements at the outset) and part-whole sequencing, starting with simple content that builds up complexity gradually, effectively decrease ICL (Van Merriënboer, Kester, & Paas, 2006). However, instructional interventions to manipulate ICL can lead to unnecessary use of the available cognitive capacity, leading to "extraneous cognitive load" (Van Merriënboer & Sweller, 2005).

Extraneous Cognitive Load (ECL)

An instructional design imposes ECL when it gives rise to modality, redundancy, and split-attention effects (Kalyuga, 2012). Simultaneous delivery of various textual and pictorial information through only the visual channel of working memory results in the modality effect. As for simultaneous reception of the same information via separate channels (auditory and visual modalities), the redundancy effect occurs (e.g., textual descriptions for a diagram that is intelligible in isolation). If a diagram is

unintelligible and spatially segregated from textual description, learners would pay attention to the description while searching for its corresponding part on the diagram, and thus, the split-attention effect takes place. Moreno and Mayer (2007) suggested (a) presenting the information codes over audio-visual channel to avoid the modality effect; (b) excluding unnecessary information to eliminate the redundancy effect; and (c) synchronising the audio-visual information in time and space to control the split-attention effect.

In developing an instructional design, ICL and ECL are taken into account to prevent the design from imposing an inimical load on working memory. However, an equally important goal is to free up cognitive capacity for processing information relevant to schema construction, concerning the generation of germane cognitive load (Van Merriënboer et al., 2006).

Germane Cognitive Load (GCL)

GCL is associated with the construction of new or alteration of stored knowledge structures in long-term memory (Van Merriënboer et al., 2006). According to Schnotz and Kürschner (2007), what qualifies an imposed load as GCL is the conscious construction of knowledge that requires additional cognitive capacity beyond the requirements of the task performance. A learning task unavoidably imposes more or less ICL and ECL, which do not necessarily result in learning, but occupy extra cognitive capacity. If cognitive activities do not go beyond task performance or result in learning, GCL would not be different from ICL and ECL.

Schnotz and Kürschner (2007) asserted that task performance and learning are fundamentally different processes; despite the fact that they are closely correlated, they operate on different sources of mental representations. Task performance operates on the representation of novel information in working memory, whereas learning operates on the representation of prior knowledge in long-term memory. Working memory is, therefore, not the place where learning occurs. “What does take place in working memory is information processing as part of the learning task performance (such as, for example, comprehending texts, solving equations, or proving theorems), which trigger with some likelihood changes in long-

term memory" (p. 492). However, the suggested difference between task performance and learning to distinguish between ICL, ECL, and GCL needs further evidence.

How to Distinguish between Intrinsic, Extraneous, and Germane Cognitive Load

Moreno and Mayer (2007) posited that GCL and ICL occur in the same way, in which less experienced learners start selecting, organising, and integrating words and images with existing knowledge structures. They hereby engage in "essential processing" and "generative processing" to learn. The former refers to mentally selecting new information, while the latter refers to mentally organising novel information into coherent schemata and integrating with prior ones. Thus, like GCL, ICL is contributory to learning (De Jong, 2010).

Kalyuga (2011) suggested considering GCL as equal to ICL, and stated that GCL is not based on specific empirical evidence, whereas ICL is. According to Sweller (2010), GCL can be used to emphasise the amount of working memory resources that learners devote to dealing with ICL. Thus, the present formulation of cognitive load only consists of additive ICL and ECL rather than ICL, ECL, and GCL. Hence, a direct measurement should be developed to differentiate between only the two (Kalyuga, 2011; Sweller, 2010).

A traditional way to distinguish between the two types of load is to consider levels of prior domain-specific knowledge of learners. In other words, the effectiveness of an instructional design to manipulate ICL and ECL varies according to the expertise levels (i.e., the expertise reversal effect), implying that "instructional techniques that are highly effective with inexperienced learners can lose their effectiveness and even have negative consequences when used with more experienced learners" (Kalyuga, Ayres, Chandler, & Sweller, 2003, p. 23). For instance, a spatially integrated design that provides necessary information for less experienced learners to learn better may contain unnecessary information that is intelligible in isolation for more experienced learners, thereby yielding extraneous load and interfere with their cognitive-task performance (Kalyuga, 2007). In such cases, high

expertise learners inevitably hold mental representations of redundant information (i.e., representational holding process), thereby wasting their time and available cognitive capacity (Moreno & Mayer, 2007). Thus, an instructional design that takes the expertise reversal effect into account would allow learners of all expertise levels to devote their cognitive resources to the construction of schemata.

The Construction and Automation of Schemata

"Whereas there are severe capacity limits to the amount of information from sensory memory that working memory can process, there are no known limits to the amount of information from long-term memory that can be processed by working memory" (Sweller, 2004, p. 13). This limitation of working memory is hereby less likely to impede processing various elements of information that are organised into coherent schemata, which are already structured, encoded, classified, and rehearsed information codes with common features in long-term memory (Van Merriënboer & Sweller, 2005). Therefore, as Sweller et al. (1998) suggested, an instructional design should be aimed at facilitating conscious/mental combinations of visual and verbal instructional messages of a cognitive task into related schemata, which can later become automated as repeatedly and successfully being applied to the task.

"As is the case for schema construction, automation can free working memory capacity for other activities because an automated schema directly steers behaviour, without the need to be consciously processed in working memory" (Van Merriënboer & Sweller, 2005, p. 6). Therefore, once schemata have been automated, learners will exert very little conscious effort to operate them (Van Gog, Ericsson, Rikers, & Paas, 2005). With the help of automated schemata (unconscious processing), "human cognitive architecture handles complex material that appears to exceed the capacity of working memory" (Paas et al., 2003, p. 2).

An instructional intervention can facilitate the construction and automation of schemata as long as it is aligned with the expertise level. Otherwise the learning would be impeded, such as by asking low expertise learners to imagine the content of worked-out examples (Kalyuga, 2007). A way of

helping the learners is to present them with spatially combined rather than segregated instructional messages, but this combination may have little or no contribution for more expert learners (Kalyuga et al., 2003). Leung, Low, and Sweller (1997) reported that supplementing a mathematical equation with an elaborated text did not improve the learning for learners who had sufficient knowledge because the equation was intelligible to them. As learners increase the knowledge necessary for a learning task, the advantages of integrating verbal explanations with visual illustrations disappear. In this stage, they learn better through only visual presentations (Leahy, Chandler, & Sweller, 2003). The visual rather than verbal processing facilitates the construction of mental representations, thereby easing the construction and automation of schemata for learners at all levels of expertise (Kalyuga, 2012).

An instructional design that presents different modes of the same information (e.g., an animation and its textual explanation) over both visual and auditory modalities is less likely to impose high load as compared to only visual modality. Such a design can be beneficial for low expertise learners, who can learn better from the visual mode accompanied by a corresponding explanation as narration rather than as written text (Moreno & Mayer, 2007). The presentation of static visual materials simultaneously with corresponding textual or oral explanations in a conventional learning environment (Sweller et al., 1998), while replacing the written explanation (on-screen text) with spoken text to describe the dynamic visual material in a multimedia learning environment can reduce high cognitive load, facilitate imagining the content of instruction (Tindall-Ford & Sweller, 2006), and minimise the split-attention effect (Kalyuga, 2012; Moreno & Mayer, 2007). Such advantages of spoken text over written text can disappear when (a) an auditory instruction contains longer segments (Leahy & Sweller, 2011); (b) a narration is without its pictorial presentation; (c) a pictorial presentation is too unintelligible or is too intelligibly simple, not needing the narration; and (d) when spoken and written texts are concurrently presented (Kalyuga, 2012).

As a result, these suggestions for schema construction also emphasise how automated conscious knowledge facilitates working memory performance. Given that the automated schemata helps the conscious processing of novel information, conscious learning happens partially

unconsciously. As such, how can one distinguish between conscious and unconscious learning? The following sections serve to clarify this question and also explain how working memory performance is facilitated or inhibited by unconscious learning processes (i.e., encoding, storage, and retrieval information mostly without deliberate and controlled attention and largely inaccessible to verbal report).

Unconscious Learning Processes

Cognitive load theory claims validity for conscious construction of the kinds of knowledge, such as reading, writing, and arithmetic, which have to be explicitly taught (Schnotz & Kürschner, 2007). However, as Paas et al. (2003) highlighted, working memory, in which all conscious cognitive processing occurs, can handle only two or three novel interacting elements. "This number is far below the number of interacting elements that occurs in most substantive areas of human intellectual activity" (p. 2).

The human cognitive system is capable of storing more information in long-term memory through its unconscious channel than the conscious (Lewicki, Czyzewska, & Hoffman, 1987). The unconscious system is structurally and functionally much more sophisticated than the conscious (Bargh & Morsella, 2008). Lewicki et al. (1987) remarked that the unconscious system "releases the controlled processing from the responsibility of dealing with numerous tasks supporting every act of consciously controlled cognition" (p. 529), such as speech production, recognising shapes and locations of objects in three-dimensional space, or forming first impressions of a social stimulus. Furthermore, unconsciously learned information automatically primes appropriate responses to relevant stimuli, thereby operating on more information than could be operated consciously. This function is a general property of the human cognitive system (Lewicki et al., 1987).

Therefore, as Schnotz and Kürschner (2007) suggested, conscious processing should not be reckoned as the only prerequisite for learning. A growing body of literature suggests that the acquisition and application of knowledge is not solely a consciously goal-directed cognitive process; it is not merely subject to conscious awareness, conscious effort, conscious

control, or consciously acquired knowledge (Kuldas, Bakar, & Ismail, 2012). Extant studies (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001; Custers & Aarts, 2010; Scott & Dienes, 2010) suggest that learners can unconsciously form, retain, recall, and apply a goal-directed activity (e.g., decision-making) and create the same outcome as can be done consciously. This is because, as Bargh and Morsella (2008) acknowledged, an unconscious goal-directed process is not less deliberate, controlling, and adaptive than the conscious one.

Knowledge can be unconscious in the sense that learners are neither aware of how they acquire and learn it, nor aware of how the unconsciously acquired knowledge facilitates their cognitive-task performance (Lewicki et al., 1987). Dienes and Berry (1997) concluded from their review that learners can unconsciously learn to perform well in a task when their attention is focused on specific items and not on the underlying rules. For example, before having formal education, most learners have already unconscious knowledge about how to speak and how to listen without explicit instruction on semantic and syntactic rules of their first language. Such knowledge, referred to as biologically primary knowledge, lays foundations for the construction of biologically secondary knowledge, such as learning how to write and to read (Geary, 2002). The former is procedural, mostly acquired unintentionally and not easily verbalised, unlike the latter, which is declarative, intentional and easily expressible. Dienes and Berry (1997) further stressed that that knowledge used for task performance can be regarded as inaccessible to conscious introspection or to conscious awareness only in the sense that learners are unable to articulate freely how and what they learn. Thus, asking learners to articulate how they acquired and applied knowledge, and whether or not they intentionally used it for task demands, can be of the ways to determine whether the knowledge is conscious and unconscious.

Empirical evidence indicates that knowledge construction takes place mostly in unconscious perceptual (sensory information-processing), cognitive (e.g., associative memory networks), and emotional functions, which can later be accessible to conscious awareness (Kuldas et al., 2013). However, whether unconscious information processing is primarily an emotional, perceptual, or cognitive phenomenon is a highly controversial

issue (Kihlstrom, Barnhardt, & Tataryn, 1992). This controversy might be a reason for referring to unconscious processing under various terms, such as automatic, experiential, implicit, intuitive, adoptive unconscious, heuristic, associative, psychological, or non-conscious (Kuldas et al., 2013). Another reference to associative networks of neural activities of the brain is made; the activities form associations within and between information patterns at the outset of information processing, and subsequently, affect their retrieval processes (Sohn et al., 2005). A further reference to perceptual information-processing is made, suggesting an unconscious perceptual defence, unconsciously suppressing or even blocking sensory information that is undesirable (Erdelyi, 1974). The suppression of information may also be due to the limited capacity of visual-sensory processing, which does not allow for encoding multiple visual information simultaneously and consciously, and therefore, has to unconsciously suppress some of the messages to encode those messages that can be represented in the conscious mind (Kastner & Ungerleider, 2000).

However these various references to unconscious processing are made (i.e., as automatic, experiential, implicit, intuitive, adoptive, heuristic, associative, psychological, nonconscious, perceptual defence, or suppression), the consensus is that the bulk of perceptual, cognitive, and emotional processing, including their interconnections, is inaccessible to conscious awareness and thus to verbal report (Kuldas et al., 2014a). A convincing reason for the distinctive references may be that the unconscious perceptual, cognitive, emotional and motivational functions cannot be easily referred to a single heading (i.e., the unconscious mind); instead, the term "unconscious processes" may be used (Westen, 1998). The unconscious processes can be either inhibitory or facilitatory to learners' conscious thoughts and acts in a classroom setting. An association between conscious and unconscious processing (e.g., forming and retrieving thoughts) is of elementary associative learning processes. A conscious goal-directed activity is accompanied with unconscious associative "memory networks", such as beliefs, wishes, desires, and thoughts, which are linked with "unconscious procedures", such as emotions, motives, and defences (Westen, 1998). These unconscious networks and procedures guide human behaviour by activating associated memories and affecting emotional states, flows of thoughts, and

behavioural tendencies (Kuldas et al., 2013). This activation brings the emotional and motivational influence of past experiences into present experiences (Schacter, 1992; Westen, 1998). Activated expectations, desires, or fears motivate or demotivate learners investing the necessary cognitive effort (i.e., facilitating or inhibiting conscious learning processes).

The Effect of Unconscious Emotional Processing on the Use of Working Memory

"Affect acts as the on/off switch to motivation, which is the process by which goal-directed behavior is initiated and sustained either consciously or unconsciously" (Moreno, 2010, p. 137). Affect/motivation determines how learners perceive a cognitive learning task in terms of the amount of cognitive effort needed to deal with it (Schnotz & Kürschner, 2007). However, most parts of the affective/motivational processes can be formed and activated unconsciously, thus, resulting in the unconscious evaluation of perceived information and unconscious behaviour (Bargh & Morsella, 2008).

Through the limited conscious capacity, learners cannot promptly interfere with the preliminary unconscious evaluation of emotional experiences, with the unconscious influence concerning how they perceive information, acquire memories, feel, think, behave, and learn (Bargh & Morsella, 2008). Experiencing intense negative emotions, such as panic, insecurity, or anxiety, and related thoughts (e.g., feeling incompetent) can inhibit effective learning, whereas other negative emotions, such as mild anxiety, and positive emotions, such as curiosity, can facilitate learning activities (Kuyper, Van Der Werf, & Lubber, 2000). Due to the preliminary evaluation, humans unconsciously tend to approach emotionally desirable experiences that interfere with conscious processing (Epstein, 1994).

Although learners can later become aware of and evaluate their unconsciously initiated behaviour, this conscious evaluation does not mean that they are fully aware of emotional/motivational influences, such as urges, desires, or fears, nor does it indicate that they have complete conscious knowledge of why they are doing what they are doing. They can still be unaware the causal origins of their behaviour, of the behaviour itself, and of the influence of such behaviour on their positive and negative evaluations

(Gawronski, Hofmann, & Wilbur, 2006). Feelings, impressions, or prior beliefs can still unconsciously influence a typical cognitive task, such as reasoning and problem solving (Evans, 2003). Such factors can be uncontrollable; an unwanted thought can easily exceed one's conscious control and influence one's behaviour, such as, inhibiting learning and performance of a problem-solving task or mediating inferences and giving rise to inaccurate judgements or decisions (Efklides, 2006). Given such inhibitory effects, working memory seems to be occupied with emotional cognitive load (i.e., thoughts related or evoked by negative emotions). As such, further research is needed to provide insight into how the emotional load is related to the intrinsic and extraneous load.

As a result, the unconscious emotional/motivational processing can precede the arrival of its counterpart and determine the amount of cognitive effort to invest in a learning task. Hence, only focusing on the conscious processing capacity can deprive both educators and learners of the contribution of unconscious processing. Disregarding the affective/motivational processing limits the understanding of how human learning occurs. However, the question of how an effective educational implication of unconscious learning processes can be designed has yet to be tested (Kuldas et al., 2013). Such a test requires differentiating between conscious and unconscious motivation for cognitive resource expenditure, so as to explain how an instructional intervention must be tailored to meet learners' needs for motivation. As Sweller et al. (2011) emphasised, better learning (schema construction) depends on whether or not an instructional intervention stimulates learners to consciously allocate the necessary cognitive effort. An instructional design must allow students to be consciously aware of their motives and thus to avoid the inhibitory effects of unconscious emotional processing (i.e., engaging in thoughts or retrieving past experiences associated with negative emotional states).

Tailoring an Instructional Intervention to Learners' needs for Motivation

Schnotz (2010) remarked that an instructional manipulation alone is not stimulating enough for the allocation of the necessary cognitive effort. To encourage learners of all expertise levels to exert the effort, an instructional guidance, aid, or design should be tailored not just to suit learner expertise level, but also to meet their motivational needs (Schnotz & Kürschner, 2007), such as the need for an optimal challenge level of task difficulty. If learners perceive a learning task as too difficult or too easy, they are discouraged to persist to learn (Paas et al., 2005). For instance, when low expertise learners are provided with a multimedia presentation of a cognitive task without onscreen text, they perceive the task as complicated and frustrating and thus reduce persistence in dealing with it (i.e., low motivation for the use of available capacity in working memory); in contrast, relatively experienced learners consider the task challenging (i.e., high motivation for the use of capacity), thereby investing more cognitive effort and increasing their persistency (Schnotz, Fries, & Horz, 2009).

To encourage low expertise learners to devote the effort to germane learning processes, such as engaging in learning a complex mathematical optimisation algorithm, Paas et al. (2005) suggested presenting an animation and its textual explanation onscreen to describe the learning task, but the difficulty level should be challenging. An unchallenging task is inhibitory (i.e., generating low motivation) rather than facilitatory to learning. In Schnotz and Rasch's (2005) study, animated pictures impaired the learning processes of low expertise learners because the animation made the task too easy (i.e., decreased the motivation, thereby decreasing cognitive effort expenditure). Low expertise learners spent less cognitive effort to learn from the animation. Nevertheless, the learners performed their task (learning date/time differences and the earth's rotation around its axis) better with the help of animated rather than static pictures. Thus, as predicted, low expertise learners usually invest less cognitive effort to learn via animation generating low motivation (Cooper, Tindall-Ford, Chandler, & Sweller, 2001).

In addition, instead of making a learning task easier, educators should decrease their support and allow learners to learn or perform the task on their

own (Schnotz & Kürschner, 2007). In a series of studies (Kalyuga, Chandler, & Sweller, 2001; Kalyuga, Chandler, Tuovinen, & Sweller, 2001), learners with low expertise were allowed to practice worked-out examples and thereafter perform a difficult task; they hereby learned from the examples and performed the task better (i.e., high motivation leading to the investment of more cognitive effort). In contrast, high expertise learners were allowed to explore the same task on their own; they hereby learned most from the exploration and performed the task better than after practising the examples. Cooper et al. (2001) demonstrated that cognitive-task performance was facilitated by allowing low expertise learners to understand and remember the task related procedures and concepts through worked-out examples, while encouraging high expertise learners to do so on their own by imagining, referred to as the imagination effect. Leahy and Sweller (2005) reported that low expertise students' learning of a procedure (learning to use a bus timetable) was facilitated through worked-examples rather than imagination, however, this result reversed when their expertise increased.

To both high and low expertise learners, worked-out examples can be substantially beneficial, if they are stimulated to give explanations (i.e., the self-explanation effect) about what steps are needed to solve a problem and to establish a rationale for the problem-solving steps. In particular, stimulating high expertise learners to deliberately engage in learning-practice activities can improve their learning performance, referred to as the deliberate practice effect (Van Gog et al., 2005). However, Renkl (1997) argued that merely studying the worked-examples does not suffice to promote schema construction because it does not assure learners of avoiding misunderstanding. Furthermore, learners are not always able to identify how the examples are relevant to corresponding learning tasks or how to use the same problem-solving steps to deal with new problems. A rather different stance is taken by Schnotz and colleagues (2009), who argued that the examples are not motivational enough, even perceived as dull and unchallenging. To clarify the reasons for the different effects of worked-out examples on low and high expertise learners, Moreno (2006) stressed the need for further explanation on the relationship between motivational factors and the allocation of the necessary cognitive effort.

The Relation of Motivational Factors with the Allocation of Cognitive Effort

A commonly accepted view about human learning is that learners do not spontaneously engage in germane learning processes. The cognitive engagement is encouraged or discouraged by motivational factors, such as anxiety, probability of success, interest, and challenge, that activate, energise, and direct human behaviour (Kuldas et al., 2014b). Motivational factors, particularly goals, interests, and beliefs of learners determine whether or not they devote the necessary cognitive effort. For instance, unlike learners with low interest, those with high interest in a learning task would increase their cognitive effort to deal with the task (Hidi & Renninger, 2006). Paas et al. (2005) reported that when the motivation was lower, less cognitive effort was invested, thus indicating lower cognitive performance; but when the motivation was higher, more cognitive resources were invested, resulting in higher cognitive performance.

Learner interest level is increased or decreased by their belief in their own competence to complete tasks (Moreno & Mayer 2007). If learners do not believe they can perform a cognitive task successfully, they would not invest the necessary cognitive effort (Weiner, 2000). In contrast, they would invest the effort if they believe they can, and would, thus, perform better than those with low or no belief in their success (Wigfield & Eccles, 2000).

Learners' interests can vary according to their achievement goals, such as: (a) "mastery-approach goal" to improve learning or attain competence in a learning task; (b) "mastery-avoidance goal" in order not to fall short of task mastery (avoiding skill decline, loss of existing knowledge, or learning failures); (c) "performance-approach goal" to outperform others or demonstrate competence; and (d) "performance-avoidance goal" in order not to appear incompetent or not to do worse than others (Elliot & Thrash, 2001). When the goal is to increase competence on a task, learners devote greater effort to learn. On the contrary, they devote less cognitive effort, if the goal is solely to demonstrate task competence (Ford, Smith, Weissbein, Gully, & Salas, 1998).

The amount of cognitive resource investment is a waste or necessity for an achievement goal, depending on learners' evaluation of costs of time and

cognitive effort (Kuldas et al., 2014b). Learners would invest more cognitive resource if they believe it is necessary (Paas et al., 2005). Yet, as Schnotz (2010) highlighted, the evaluation process itself draws on motivational resources by taking some time and cognitive effort. Hence, an achievement goal is likely to draw upon motivational rather than cognitive resources.

Accordingly, the actual amount of motivational resources spent is the other determinant of cognitive effort expenditure for better learning and task performance. Only motivated learners devote the available capacity to the additional cognitive processing that is germane to learning (Schnotz et al., 2009). "When learners lack motivation they may fail to engage in generative processing even when cognitive capacity is available" (Moreno & Mayer, 2007, p. 315).

However, the failure or impaired performance may also be the source rather than the result of investment decline (Roets & Van Hiel, 2011b). Roets, Van Hiel, and Kruglanski (2013) showed that the unavailable or depleted cognitive capacity activates aversive feelings, which, in turn, substantially decrease motivation for task performance (i.e., indicating the causal effect of depleted cognitive capacity on motivation). Learners can maintain task performance, particularly under situational stressors (e.g., time pressure or noise), as long as they adequately have both motivation and cognitive capacity (Roets & Van Hiel, 2011b). These findings indicate that when both motivation and cognitive capacity are low, learners may engage in unconscious processing of task-irrelevant information; conversely, when both are high, learners attend to task-relevant information. As for when motivation for processing additional information is high but available cognitive capacity is low, learning can be inhibited rather than facilitated, because the inadequate capacity does not allow learners to properly perceive even task-relevant information as useful for learning and task performance (Kuldas et al., 2014b). Hence, an instructional intervention must be aimed at the optimisation of both cognitive load and the exertion of cognitive effort (i.e., optimising the interaction between motivation and cognitive capacity).

The abovementioned findings substantiate the "Integrative Process Approach" proposed by Roets and Van Hiel (2011a). This approach provides new insights into the dynamic interplay between learners' affect, motivation, and cognitive capacity, which are "the most proximal process

variables directly affecting information processing" (Roets & Van Hiel, 2011a, p. 510). This dynamic/causal interplay determines both qualitative and quantitative values of information processing. To show how the interaction between cognitive capacity, affect, and motivation could be optimised (i.e., increasing motivation as long as cognitive capacity is available or adequate for deliberate processing task-related information), further research could apply the integrative process approach to instructional interventions.

Conclusion

This review has reconsidered the main concern of Cognitive Load Theory over the issue of how to optimise learners' use of working memory capacity. The review has aimed at explicating the need to investigate the role of unconscious processes, including emotional/motivational factors, in learning and performance of a cognitive task. The reviewed literature suggests that the use of working memory is determined not only by learners' expertise levels, but also by their emotional/motivational states. An instructional format would encourage learners to use the available capacity to perform and learn their task better, provided that the design is aligned with the emotional/motivational factors. This alignment would help educators predict whether providing learners with more or less information facilitates rather than inhibits learning. Educators also need further clarification on how an instructional design can be aligned with learners' motivational factors, to stimulate them to use their cognitive capacity for better learning.

The theory claims validity for the conscious construction of knowledge, the kinds of learning requiring conscious effort to take place in long-term memory. Traditionally, the theory does not concern itself with the unconscious construction of knowledge or the unconscious influence of motivational factors. The theory thereby deprives both learners and educators of what the unconscious processing can contribute to the learning and teaching activities, and whether it impedes or facilitates cognitive learning and task performance. This review suggests that the theory can be more effectively applied to instructional designs, provided that it takes the unconscious nature of human cognitive and emotional information-

processing systems into account. The theory would thus predict what effects different emotional/motivational factors will have on the investment of cognitive effort. The framework of the cognitive load theory would be comprehensive with the integrative process approach to instructional designs, and thus, would provide new insights into the interaction between working memory capacity, affect, and motivation, in particular how this interaction could be optimised (i.e., increasing motivation under adequate cognitive capacity).

Further studies are needed to explain the relation between the investment of cognitive effort and the motivational factors to provide new insights into the following questions: (a) To what extent can learners consciously mediate their motivational factors (e.g., interest, beliefs, desires, or goals) to perform a cognitive learning task? (b) Do learners invest different amounts of cognitive effort in the task when they are consciously motivated and otherwise? (c) To what extent do learners' avoided thoughts (e.g., failure expectation) or undesirable experiences (e.g., past unsuccessful achievements) determine the investment of cognitive effort; for instance, whether or not learners' fear of failure highly affects the investment? Prospective studies could also provide more empirical evidence for whether or not the emotional load (i.e., task-irrelevant thoughts associated with negative emotions) is an additional cognitive load distinguished from the intrinsic and extraneous load.

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Personality and Academic Motivation: Replication, Extension, and Replication

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Personality and Academic Motivation: Replication, Extension, and Replication

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Abstract

Previous work examines the relationships between personality traits and intrinsic/extrinsic motivation. We replicate and extend previous work to examine how personality may relate to achievement goals, efficacious beliefs, and mindset about intelligence. Approximately 200 undergraduates responded to the survey with a 150 participants replicating the study two weeks later. When comparing data from the first and second collections, three of the five pathways for personality and achievement goals were replicated: neuroticism, openness, and agreeableness. For personality and efficacy three of the eight pathways remained significant from the first collection to the second. Openness was the only personality factor that significantly predicted participants' mindset about their intelligence. Results suggest certain personality traits may correspond with different motivational self-beliefs, but these results were neither reliable nor consistent.

Keywords: personality, motivation, self-efficacy, achievement goals, mindset.

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Personalidad y Motivación Académica: Réplica, Extensión y Réplica

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Resumen

Investigación previa ha examinado las relaciones entre rasgos de la personalidad y la motivación intrínseca/extrínseca. Replicamos y extendemos ese trabajo previo para examinar cómo la personalidad se puede relacionar con objetivos de rendimiento, creencias de eficacia y actitud sobre la inteligencia. Aproximadamente, 200 estudiantes de grado respondieron a una encuesta con 150 participantes replicando el estudio dos semanas más tarde. Cuando se compararon los datos de la primera y segunda fases de recogida de información, tres de los cinco perfiles de personalidad y objetivos de rendimiento se replicaron: neuroticismo, apertura y simpatía. Para personalidad y eficacia, tres de los ocho perfiles permanecieron significativos entre la primera y segunda recogida de datos. Apertura fue el único factor de personalidad que predijo de forma significativa la actitud de los participantes sobre la inteligencia. Los resultados sugieren que ciertos rasgos de la personalidad se podrían corresponder con creencias motivacionales diferentes, pero estos resultados no fueron fiables ni constantes.

Palabras clave: personalidad, motivación, auto-eficacia, orientación de logro, actitud

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Students' academic motivation plays an integral role in school achievement and school engagement, but there is ongoing discussion about students' motivational antecedents (Fiske, 2008; Pintrich, 2003; Weiner, 1990). Students' academic motivation may come from cognitive beliefs, past academic experiences, affective states, and socio-contextual influences (Ryan & Deci, 2000; Fiske, 2008; Pintrich, 2003). Academic motivation may also parlay with students' personality traits (Komarraju & Karua, 2005; Watanabe & Kanazawa, 2009). Previous studies correlate personality traits and academic motivation (Ariani, 2013; Clark & Schroth, 2010; De Feyter, Caers, Vigna & Berings, 2012; Hazrati-Viari, Rad & Torabi, 2012; Heaven, 1990; Komarraju & Karua, 2005; Komarraju, Karua & Schmeck, 2009; Watanabe & Kanazawa, 2009). Other research suggests that academic motivation does not correspond with personality traits (Matthews, Zeidner, & Roberts, 2006; Fiske, 2008; Pintrich, 2003; Weiner, 1990). The extant literature offers conflicting reports on whether personality aligns with academic motivation, which inhibits researchers and teachers from understanding what intrapersonal factors affect students' motivation and, ultimately, achievement.

For over 50 years, psychological research debated whether personality traits relate with academic motivation (Matthews et al., 2006). One argument suggests that self-determination theory supports a relationship between personality and academic motivation, whereby more intrinsically motivated people hold certain personality traits (Hazrati-Viari et al., 2012; Komarraju & Karua, 2009). These studies suggest a correlation between personality and motivation since an individual with a highly conscientious personality type may also have a higher degree of intrinsic motivation (Komarraju & Karua, 2005). Other work suggests that academic motivation is more influenced by contextual factors than inherit personality traits (Ciani, Summers, & Easter, 2008; Ciani, Middleton, Summers, & Sheldon, 2010). Further, though personality is a general trait, individual expressions of personality vary situationally, making it difficult to link specific personality traits with behaviors known to affect learning outcomes (Bem & Allen, 1974).

Previous work linking personality with academic motivation also relies upon a general definition of intrinsic motivation (see Table 1). A general view toward intrinsic motivation is no longer widely accepted within the field of academic motivation research (Pintrich, 2003; Weiner, 1990). Instead, intrinsic academic motivation consistent of multiple psychological constructs that simultaneously affect a student's desire to learn. In addition, few studies attempt study replication. The current study hopes to address these disparities by replicating and extending previous empirical findings with current achievement motivational theories (achievement goals, self-efficacy, and mindset). In addition, we replicate our own findings to test for reliability. Given the historical and current foci on personality and academic motivation, the study may provide additional support as to the role of students' personality in academic motivation.

Personality: A Brief Overview

The most commonly occurring personality factors include neuroticism, extroversion, agreeableness, openness, and consciousness (e.g., Costa & McCrae, 1985). Each of these personality factors are considered to be distinct from each other. Neuroticism refers to people who feel anxiety, hostility, depression, and impulsiveness (Judge, Higgins, Thoresen, & Barrick, 1999). Extroversion refers to an individual who is enthusiastic, sociable, active, and talkative (Komarraju & Karua, 2005). Agreeableness is being sympathetic, trusting, cooperative, and helpful (Komarraju & Karua, 2005). Openness to experience includes being imaginative, autonomous, nonconforming, and philosophical (Judge et al., 1999). Conscientiousness is characterized as someone who is organized, self-controlled, and purposeful (Komarraju & Karua, 2005). Most of the literature suggests that conscientiousness and openness predict motivation, but fewer studies explain how neuroticism, agreeableness, and extroversion link with motivation (Clark & Schroth, 2010; Komarraju & Karua, 2005; Komarraju et al., 2009). The NEO-FFI was the most commonly used measure for personality, but different scales were used to measure motivation. Conscientiousness consistently predicted both academic and intrinsic motivation regardless of measures used, but few other correlations between personality and motivation were found (see Table 1).

Table 1
Correlations between motivation and personality

Tests used to Measure Motivation	What the Tests Measure	Personality Measurement used to Correlate with Motivation	Correlations found between Personality and Intrinsic Motivation	Correlations found between Personality and Extrinsic Motivation
Academic Motivation Inventory	19 scales to measure motivation: thinking motives, achieving motives, persisting motives, competing motives, influencing motives, facilitating anxiety, grades orientation, economic orientation, desire for self-improvement, demanding, affiliating motives, withdrawing motives, approval motives, debilitating anxiety, dislike school, discouraged about school, male continuance, female continuance, and male GPA.	NEO FFI to measure personality	Consciousness and openness to experience (Komarraju & Karua 2005)	
Academic Motivation Scale	Measures: amotivation, three ordered subscales of extrinsic motivation: external, introjected, and identified regulation. Three unordered subscales of intrinsic motivation: to know, to accomplish things, to experience stimulation.	NEO FFI to measure personality (Komarraju & Karua 2005; Hazrati-Viari et al., 2012), 50 Big Five Factor Markers scale (Clark & Schroth 2010)	Consciousness and openness to experience (Komarraju &Karua, 2009, Hazrati-Viari et al., 2012). Consciousness, agreeableness, and extroversion (Clark & Schroth 2010).	Consciousness, neuroticism, extroversion (Komarraju &Karua, 2009). Consciousness (Hazrati-Viari et al., 2012).
Learning and Study Strategies Inventory	This motivation scale measures students' self-discipline, diligence, and willingness to apply the effort needed to successfully complete academic requirements.	NEO FFI to measure personality	Consciousness (De Feyter et al., 2012)	
Constructed a New Scale for the Study	Constructed an eight item intrinsic motivation scale. Which included questions like, "I am willing to undertake challenging jobs even if successfully performing them will not result in a promotion" (Watanabe & Kanazawa, 2009). Intrinsic and extrinsic motivation scales taken from 30 items from Lepper et al., (2005) (Ariani, 2013).	To assess levels of conscientiousness and openness to experience extracted twelve measures from McCrae and Costa's eighty bipolar adjective scales (Watanabe & Kanazawa, 2009). Personality had 44 items taken from Hart, Stasson, Mahoney, and Story (2007) (Ariani, 2013).	Consciousness and openness to experience (Watanabe & Kanazawa 2009; Ariani, 2013).	

Achievement Goals and Personality Traits

Goals are the academic purpose or motive that describes what a student hopes to achieve through in an academic endeavor (Ames, 1992; Pintrich, 2000). Current achievement goal theory suggests that individuals hold mastery and performance goals. Both mastery and performance goals can include either approach or avoid factors (Elliot, 1999; Finney, Pieper, & Barron, 2004). Mastery-approach goals refer to student's desire to develop their own intellectual abilities (Ames, 1992; Elliot & McGregor, 2001). Performance-approach goals are the impetus for outperforming others or demonstrating some level of competency (Ames, 1992; Senko, Hulleman, & Harackiewicz, 2011). Performance-avoid goals include students' desire to not appear academically inferior to others.

There is little research on achievement goal theory that attempts to relate with students' goals with their personality traits. The literature suggests that avoid goals positively correlate with neuroticism and extroversion personality traits (Komarraju & Karua, 2005). In addition, avoid goals negatively correlate with conscientiousness and openness to experience traits (Komarraju & Karua, 2005).

Mindset and Personality

Individuals often hold domain-specific beliefs about the malleability of one's abilities, which are termed implicit theories of ability, or mindsets (Dweck, 1999; Yeager & Dweck, 2012). Mindset orientations are either fixed or growth. When an individual believes their ability cannot change, then they hold a fixed mindset. In contrast, an individual has a growth mindset when that individual believes ability can be improved or altered. Students with a growth mindset often have higher academic achievement and greater academic resiliency (Yeager & Dweck, 2012).

Mindset may also correspond with students' personality (Furnham, Chamorro-Premuzic, & McDougall, 2003). Conscientiousness significantly correlates with mindset, and to a lesser degree extraversion (Furnham et al., 2003), and Personality can shape ideas about mindsets for intelligence (Furnham et al., 2003).

Efficacious Self-Beliefs and Personality

Efficacious self-beliefs are domain-specific perceptions regarding the extent to which individuals feel competency over their own abilities (Bandura, 1977, 1986). This study utilizes two specific efficacious beliefs: academic self-efficacy and teacher efficacy. Academic self-efficacy beliefs are subject-specific concepts of one's ability. Teacher efficacy is a teacher's self-perception to positively affect student learning and classroom management (Tschannen-Moran, & Woolfolk-Hoy, 2001; Tschannen-Moran, Woolfolk-Hoy, & Hoy, 1998).

As noted by Klassen, Tze, Betts, and Gordon (2011), the sources of teacher efficacy are not fully understood. Some work suggests a reciprocal relationship between teacher efficacy and classroom instructional practices (Holzberger, Philipp, & Kunter, 2013). More commonly, research suggests that self-efficacy beliefs stem from mastery experiences, vicarious experiences, verbal persuasion, and one's mood (Bandura, 1997; Chen & Usher, 2013; Usher, 2009). Currently, some research seems to suggest that personality may play a role with a person's self-efficacy such as, personality traits could be an additional source of efficacious beliefs since intrapersonal factors can affect self-efficacy (Ariani, 2013; Clark & Schroth, 2010; Furnham et al., 2003).

Present Study

The current work hopes to address some historical and contemporary issues regarding the relationships between academic motivation and personality. We replicate previous work suggesting that certain personality traits correspond with intrinsic and extrinsic motivation. We extend this work by examining how personality might relate with achievement goals, efficacious beliefs and mindset about intelligence. These analyses are then replicated two weeks later to see if whether our results were reliable. To our knowledge, this is the first study to replicate its own results regarding personality and academic motivation. Findings should provide additional understanding as to the potential role of personality in students' academic motivation.

Methods

Participants

The study included two waves of data collection. In both wave 1 and wave 2, participants were undergraduates at a large university participating in required coursework for a teacher education program. Wave 1 data collection included 205 participants (n_{women} = 156, 76%; n_{men} = 48, 23%, $n_{\text{other gender}}$ = 1, 1%), with 92 self-reporting as Non-Hispanic/White (45%), 69 Hispanic/Latino/a (34%), 14 multicultural (7%), 12 indigenous persons (6%), "other" 8 (4%), 7 Black/African American (3%), and 3 Asian American (1%). Ages ranged from 18 to 63 years old (M =24 years old; Mdn = of 22 years old).

Wave 2 data collection included 162 participants (n_{women} = 126, 78%; n_{men} = 36, 22%). Wave 2 included 150 participants from wave 1 (73% retention rate) and 12 new participants (7% of second wave participants). Wave 2's participants self-reported as 72 non-Hispanic/White (44%), 59 Hispanic/Latino/a (36%), 12 multicultural (7%), 9 indigenous persons (6%), 4 "other" (3%), 3 Black/African American (2%), and 3 Asian American (2%). Ages were from 18 to 63 years old (M = 24 years old; Mdn = 21 years old).

Measures

Personality. Participants' self-ratings of personality came from the Little Big-5 Questionnaire (Little & Wanner, 1996). The instrument measures the five major personality traits: neuroticism, openness, agreeableness, conscientiousness, and extroversion (Costa & McCrae, 1985). The questionnaire included 43 items measuring neuroticism (9 items; e.g., "I often worry about what others might think of me."), openness (9 items; e.g., "I am open to new experiences."), agreeableness (9 items; e.g., "I try to see the good in everyone."), conscientiousness (9 items, e.g., "Even when a task is difficult I want to solve it anyway."), and extroversion (7 items; e.g., "I prefer to be together with others than to be alone."). Likert-like scales ranged from 1 (strongly disagree) to 7 (strongly agree). All scales had good internal reliabilities in both waves of data collection (see Table 2).

Table 2
Descriptive Statistics

	Wave 1			Wave 2		
Scale	M	SD	α	M	SD	α
Personality						
Openness	5.74	.64	.78	5.67	.71	.85
Agreeableness	5.94	.62	.86	5.86	.63	.89
Conscientiousness	5.41	.81	.81	5.41	.80	.85
Extroversion	4.84	.79	.75	4.79	.82	.81
Neuroticism	4.15	1.08	.84	4.08	.99	.85
Achievement Goals						
Mastery-approach	5.77	.80	.90	5.80	.86	.93
Performance-approach	3.78	1.34	.92	3.87	1.38	.94
Performance-avoid	4.07	1.42	.86	4.09	1.40	.90
Efficacious Beliefs						
Self-efficacy	5.95	.74	.88	6.01	.81	.93
Teacher efficacy	7.20	.95	.91	7.22	1.01	.94
Mindset	4.50	1.08	.94	4.46	1.18	.96

Achievement Goals. Three scales from the Pattern of Adaptive Learning Scales measured students' achievement goals: mastery-approach, performance-approach, and performance-avoid (PALS; Midgley, et al., 2000). The mastery-approach and performance-approach scale includes five items each (e.g., mastery-approach, "One of my goals in class is to learn as much as I can."; e.g., performance-approach, "One of my goals is to show others that I'm good at my class work.), whereas the performance-avoid scale had four items (e.g., "One of my goals in class is to avoid looking like I have trouble doing the work").

The achievement goals scales are one of the most prominent and validated achievement goal measures (Huang, 2011, 2012; Midgley, et al., 1998). PALS items are designed to be subject specific. Therefore, items referenced participants' educational psychology course. Response scales were Likert-like (7 = strongly disagree to 1 = strongly agree). Internal reliabilities were strong across both wave 1 and wave 2 (see Table 2).

Mindset. Four items gauged participants' mindset for intelligence (e.g., "You have a certain amount of intelligence, and you can't really do much to change it."; Dweck, 1999). Prior studies validated and extensively employed the instrument (Blackwell, Trzesniewski, & Dweck, 2007; Chiu, Hong, & Dweck, 1997; Dweck, 1999; 2006; 2012). Scores were on a 6-point scale from 1 = strongly disagree to 6 = strongly agree. Scores were then reverse-coded, so that higher scores indicate a growth mindset. The present study's descriptive statistics and internal reliabilities are found in Table 2.

Efficacious Beliefs. Two types of efficacious beliefs were measured in this study: academic self-efficacy and teacher efficacy. Academic self-efficacy items came from PALS (Midgley, et al., 2000). Five questions assessed students' academic self-efficacy. The wording of all five items reflected students' academic self-efficacy for their educational psychology class (e.g., "Even if the work is hard in my educational psychology class, I can learn it"). Internal reliabilities were strong (see Table 2). Previous work suggests the scale to be both valid and reliable (Patrick Hicks, &Ryan, 1997; Ryan, Gheen, & Midgley, 1998).

The second efficacious beliefs scale measured pre-service teachers' beliefs regarding their teacher efficacy. Twelve items measured self-perceptions of effective classroom management and pedagogical ability (e.g., "How much can you do to motivate students who show low interest in school work?"). Only a single factor is computed with this scale for pre-service teachers as noted in Fives and Buehl (2010). All items came from the Teachers' Sense of Efficacy Scale (Fives & Buehl, 2010), which was based on the work of Tschannen-Moran and Woolfolk-Hoy (2001). Prior work validates the Teachers' Sense of Efficacy as an accurate measurement of teacher efficacy (Fives & Buehl, 2010; Tschannen-Moran & Woolfolk-Hoy, 2001).

Procedure

Wave 1 and wave 2 of data collection were at the end of the fall semester. Average delay between data collections was 14 days. Participants answered all surveys online. Participants received partial credit for a psychology course in return for their participation. All students' information was collected anonymously.

Results

Three separate sets of analyses are presented regarding personality and academic motivation. The first set of analyses examines the relationships among personality characteristics and achievement goals. The second set of analyses investigates the relationships among participants' personality traits and their efficacious beliefs. The final set of analyses involves the role of personality in contributing to participants' mindset. For all sets of analyses, the results from waves 1 and 2 are presented.

Preliminary Data Analyses

We tested for potential differences between participants who did and did not complete both waves of data collection. For personality, a Multivariate Analysis of Variance (MANOVA) suggested no significant differences between participants with one or two data points, F (5, 199) = 1.49, p = .19. A MANOVA suggested no differences for achievement goals, F (3, 201) = 2.49, p = .06, nor for teacher efficacy and self-efficacy, F (2, 202) = .35, p = .71. An analysis of variance suggested no difference in mindset for those participating in one or both waves of data collection, F (1, 203) = .08, p = .79. These results suggest little difference between students who completed one or both waves of data collection.

Personality and Achievement Goals

A path analyses tested the relationships among participants' personality traits and achievement goals (see Figure 1).

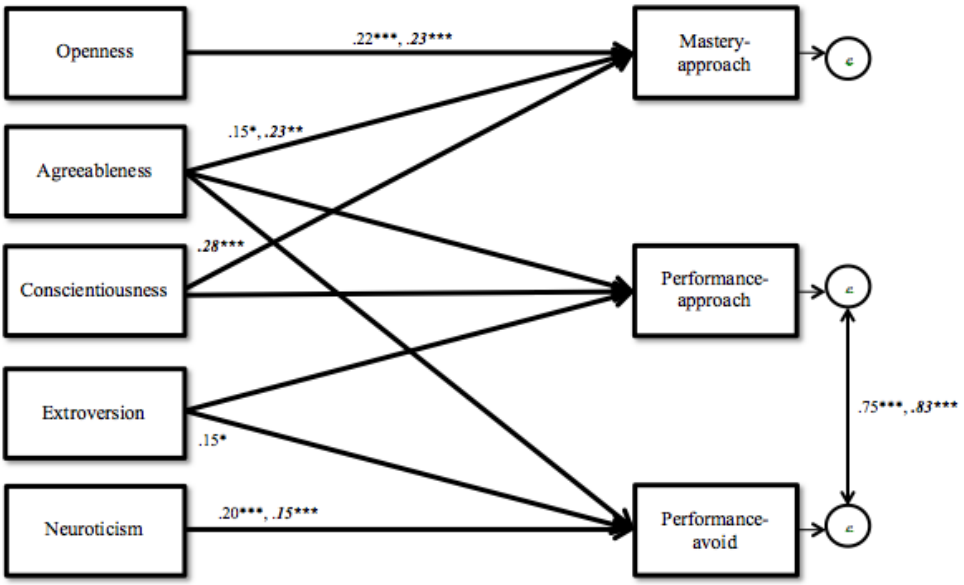

Figure 1. Path analysis between personality and achievement goals. Correlations among personality traits are inside Table 2. Non-italicized coefficients are from wave 1. Italicized and bolded coefficients are from wave 2. ***$p \leq .001$, *$p \leq .05$.

As part of the path analysis, we correlated certain personality traits with each other in the first second waves of data collection. These correlations were based upon prior research showing significant interrelationships among personality traits (Ariani, 2013; Clark & Schroth, 2010; De Feyter et al., 2012; Hazrati-Viari et al., 2012; Komarraju & Karua, 2005; Komarraju et al., 2009; Watanabe & Kanazawa, 2009). Correlational results are found in Table 3 for both waves of data.

Table 3
Correlations among variables in figures 1 and 2

	Openness	Agreeableness	Conscientiousness	Extroversion	Neuroticism
Openness	--	.40***, **.45*****	.36***, **.38*****	.17*, **.28*****	n/a
Agreeableness	.45***, **.40****	--	.32***, **.29*****	.28***, **.40*****	n/a
Conscientiousness	.38***, **.36*****	.29***, **.32*****	--	.16*, **.13**$^{n.s.}$	-.17**, **-.19****
Extroversion	.28***, **.17***	.40***, **28*****	.13$^{n.s.}$, **.16***	--	n/a
Neuroticism	n/a	n/a	-.19**, **-.17***	n/a	--

Note. Figure 1 data are below the diagonal, whereas Figure 2 scores are above the diagonal. First wave data is on the left, with second wave data bolded, italicized, and on the right. n/a = correlations were not run. ***$p \leq .001$, **$p \leq .01$, *$p \leq .05$, $^{n.s.}$ non-significant.

Path analysis fit indices for wave 1 suggested adequate model fit, χ^2 (11, n = 205) = 23.60, p = .02, CFI = .96, RMSEA = .08. Significant and positive paths included the relationship between openness and agreeableness with mastery-approach goals. Extroversion and neuroticism positively related with performance-avoid goals. In the first wave of data collection, no personality traits related with performance-approach goals.

Wave 2 of data collection replicated some, but not all, of the paths between personality traits and achievement goals. Model fit was slightly improved in the second wave of data collection, χ^2 (11, n = 162) = 9.21, p = .60, CFI = .90, RMSEA = .01. As in wave 1, openness and agreeableness positively and significantly related with mastery-approach goals. The positive relationship between neuroticism and performance-avoid goals was also replicated in the second wave of data collection. . In contrast, extroversion did not relate with performance-avoid goals. Unlike wave 1, conscientiousness did significantly relate with mastery-approach goals. In sum, three of the five pathways (60%) were replicated between waves 1 and 2.

Personality and Mindset

The second set of analyses examined whether personality traits might relate with participants' mindset toward their intelligence. As there was only a single outcome variable (mindset), we ran a regression analysis for both wave 1 and 2. All five personality traits were entered simultaneously as predictor variables.

Results from the wave 1 included a significant regression model, F (5, 199) = 3.81, p = .003. Though the model was significant, results suggested that personality traits explained only a small portion of the variance, Adj. R^2 = .06. Indeed, only a single personality trait predicted students' mindset. Openness was positively related with having a growth mindset, β = .16, p = .04.

Wave 2 replicated results from wave 1. The wave 2 model was significant, F (5, 155) = 4.77, p < .001. As per the first wave of data, the model explained only a portion of the variance, Adj. R^2 = .11. Openness was the only significant predictor in the second wave, β = .28, p = .002, which

corresponds with results from wave 1. These findings suggest that personality traits may play a small role in how students perceive their intelligence mindset, specifically that students with greater openness to experiences might also have more of a growth mindset.

Personality and Efficacious Beliefs

The final analysis examined how personality traits related with efficacious beliefs, specifically teacher efficacy and academic self-efficacy (See Figure 2). As with the first set of analyses, this path analysis included correlated personality traits in both waves of data collection. The same correlations among personality traits were run in this and the first set of analyses (See Table 3).

Path analysis findings suggested the model fit the data well in wave 1, χ^2 (3, n = 205) = 4.22, p = .24, CFI = .99, RMSEA = .05. Results of the first wave of data suggested significant pathways between teacher efficacy and participants' agreeableness and extroversion. Academic self-efficacy significantly related with openness and agreeableness. It may also be of interest that teacher efficacy was unrelated with self-efficacy, which suggests pre-service teacher distinguish between their efficacious beliefs in teaching and being successful in class. This result was replicated in wave 2.

Wave 2 suggested a significant path analysis model, χ^2 (3, n = 162) = 2.62, p = .45, CFI = .99, RMSEA = .01. In wave 2, several more paths were significant than in the wave 1. A newly significant pathway appeared between teacher efficacy and conscientiousness. For self-efficacy, newly significant pathways in wave 2 included a positive relationship with conscientiousness and negative relationships with extroversion and neuroticism. In addition, agreeableness and openness again related with self-efficacy in wave 2. The path between teacher efficacy and openness was replicated, but agreeableness was no longer significant in wave 2. These results indicate that three of the eight (38%) significant pathways between personality and efficacious beliefs appear in both waves 1 and 2.

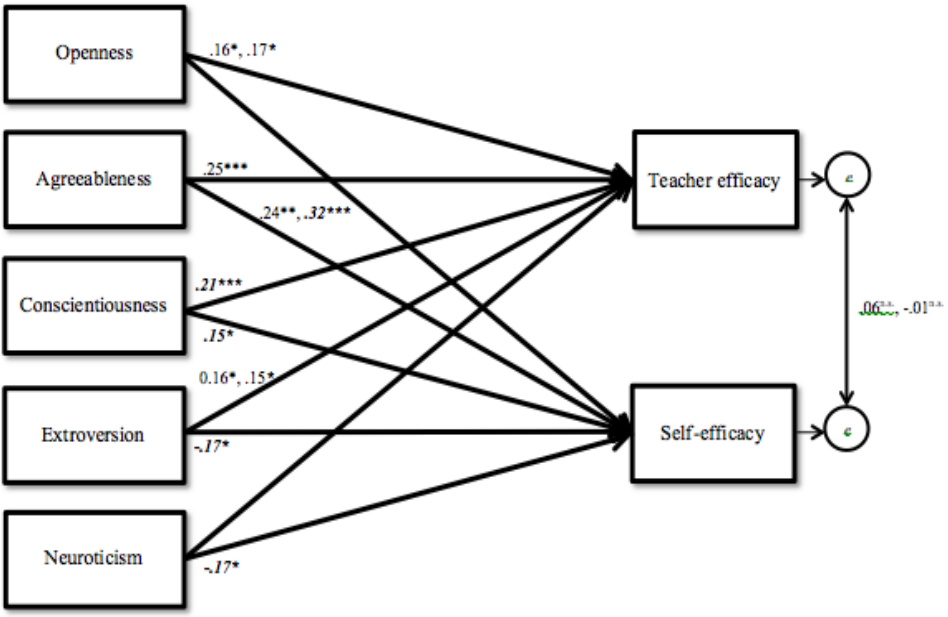

Figure 2. Path analysis between personality and efficacious beliefs. Correlations among personality traits are inside Table 2. Non-italicized coefficients are from wave 1. Italicized and bolded coefficients are from wave 2. ***$p \leq .001$, **$p \leq .01$, *$p \leq .05$.

Discussion

The study hoped to both replicate and extend previous research on how personality traits might relate to academic motivation. In addition, the study attempted to replicate its own findings by conducting the same analyses two weeks between participants' two data collections. Results of this study continue prior work as well as expanding upon previous research between personality and academic motivation by utilizing contemporary academic motivation theory to address outstanding issues regarding whether inherent personality traits align with academic motivation. The current study found

that prominent current motivational theories (achievement goals, teacher efficacy, and self-efficacy) may have slight relationships with students' personality traits. Mindset appears to have a more robust relationship with one aspect of personality, namely openness. Still, there was scarce replication of these relationships between academic motivation theories and personality traits within this study. As such, we are quite hesitant to suggest that academic motivation may be strongly linked with students' own personality traits. Instead, results suggest inconsistent findings among participants' personality traits and multiple academic motivation constructs across data points. Despite the prominence of inconsistent results, these findings may help inform, though not entirely resolve, a 50 year old debate about whether students' academic motivational antecedents come from their personality traits. Further, the study's findings may also help explain theoretical discrepancies in prior empirical research.

Previous literature suggested that personality traits should align with some aspects of academic motivation (Komarraju & Karua, 2005; Watanabe & Kanazawa, 2009), whereas other studies suggest no relationship between academic motivation and students' personality traits (Matthews, Zeidner, & Roberts, 2006; Fiske, 2008; Pintrich, 2003; Weiner, 1990). If personality traits do correspond with academic motivation, then there should be reliability across time and across multiple motivational theories. There may likely be some consistency in certain personality traits correlating with the different motivational constructs. Indeed, the literature suggests that conscientiousness, extroversion, openness, and agreeableness often relate with intrinsic motivation (Clark & Schroth, 2010; Komarraju & Karua, 2005). Except for openness, the literature also suggests that these same personality traits align with extrinsic motivation. The current study's results provide little support for these past results, despite some past findings suggesting a relationship between personality traits and academic motivation. The discrepancy in findings between past results and the present findings may well have to do with different theoretical orientations toward academic motivation. Indeed, the present study's findings can be supported by current understanding of academic motivation theory.

Contemporary understanding of academic motivation suggests that contextual factors have a strong influence on students' desire to learn and

persist through academic difficulties (Ciani, Summers, & Easter, 2008; Ciani, Middleton, Summers, & Sheldon, 2010). Academic motivation is now understood to be nuanced beyond the two larger motivational constructs often used in other studies (intrinsic motivation and extrinsic motivation; Deci & Ryan, 1985; Pintrich, 2003). More contemporary academic motivation theory suggest that students simultaneously experience multiple motivational constructs pertaining to school. These different types of academic motivation can be strongly influenced by teachers creating environments conducive to supporting students' sense of autonomy of their learning, which increases students' academic motivation (Ames, 1992; Deci & Ryan, 1985). Prior work (as noted in Table 1) did not examine the many varied motivational theories. Hence, the relationship between academic motivation and personality traits may appear in a more a generalizable sense, such as those people with a highly conscientious personality type and intrinsic motivation (Komarraju & Karua, 2005), but these findings do not account for the more complicated and current understanding of how academic motivation to learn parlays with students' multiple motivational self-beliefs and different classroom contexts.

To a limited degree, the present study also accounts for environmental influences that can affect students' motivation to learn (Ames, 1992; Pintrich, 2003). The present study applied multiple motivational theories to a single course. This choice presumed that environmental factors may affect the students' motivation within the course (e.g., teacher and classmates increasing or decreasing students' academic motivation to varying degrees across classrooms). The study's inconsistent relationships among personality traits and motivational theories highlights how personality traits may appear to correspond with academic motivation, but for only certain motivational self-beliefs, at certain times, and for only certain students. Hence, it is possible that classroom context may be a factor complicating any possible relationships between academic motivation and personality traits. This was further exemplified in the inconsistent results found across the two data collections.

The study attempted replication using the same students and motivational constructs within the same course. Replication was inconsistent among personality traits and motivational theories. These findings provide further

support for current understanding of students' academic motivation, such that a student's desire to learn is more likely to change due to environmental influences (Ciani, Middleton, Summers, & Sheldon, 2010; Deci & Ryan, 1985). We highlight these findings and inconsistencies for each of the study's academic motivation theories below.

Achievement Goals

The present study's findings suggest that students' achievement goals align with three personality traits at both time points. This supports other work that found that agreeableness and openness align with intrinsic motivation (De Feyter, Caers, Vigna & Berings, 2012; Hazrati-Viari, Rad & Torabi, 2012), and neuroticism corresponds with performance-avoid goals (Komarraju & Karua, 2005). Still, two other relationships between personality traits and achievement goals were not replicated. In addition, no coefficient loadings were particularly strong, with all loadings at or below β = .23. These results particularly dubious of given the strength that the classroom setting has over achievement goal adoption ($\beta \geq .24$; Ciani, Summers, & Easter, 2008; Ciani, Middleton, Summers, & Sheldon, 2010). Hence, results could be interpreted as certain personality factors statistically corresponding to achievement goal adoption, but with limited practical significance.

Mindset

Previous work suggested that one's mindset toward intelligence correlated with the conscientiousness personality trait (Furnham, Chamorro-Premuzic & McDougall, 2003). Previous work suggested that conscientiousness may align with mindset when one believes that effort and work habits lead to greater ability (Furnham et al., 2003). That is growth mindset can exist when students believe their hard work leads to greater performance. This is one of the few studies examining the role that personality may have on mindset beliefs. The current study adds to the literature by suggesting that openness might align with mindset, but conscientiousness did not correspond with mindset beliefs about intelligence. Instead, we suggest that those who are

open to new experiences may have more optimistic viewpoints, which could also be seen in optimistically believing that intellectual abilities can improve as well. This assertion would need additional research for confirmation. As well, more work would provide additional support, or refute, the possibility that the work habits of conscientious students parlay into growth mindset adoption.

Efficacious Beliefs

To our knowledge, very little research examines the role of personality in students' self-efficacy and pre-service teachers' teacher-efficacy. Other work suggests that both intrapersonal factors can enhance or detract one's efficacious self-beliefs (Bandura, 1986; Holzberger, Philipp, & Kunter, 2013; Usher, 2009). Hence, it may be plausible that other intrapersonal factors, such as one's personality, might alter self-efficacy beliefs.

The current study's results provided conflicting results concerning potential relationships between personality traits, self-efficacy, and teacher-efficacy. Agreeableness, openness, and extroversion aligned with efficacious beliefs at both time points, but for different efficacy beliefs (extroversion with teacher efficacy, whereas openness and agreeableness with self-efficacy). Conscientiousness and neuroticism aligned with the efficacy scales at only the second data collection point. Results suggest that certain personality factors could pertain to sources of self-efficacy beliefs, but we are critical of this possible rationale since different personality traits corresponded with different efficacious beliefs. Instead, if personality traits were aligned with efficacious beliefs, then there should be consistency across time points, personality traits, and the efficacy scales. The results from the present study provide little support that personality corresponds with self-efficacy since only 38% of the paths were replicated at both time points.

Limitations and Future Directions

The current study is the first to expand personality research with several currently prominent academic motivation theories. Our results provide little support that personality aligns with achievement goals, mindset, nor self-efficacious beliefs. Still, these findings are not without critique. Foremost, the current sample consisted mostly of female teacher education students. Though the sample was fairly ethnically diverse, additional work is needed to see if participants' results are only representative of those going into the teaching profession and to test for potential gender differences.

Unlike previous work, the current results included the attempted replication of findings across two time points. The two-week delay between data collection opens the possibility that some self-beliefs could change, and therefore alter relationships with personality traits. More longitudinal research with different time intervals might provide greater light on whether this two-week delay offered too much time for students to alter their self-beliefs.

The current study utilized domain-specific academic motivation instruments. This choice allowed to measure whether fairly domain-general personality traits would align with domain-specific motivational beliefs. This also leaves open the possibility that domains not considered in the present study could correspond with personality traits. It may be that personality could correspond with achievement goals for other classes, mindsets toward other beliefs, and various self-efficacy beliefs. Additional research would help suggest whether personality traits might pertain to specific academic motivation domains, or only the more general academic motivational beliefs measured in previous work (Clark & Schroth, 2010; Hazrati-Viari et al., 2012; Heaven, 1990; Komarraju et al., 2009).

Conclusion

The study was one of the first to test and replicate the potential relationships between students' personality traits and academic motivation. Results suggest that certain personality traits might correspond with different motivational self-beliefs. In addition, results were not always reliable across

the time points, nor were results consistent across academic motivational beliefs. This suggests that the role of personality in students' academic motivation may have less impact than other environmental and intrapersonal antecedents. The study's findings offer additional evidence that, while personality traits may be fairly stable and domain-general, academic motivation is generally domain-specific and malleable.

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Students' Response to Academic Setback: "Growth Mindset" as a Buffer Against Demotivation

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Students' Response to Academic Setback: "Growth Mindset" as a Buffer Against Demotivation

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Abstract

It is important to understand why some students are able to bounce back following setbacks, while others become de-motivated and suffer negative consequences. This study tests a model which places students' beliefs about ability (Dweck & Leggett, 1988) as a key factor which may influence students' motivational response to setbacks and achievement. A survey was conducted among second semester university students in Indonesia (N=123, mean age 18.67 years, 81% female) enrolled in a challenging statistics course. Beliefs about intelligence, about academic ability, and goal orientation were measured at the beginning of the semester, while effort attribution and de-motivation were measured one week after the mid-term examination grades were announced. Mid-term and final examination grades were obtained from the course instructor, while first semester GPA (as an index of prior ability) was obtained from the university register. Path analysis indicated that growth mindset about academic ability (but not about intelligence) prompted the adoption of mastery goals and effort attribution, which buffered against demotivation in the face of academic setback, which in turn led to better academic achievement. This motivational pattern became more pronounced among students who experienced setback in their mid-term exam

Keywords: academic setback, implicit theory of ability, motivation, academic performance, goal orientation.

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Respuesta del Alumnado a las Dificultades Académicas: La "Mentalidad de Crecimiento" como Mediador contra la Desmotivación

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Resumen

Es importante comprender porqué algunos estudiantes son capaces de recuperarse después de dificultades, mientras que otros se desmotivan y sufren consecuencias negativas. Este estudio analiza un modelo que entiende las creencias del alumnado sobre su habilidad (Dweck & Leggett, 1988) como un factor clave que puede influir tanto la respuesta motivacional del alumnado a los obstáculos como el rendimiento. Se llevó a cabo una encuesta entre estudiantes universitarios de segundo semestre en Indonesia (N=123, 18.67 años de edad media, 81% mujeres) matriculados en una asignatura difícil de estadística. Las creencias sobre la inteligencia, la habilidad académica y la orientación de logro se midieron al inicio del semestre, mientras que la atribución del esfuerzo y la desmotivación se midieron una semana después de que las notas del examen a mitad del semestre se publicasen. Las notas de los exámenes de mitad y final de semestre se obtuvieron vía el docente del curso, mientras que la nota media del primer semestre (como índice de habilidad previa) se obtuvo del registro de la universidad. El análisis de trayectoria indicó que la 'mentalidad de crecimiento' acerca de la habilidad académica (pero no acerca de la inteligencia) provocaba adoptar objetivos de éxito y atribución de esfuerzo, lo que amortiguaba la desmotivación cuando había que enfrentarse a dificultades académicas y esto, en consecuencia, conducía a un mejor rendimiento académico. Este patrón motivacional apareció más pronunciado entre los estudiantes que experimentaron dificultades en el examen de mitad de trimestre.

Palabras clave: dificultades académicos, teoría implícita sobre la habilidad, motivación, rendimiento académico, orientación de logro.

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Failure and setbacks are part and parcel of academic life, and also life more generally. While not every student will experience dramatic failures such as getting kicked out of school/university in their academic career, most are likely to experience lesser forms of setbacks such as obtaining a low grade in an exam and failing to pass individual courses. Students can respond to such setbacks in more or less productive ways: some may feel de-motivated and avoid similar challenges, while others could feel challenged, evaluate the causes of their setback, and plan strategies to address those problems. Understanding the psychological factors that lead to such differing interpretations of and responses to setback is important. The present article aims at testing a model that describes the motivational dynamics that may stem from beliefs about intelligence and ability, which is a class of potentially important individual difference factor. The model is based on a theoretical framework (outlined in the next section) proposed by Dweck and her colleagues (1995). The article extends prior work in several ways: by comparing directly students who have just experienced a setback to those who did not; by applying the theoretical framework in a non-Western sample (Sternberg & Grigorenko, 2004); and by measuring beliefs about ability (Dweck, 1986) at two levels of generality (general intelligence and academic ability).

Fixed vs. Growth Mindsets

Implicit theory of intelligence refers to one's beliefs about whether intelligence is malleable, or whether it is largely determined at birth and difficult to change (Dweck, et al., 1995). Dweck (2006) has more recently used the terms "growth" and "fixed mindsets" to refer to these beliefs. Having a growth mindset doesn't mean believing that all individuals are equally intelligent, or equally able to learn new skills/knowledge. Rather, it means believing that for any particular individual, his/her intelligence could be further developed (Blackwell, Trzesniewski, & Dweck, 2007). Although often described as two different beliefs, the fixed and growth mindsets could be seen as opposite ends of a continuum. A person could hold relatively weaker or stronger beliefs that intelligence can be developed.

Mindsets about ability themselves are malleable. Children's mindsets are likely to be shaped by feedback from caregivers. Praising a child and attributing his/her success to intelligence, as opposed to effort or process, encourages the development of a fixed mindset (Pomerantz & Kempner, 2013) and can undermine persistence and enjoyment of an activity (Mueller & Dweck, 1998). Consolations from teachers endorsing a fixed mindset (e.g. "It's alright, not everyone is good at math"), while comforting, leads to lower student motivation and expectancy (Rattan, Good, & Dweck, 2012). On the other hand, ability mindsets could be changed through training, such that a person with a fixed mindset could develop a belief that intelligence is malleable (Burke & Williams, 2012; Donohoe, Topping, & Hannah, 2012).

Dweck's socio-cognitive theory postulates that mindsets about intelligence is an important personality variable that underlie motivational dynamics in achievement situations, such as when students engage in academic tasks (Dweck, 1986, 2006; Dweck, et al., 1995; Dweck, Mangels, & Good, 2006). One possible mechanism by which mindsets about intelligence influence motivation is through achievement goals (Dweck & Leggett, 1988). When intelligence is seen as fixed, success in a task tends to be seen as validating the adequacy of one's ability (and vice versa, failure is seen as validating the inadequacy of ability). Thus, a fixed mindset is associated with what Dweck and Leggett (1988) called a performance orientation, i.e. wanting to validate, prove, or demonstrate ability. In contrast, when intelligence is seen as malleable, success and failure in a task are not taken as validations of ability. Rather, engagement in a task tends to be experienced as opportunities to improve one's competence. This is what Dweck and Leggett (1988) called a learning orientation.

Achievement goals have been found to influence motivation and task engagement (Ames, 1992; Daniels, et al., 2009; Dweck, 1986; Grant & Dweck, 2003). Observations of children in laboratory settings show when they perceive their present ability to be low, adopting a performance goal leads to negative affect, low persistence, and avoidance of challenge (Ames, 1992; Dweck, 1986; Dweck & Leggett, 1988). More recently some researchers have suggested a distinction between *normative* goals, i.ecompeting or comparisons with peers, and *ability* goals, which is closer to the original meaning of performance goal (Grant & Dweck, 2003; Hulleman,

et al., 2010). Grant and Dweck (2003) found that ability goals, but not normative goals, predicted loss of intrinsic motivation and withdrawal of effort when confronted with setbacks.

Mindsets about intelligence may also influence motivation through attributions, in addition to achievement goals. Attributions are the explanations we generate about why events happen. Attribution theory (Weiner, 1985, 2010) postulates a number of important causal dimensions, including locus and stability. Thus, individuals could attribute success and failure to factors within (intelligence, effort) vs. outside of one's self (social structures, pure luck); and stable (intelligence) vs. changeable factors (effort). Mindsets about intelligence may provide a framework or meaning system with which individuals make causal attributions of events. A growth mindset may predispose an individual to explain successes and failures events in terms of effort (Hong, et al., 1999). Furthermore, individuals with growth and fixed mindset may both attribute failure (or success) to intelligence. However, from a fixed mindset perspective, intelligence is a stable and uncontrollable factor, whereas from a growth mindset perspective, it is seen as less stable and more controllable.

In turn, attributions about successes and failures can influence how individuals feel and respond to those events (Weiner, 1985, 2010). Attributing the cause of failure or negative performance to stable, uncontrollable factors will tend to prompt negative emotions, de-motivation, and maladaptive behaviours such as withdrawal. Thus, if a fixed mindset predisposes an individual to explain failure more in terms of intelligence than effort, then having such a mindset will make them vulnerable to negative emotions and maladaptive responses (King, MCInerney, & Watkins, 2012; Robins & Pals, 2002). Moreover, because intelligence is believed to be stable and uncontrollable, then expending more effort can be seen as futile (Hong, et al., 1999).

Mindsets and Academic Achievement

Based on the previous description about mindsets and motivation, believing intelligence as malleable should lead to better academic achievement. Having a growth mindset would predispose students to orient towards

acquiring new knowledge/skills and less concerned about proving their intelligence (or avoiding the threat of appearing unintelligent) (Dweck, 1986; Dweck & Leggett, 1988). In the face of setbacks and failure, having a growth mindset would also predispose students to make effort attributions, which could protect them from negative emotions and de-motivation (Hong, et al., 1999). These contentions are also supported by neurological evidence which suggest that attention is biased by one's mindset about ability. Mangels et al. (2006) collected event-related potentials data on subjects who were engaged in a task and were given both evaluative feedback (whether one have provided a right or wrong answer to a question) and learning-relevant feedback (the correct answer to a question). They found that subjects with fixed mindsets attend more to evaluative feedback, whereas those with growth mindsets give more attention to semantic processing of learning-relevant feedback.

While the motivational patterns associated with a growth mindset are adaptive and should lead to better outcomes, academic achievement is a multiply-determined variable. A recent systematic review indicates that college grade point average (GPA) was predicted by more than 30 demographic and psychological variables (Richardson, Abraham, & Bond, 2012). Among these variables, most were only weakly correlated with college GPA. Psychological factors with moderate correlations with college GPA include cognitive (high school achievement and academic aptitude) and motivational variables (self efficacy and effort regulation). College GPA was only weakly correlated with learning and performance goals, while attribution did not predict college GPA (Richardson, et al., 2012, p. 366). Thus, it is important to investigate the mechanisms by which mindsets about intelligence influence achievement in real academic settings.

A number of articles report data that is relevant to this question. Romero (2014) found that growth mindset predicted middle-school GPA (r= .33). Similarly, Stipek and Heidi's (1996) study on third to sixth grade students found that mindset about intelligence was correlated with performance in math and social studies (r between .10 and .25). These authors also noted that contrary to theoretical predictions, goals and strategies did not mediate the relationships between mindset and performance. Consistent with this, Faria (1996) conducted a study with Portuguese high school students and

reported that mindset about intelligence was weakly correlated with grades, but this relationship was not mediated by effort attribution (which she termed "controllability").

In contrast, Shively and Ryan's (2013) study of college students found that mindset about intelligence (in general and for math ability) did not predict achievement in an algebra class. Dupeyrat and Marine (2005) also found no direct relationship between mindsets about intelligence and achievement (college GPA) in a sample of adult students in France. They did, however, observe an indirect relationship, where learning goal and effort acted as mediators between fixed mindset and achievement. This is consistent with findings reported by Blackwell et al. (2007), which show that growth mindset was linked with increases in math performance during the first two years of junior high school, and that the relationship was mediated by learning goals, effort attribution, and positive strategies. In summary, there is mixed evidence regarding whether mindsets about intelligence directly predicts achievement, and also regarding the mediating roles of motivational factors that are postulated by Dweck's theory. In studies which found that mindsets predicted achievement, the effect sizes were mostly small.

Overview and Research Questions

According to the motivational theory proposed by Dweck and her colleagues (Dweck, 2006; Dweck, et al., 1995), a growth mindset about intelligence should be associated with better academic achievement. This is because a growth mindset predisposes students to strive for improving one's ability (as opposed to proving or demonstrating it), and to attribute successes and failures more to effort rather than ability. The theory further suggests that the motivational dynamics linking mindset and achievement should be more pronounced when students are unsure about their chances of succeeding in task. In other words, mindsets about intelligence should be more important when a student is in a situation perceived to be challenging. Thus, in could be inferred that mindsets about intelligence would play an important role when students are faced with setbacks.

The present study extends prior research in a number of ways. First, few prior studies have examined the role of mindsets in the motivation and achievement among students who have experienced a setback in actual academic setting. Early studies have examined this issue in laboratory settings, in which researchers manipulate the level of task difficulty (Dweck, 1986). It is important to examine whether this is true for academic achievement, which is determined by numerous factors other than psychological ones. Prior studies linking mindset about intelligence and academic achievement have typically found small effect sizes. This may be because prior studies have not specifically looked at students who experienced setbacks, in comparisons to students did not experience the setback. Second, the present study examines the mediating role of goals, attribution, and demotivation (diminished effort and interest). Only few studies have tested these mediating variables in model, and the available studies suggest a mixed evidence regarding the role of goals, in particular (Dupeyrat & Marine, 2005; Huang, 2012). Again, this may be due to the fact that prior studies did not differentiate between students who are more or less challenged by the situation (e.g. experiencing setback or not).

Finally, the present study extends prior research by testing predictions based on Dweck' theory in a non-Western sample. This is important because the notion of intelligence may contain culture-specific dimensions. In the Confucian and Taoist tradition, for instance, intelligence is associated with both knowledge and wisdom (Yang & Sternberg, 1997a). The intelligent person is one who is capable of making wise moral judgments. A survey of Taiwanese also indicate that intelligence is associated with not only cognitive ability, but also inter-personal and intra-personal skills, as well as self-effacement (Yang & Sternberg, 1997b). A study in the Indonesian context also found that intelligence is characterized by cognitive ability as well as personality attributes (e.g. hardworking, diligent, wise), practical skills, as well as achievements (Patricia, 2014). In short, the non-Western term "intelligence" encompasses a broader set of attributes than the Western notion. This does not mean that non-Western people do not have mindsets about intelligence. Rather, this construct may need to be measured at a more specific level, e.g. academic ability, rather than "intelligence" in general. A preliminary study in the Indonesian context found that beliefs about general

intelligence is only weakly correlated with beliefs about academic ability in various domains (Patricia & Aditomo, 2014).

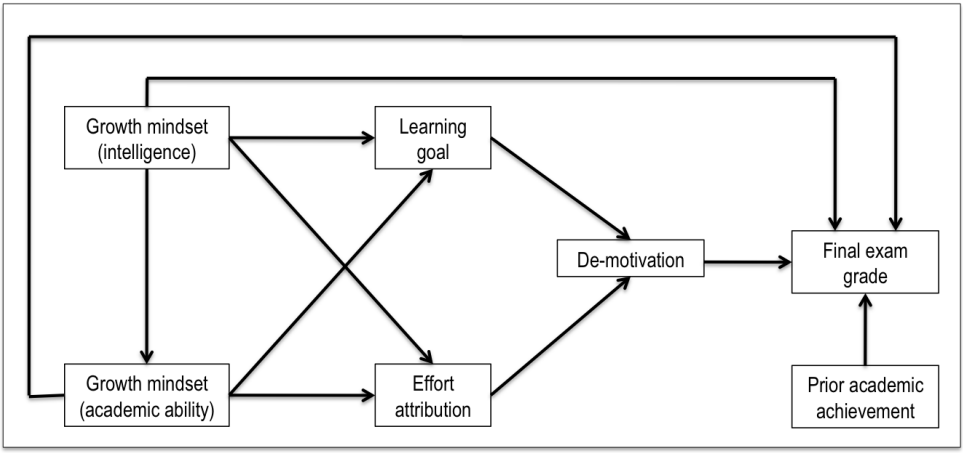

Figure 1. Conceptual model of the relationships between mindset, motivational factors, and academic achievement.

Based on the previous discussion, this study tested the model presented in Figure 1. Growth mindsets should be positively related to learning goal and effort attribution, both of which in turn should be negatively related to de-motivation. The more de-motivated students become, the lower their subsequent course grade should be. In addition, growth mindsets is postulated to predict higher course grade directly. The following research questions are posed: (a) Do (growth) mindsets about intelligence and academic ability positively predict the adoption a learning goal, effort attribution, and subsequent course performance, while negatively predict de-motivation, after controlling for prior academic ability? (b) Do learning goal, effort attribution, and de-motivation mediate the relationships between mindsets about intelligence/ability with subsequent course performance? (c) Do the relationships between mindsets, motivational factors, and subsequent course performance become more pronounced for students who experienced setback?

Method

Procedure and participants

To address the research questions, two surveys were conducted with second semester university students enrolled in an introductory behavioural statistics course. The university is a mid-sized private teaching institution in a large metropolitan city in Indonesia, primarily catering for undergraduate education. The statistics course was chosen because data from previous semesters show it had a relatively high proportion of students who fail. Thus, it allowed for the identification of a sufficiently large number of students who experienced "setbacks". In this context, academic setback was operationalized in this study as failing to score more than 66 in the mid-term exam, which was the minimum score for a satisfactory final grade ("B") set by the university. Because the mid-term exam contributed 40% to the course grade, obtaining a score of 66 or lower would jeopardize one's chance of passing with a satisfactory grade. Thus, this cut off represented a meaningful threshold for the students.

The surveys were conducted in class after lecture sessions. Students were informed that their participation was voluntary, and that their identity would be kept confidential; volunteers were provided with a small bag of snacks. The first survey was conducted at the beginning of the semester and included measures of ability mindsets and learning goals. The second approximately one week after the mid-term examination grades were announced and included measures of effort attribution and de-motivation. Mid-term and final examination grades were obtained from the course instructor, while first semester GPA (as index of prior academic ability) was obtained from the university register. Of the 169 enrolled students, 123 participated in both surveys. The participants were mostly female (81%), in their late adolescence (mean age: 18.67 years; SD: .74), and came from a variety of ethnic groups (roughly 80% from Chinese-Indonesian and Javanese backgrounds, with the remaining coming from seven minority ethnic groups).

Instruments

Mindset about intelligence. This scale was based on items from Dweck's work (Dweck, 2006; Dweck, et al., 1995). Three items measured the belief that intelligence is malleable (e.g. "You can substantially change how intelligent you are") and another three measured the belief that intelligence is fixed (e.g. "Your intelligence is something about you that you can't change very much"). The fixed mindset items were reversed to create a composite growth mindset score. Internal consistency for the six items was found to be adequate (Alpha: .73).

Mindset about academic ability. Two scales assessing beliefs about whether academic ability in general (5 items) and in mathematics (5 items) were created for this study. Each scale referred to a vignette describing an individual who had low academic ability (e.g. "In elementary and junior high schools, Doni was believed to lack in academic ability. His class grades and standardized examination results were always poor."). The items then asked respondents to rate how likely it is that the individual, through effortful study, can develop his/her ability to achieve or excel in his/her subsequent academic career (e.g. "... to become a valedictorian in high school?"). An exploratory factor analysis indicated that the ten items formed one dimension (accounting for 68.13% of the variance, with factor loadings ranged from .78 to .88). Thus, the ten items were averaged to yield a single score reflecting mindset about academic ability (Alpha: .95).

Learning goal. This scale was adapted from items measuring mastery goal orientation in the Patterns of Adaptive Learning Scales (Midgley, et al., 2000). The items were slightly reworded to refer to the specific course context (e.g. "One of my main goals in this course is to learn as much as I can"). Midgley et al. (2000) reported good internal consistency for the scale (Alpha: .85). Internal consistency for the sample in this study was also satisfactory (Alpha: .88).

Effort attribution. Two items were used to measure whether students feel they improve their achievement and understanding through effort ("I will obtain better grades if I study more for this course" and "I will understand the materials for this course better if I try harder"). Internal reliability was adequate (Alpha: .78).

Demotivation. Four items were used to assess whether students felt less motivated to learn and study in the statistics course, compared to the beginning of the semester (e.g. "Compared to the beginning of the semester, I now allocate less time and energy for this course" and "Compared to the beginning of the semester, my motivation to learn in this course has diminished"). Internal reliability for the scale was good (Alpha: .89).

Analyses

Correlation and partial correlation (controlling for prior academic ability) were used to examine the relationship between growth mindset and subsequent academic achievement. Path analysis using multiple regressions was used to estimate the mediating roles of the motivational variables. Path analysis procedures outlined by Keith (2006) were followed.

Results

Table 1 presents the descriptive statistics for the variables examined in this study, for the total sample as well as for students who obtained lower and higher mid-term exam scores. As would be expected, students who obtained lower mid-term scores also had lower prior academic ability (first semester GPA) and subsequently obtained lower scores in the final examination. The two subsamples, however, did not seem to differ in terms of any of the other variables.

Correlations between mindsets, motivation, and course performance

To answer the first research question, zero order and partial correlations between the variables were computed. The correlation pattern was mostly consistent with theory (see Table 2). Mindset about intelligence and mindset about academic ability were positively correlated. Growth mindset about academic ability positively predicted both learning goal and effort attribution, negatively predicted de-motivation, but did not predict subsequent course performance. Contrary to theory, however, growth

mindset about intelligence did not correlate with any of the motivational mediators. Furthermore, it negatively predicted mid-term examination score.

Table 1
Mean and standard deviations for the main variables

Variable	**Lower mid-term score (n = 41)**		**Higher mid-term score (n = 82)**		**Total sample (N = 123)**	
Prior academic ability (GPA, 0-4)	2.45	(.60)	3.25	(.58)	2.99	(.70)
Mindset about intelligence	4.17	(.67)	3.92	(.80)	4.00	(.77)
Mindset about academic ability	4.48	(.87)	4.47	(.72)	4.47	(.77)
Learning goal	5.02	(.70)	4.87	(.74)	4.92	(.73)
Effort attribution	5.11	(.77)	5.32	(.62)	5.25	(.68)
De-motivation	3.05	(1.01)	3.16	(1.12)	3.13	(1.08)
Mid-term exam score (0-100)	56.24	(6.47)	80.60	(9.79)	72.48	(14.50)
Final exam score (0-100)	60.88	(8.74)	79.48	(10.54)	73.28	(13.28)

Note. All variables measured in a scale of 1 to 6 except mentioned otherwise.

Table 2

Zero-order (figures in the upper half of the matrix) and partial correlations controlling for prior GPA (figures in bold in the lower half of the matrix) between the main variables

Variables	1	2	3	4	5	6	7
Mindset (intelligence)		.357**	-.078	.139	-.072	-.194*	-.125
Mindset (academic ability)	**.359****		.203*	.473**	-.198*	-.001	.038
Learning goal	**-.077**	**.203***		.283**	-.290**	.027	.056
Effort attribution	**.146**	**.474****	**.283****		-.293**	.172*	.128
De-motivation	**-.066**	**-.199***	**-.291****	**-.299****		-.091	-.134
Mid-term exam	**-.179***	**-.007**	**.027**	**.179***	**-.191***		.826**
Final exam score	**-.081**	**.053**	**.076**	**.128**	**-.301****	**.630****	

Note. * p < .05; ** p < .01, two tailed.

Motivational variables as mediators between mindsets and performance

To answer the second research question, path analysis using multiple regression was conducted, following procedures recommended by Keith (2006, pp. 212-253). To estimate paths toward final exam grade, it was regressed on prior academic ability, de-motivation, growth mindset about intelligence, and growth mindset about academic ability. To estimate paths towards de-motivation, it was regressed on learning goal and effort attribution. To estimate paths toward learning goal and effort attribution, each was regressed on growth mindset about intelligence and growth mindset about academic ability. Finally, to estimate the path towards growth mindset about academic ability, it was regressed on growth mindset about intelligence. The results are displayed in Figure 2.

The results show that neither of the two growth mindsets (about intelligence and about academic ability) had any direct effects on final examination grade. Growth mindset about intelligence did not predict learning goal or effort attribution. However, it did predict growth mindset about academic ability, which was positively associated with both learning goal and effort attribution. These two constructs were negatively linked with

de-motivation, which in turn was negatively associated with final examination grade.

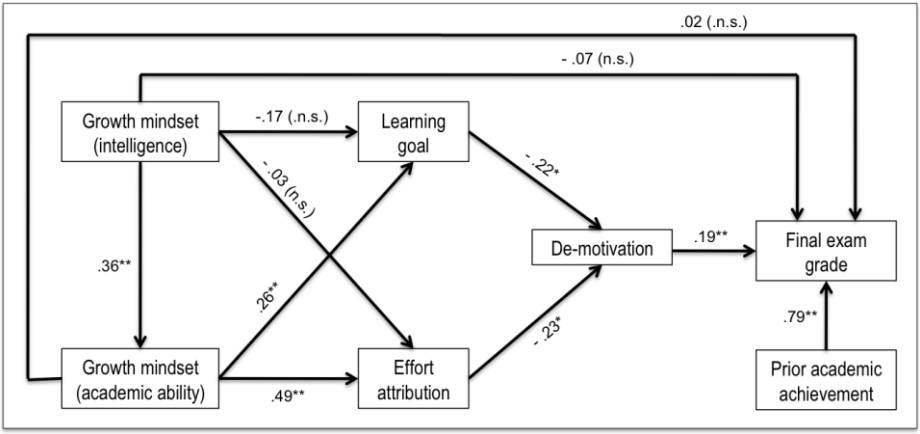

Figure 2. Path analysis results at the whole sample level. Figures show standardized regression weights (beta). * p< .05; ** p< .01 (two-tailed tests).

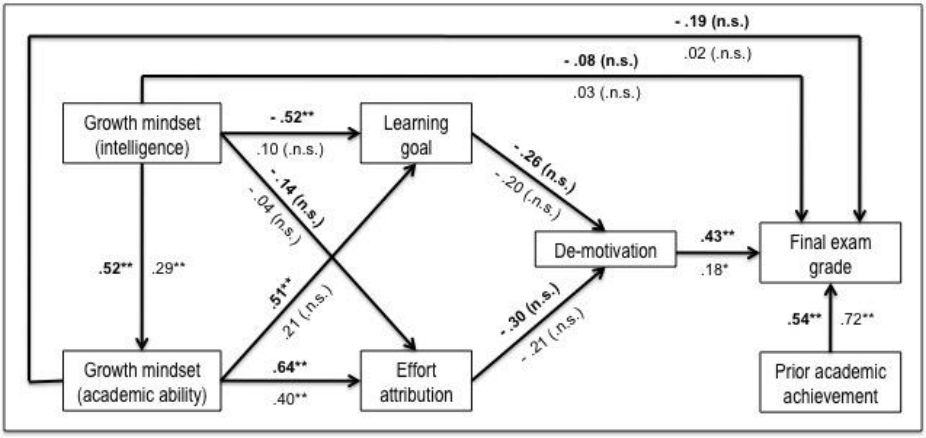

Figure 3. Path analysis results for the subsamples. Figures show standardized regression weights (beta). Figures in bold represent students who experienced setbacks in the mid-term exam. * p< .05; ** p< .01 (two-tailed tests).

Comparing students who did and did not experience setback

To answer the third research question, the path analysis procedure repeated for the two subsamples of students who obtained lower and higher mid-term exam scores (Figure 3). Comparing students who obtained lower and higher scores in the mid-term exam, the overall pattern of relationships appeared similar. However, the effect sizes were generally larger for the students who obtained lower scores in the mid-term exam. This is more obvious with regards to the effects of growth mindset about academic ability on both learning goal and effort attribution; and also the effect of de-motivation on final grade examination. The previously significant paths from learning goal and effort attribution towards de-motivation became not statistically significant, although the link between effort attribution and de-motivation approached statistical significance ($p = .056$). This could be attributed to the decrease in sample size and thus statistical power. A notably unexpected finding was that growth mindset about intelligence was negatively related with learning goal (beta: - .52, $p<.01$) among students with lower mid-term exam scores.

Discussion

Theory and prior research suggest that students' belief about whether intelligence is malleable has an important role in their motivational dynamics in achievement situations (Blackwell, et al., 2007; Davis, et al., 2011; Dupeyrat & Marine, 2005; Dweck, 2006; King, et al., 2012). Such beliefs are referred to in this article as mindsets about intelligence and ability. The present study tested a conceptual model regarding the role of mindsets in an actual academic setting among a non-Western sample of university students. The model postulates learning goal (i.e. studying for the purpose of developing one's knowledge/skills) and effort attribution (i.e. ascribing course outcomes to effort) as factors that mediate the effect of mindset on subsequent motivation level and performance in a difficult course. In the present study, mindset about intelligence was examined at two different levels: belief about general intelligence and about academic ability.

Correlation and partial correlation analyses results (Table 2) indicated that growth mindset did not have direct impact on subsequent academic achievement (grades in the final examination). This was true for both growth mindset about intelligence and about academic ability. Growth mindset about academic ability was correlated with all of the motivational variables in the predicted directions. The belief that academic ability can be improved is positively associated with learning goals (studying for the purpose of developing new knowledge and skills) and with effort attribution (the tendency to attribute outcomes of the mid-term exam to effort); and negatively with de-motivation (feeling less motivated and diminished energy for studying in the course). De-motivation predicted lower final exam score ($r=.301$, $p<01$), but this association was found only after controlling for prior academic ability. Thus it seems that prior ability suppressed the effect of de-motivation on subsequent achievement. Only when the effect of prior ability is accounted for (i.e. when comparing individuals with equal prior ability) does de-motivation come into play.

This correlation pattern suggests that while growth mindsets did not have any direct effect on academic achievement, it may have an indirect effect via learning goal, effort attribution, and/or de-motivation. This is supported by the path analysis results (Figure 2). More specifically, it seems that growth mindset about academic ability prompts students to adopt a learning goal and attribute outcomes to effort, which in turn buffered against de-motivation. De-motivation then has a negative impact on subsequent achievement. This mediational model is based on theory but has rarely been tested in actual academic settings. Thus, the present study adds to the limited evidence regarding the roles of goal and attribution in mediating the influence of growth mindset on achievement in real and challenging academic situations (Blackwell, et al., 2007).

The path analysis results (Figure 2) also indicate that learning goal and effort attribution were equally important in the motivational dynamics that influences academic achievement. Learning goal (also often referred to as mastery goal) has been found to be correlated with a host of motivational, cognitive, and meta-cognitive variables (Wolters, Fan, & Daugherty, 2013). However, previous research has also found that learning goal is only weakly associated with academic achievement (for a meta-analysis, see Hulleman, et

al., 2010, p. 437). Thus, consistent with the findings of this study, it seems that the effect of learning goal on achievement is mediated by motivational and cognitive processing variables (Grant & Dweck, 2003).

It needs to be noted that the theoretical predictions did not bear out with respect to the role of growth mindset about intelligence, which was linked to neither learning goals, nor to effort attribution (Figure 2). Growth mindset about intelligence is positively associated with mindset about academic ability, but only moderately so ($r=.357$, $p<.01$), suggesting that they are two distinct constructs. It seems that to the extent that growth mindset about intelligence has an influence on subsequent academic achievement, it occurs through the more domain-specific mindset about academic ability. This does not undermine Dweck and colleagues' theoretical framework. Rather, this more likely points to the differing meanings of intelligence across cultural groups. Some studies have found that non-Western individuals ascribe a wider meaning to the concept of intelligence, encompassing ethics, morality, and practical skills (Patricia & Aditomo, 2014; Yang & Sternberg, 1997b). Therefore researchers who wish to measure belief about cognitive ability (which is more specifically relevant for academic work) among non-Western samples should consider using more domain-specific items.

Comparing between students who experienced vs. did not experience setback in their mid-term exam, the overall motivational dynamics seemed similar (see Figure 3). However, the paths from growth mindset about academic ability towards learning goal and effort attribution became stronger. This could also be observed for paths from effort attribution towards de-motivation, and from de-motivation towards final exam grade. The link from learning goal leading into de-motivation also showed the same pattern (stronger for students who experienced setback), although this was not statistically significant. These results support the postulate that mindsets about intelligence and ability become more important in the face of challenge in actual academic settings. Thus, this study extends previous laboratory-based studies which experimentally manipulated the level of challenge that children experience. Recall that in this study, setback was operationalized as failing to obtain a satisfactory passing score in the mid-term exam. In other words, it was negative feedback about students' current level of competence. For these students, passing the course satisfactorily

became more challenging. A growth mindset about intelligence and academic ability, through the adoption of a learning goal and effort attribution, buffered against the potentially de-motivating situation.

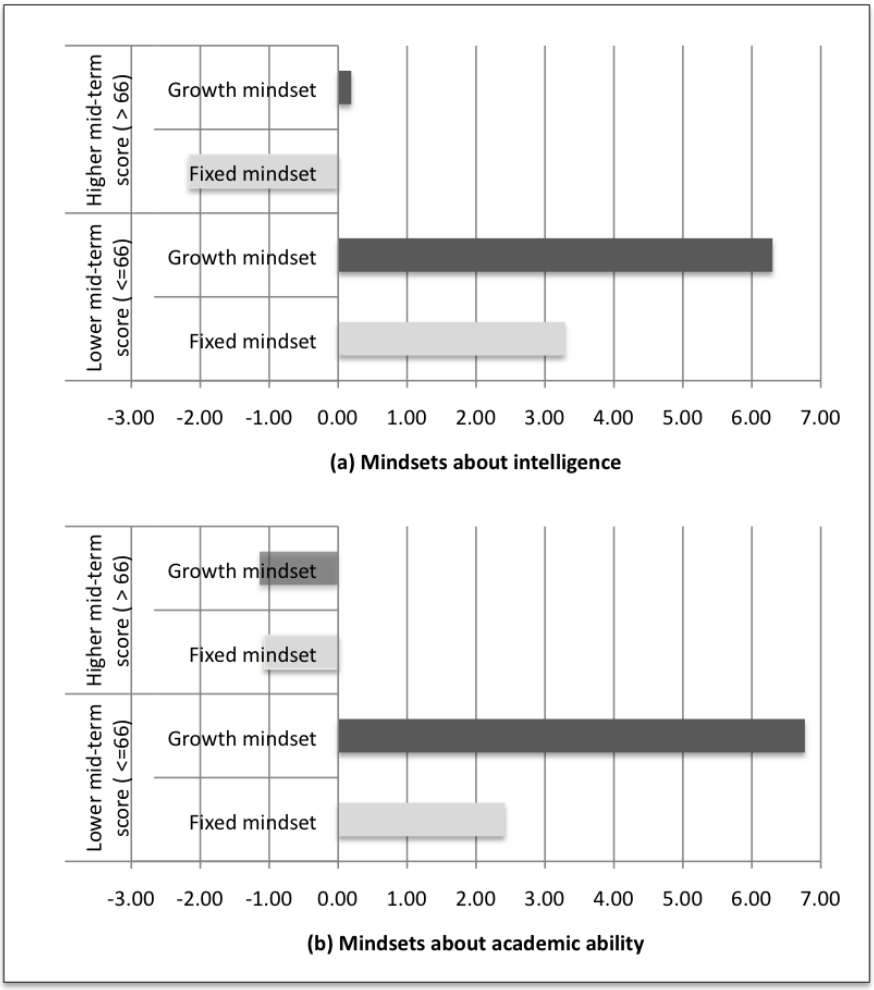

Figure 4. Score changes from mid-term to final exam for students obtaining lower and higher mid-term scores, based on their mindset about *intelligence* (panel a) and mindset about academic ability (panel b).

This point is further illustrated by additional analysis comparing the score improvement (from mid-term to final examination) of students who have stronger and weaker growth mindsets. In this analysis, the sample was further categorized using median split based on their mindset about intelligence and about academic ability. The results show that, on average, those with stronger growth mindsets were able to make higher gains from the mid-term to the final exam (Figure 4). These are descriptive results and inferential tests indicate that the differences are not statistically significant, probably due to the small sample size. These results nonetheless are consistent with Blackwell et al.'s study (2007), which contrasted students who strongly endorsed growth mindset items vs. those who strongly disagreed with them. These authors found that strong endorsement of a growth mindset predicted a more positive trajectory in mathematics performance across two years of junior high school. The difference was small, but as they point out, small differences could have large consequences in the long run (Blackwell, et al., 2007).

Conclusion and Limitations

Setbacks are a normal part of almost every students' academic career, and how one's respond to such events can be consequential for subsequent achievement. While academic achievement is determined by a multitude of causes, this study supports the idea that there are psychological factors which influence students' response to setbacks and performance. In this study, the psychological factors were those postulated by Dweck and colleagues' (Dweck, 1986; Dweck & Leggett, 1988) theory of motivation: the goals that student set for their study, the attributions they make about important outcomes/events, and the effort and interest they feel following those events. Furthermore, underlying these more situational factors is a more fundamental self-belief, referred to here as mindsets about intelligence and academic ability. These self-beliefs provide a framework or meaning system (Hong, et al., 1999) with which students interpret their experiences. The motivational dynamics become even more consequential when students are faced with setbacks or are in a challenging situation.

The present study is limited by its relatively small sample size. This prevented the use of more powerful statistical techniques such as structural equations modelling (SEM), which are more appropriate for testing complex conceptual models such as the one proposed in this study. Further studies should attempt to replicate the findings by comparing students who experience setbacks vs. who did not, but in a larger sample, or across different course contexts. Another limitation is that the measurement of mindset about academic ability may have tapped into other constructs. The instrument asked how likely a fictional character (described as having little academic aptitude) could, through effort, develop the ability to achieve or excel in his/her future studies. By asking respondents to make future-oriented statements, the items could have measured not only mindset about ability, but also constructs such as optimism. Given that mindset about academic ability seems to be distinct from mindset about intelligence, especially in non-Western samples, future studies could explore this construct further.

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Learning by Teaching: Evidence and Implications for Education

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Review

Duran, D. (2014). *Aprenseñar. Evidencias e implicaciones educativas de aprender enseñando.* Madrid: Narcea Ediciones.

From the widespread perception that teaching can be a good way to learn, David Duran invites us to discover through scientific evidence that actually the two actions, in certain circumstances, happen simultaneously. For this reason the book has been titled *aprenseñar*, a neologism that the author has fabricated for the occasion, and which summarizes his idea[1], the possibility of learning by teaching.

David Duran Gisbert, Doctor in Psychology and professor in the Educational Psychology Department at the Universitat Autònoma de Barcelona, has developed extensive research and teacher training based on peer learning. He founded the *Research Group on Peer Learning (GRAI)*, for which he is the coordinator. The piece of work reviewed reflects Duran's concern on a theme that he has spent a long time reflecting about, thanks to direct experience as a teacher, trainer and researcher.

The book exemplifies real experiences where the action of teaching brings learning to the acting teacher, but also states that this phenomenon does not always occur. A very important aspect that determines this possibility, which the author develops in the second chapter, is the conception that the teacher himself has about what it means to teach and to learn. If we think that teaching refers to the unilateral transfer of knowledge from an expert who has been previously trained for it, we would be led to anchor ourselves to a hierarchical and static view of the teaching role.

Situated as we are nowadays in the era of the knowledge society, we now know that we must learn throughout not only the longevity but also the breadth and depth of our lives. Hence lies the basic argument used by the author of the need to extend to all contexts and all people, the ability to interact to construct Collective Zones of Proximal Development, where the processes of learning and teaching are bidirectional and complex. Therefore,

we all have to learn, but not only through professional teachers, we must be aware that it is our responsibility not only to learn but also to teach.

At this point, the argument is clear: we must incorporate learning by teaching, *aprenseñar*, as standard practice, both in formal and informal education. In Chapter 3 some scholarly experiences are reviewed wherein students act as teachers of their peers (peer tutoring situations), and help to form the first scientific evidence of the neologism that the author has called *aprenseñar*. Also a gradation of student-tutor actions is proposed that brings ever-increasing benefits from learning while developing the role of the teacher. From the first step where it is argued that learning for the purpose of teaching is better than learning for yourself, the author has found that it's better if you can explain, and better yet if you can interact. Finally, we can promote even deeper learning if we reflect on the whole process.

The fifth chapter of the book goes further deepening into evidences on the instructional value of peer interaction, emphasizing cooperation between students as a good way to learning by teaching. Finally, the last chapter addresses how teachers can *aprenseñar*, presenting organized and clear, common situations of our teaching activities as learning opportunities for ourselves.

We can't fail to mention that, basically in Chapter 4, the book also brings a wealth of experiences in the informal context that generate opportunities to learn by teaching to others, mainly through the technologies of information and knowledge. From his analysis, the author identifies some characteristics of these experiences that should be seriously considered in formal educational environments.

In short, we are in front of a book that makes for a pleasant and orderly read. A strong foundation on the subject while very clear discussion of a huge volume of contrasted information. At the same time, the author offers 359 opportunities to expand or clarify the reading, that number is the total number of notes that are encountered throughout the book. Definitely a piece of work that invites us to rethink our social interactions inside and outside the working environment, making them more attractive if we perceive them as opportunities for continuous personal development.

Notes

[1]A Spanish neologism, as could be *learnteach* ("aprender" means learn; "enseñar" means teach).

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