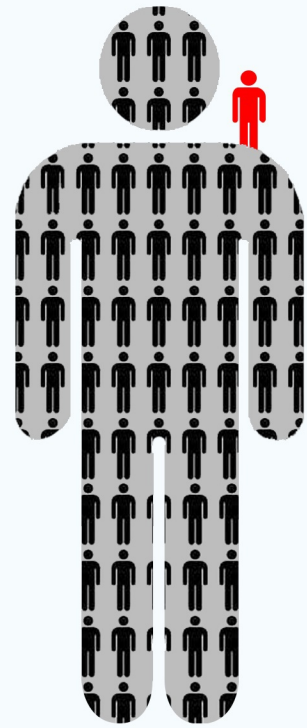
UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA
Facultad de Ciencias de la Educación

TESIS DOCTORAL

THE ROLE OF PASSION IN EDUCATION



Doctorado en Formación del Profesorado

ZULEICA RUIZ ALFONSO

LAS PALMAS DE GRAN CANARIA
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JOSÉ CARLOS CARRIÓN PÉREZ, SECRETARIO DE LA FACULTAD DE CIENCIAS DE LA EDUCACIÓN DE LA UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA,

CERTIFICA,

Que la Comisión de Doctorado de la Facultad de Ciencias de la Educación de la ULPGC, reunida el día 1 de junio de 2017, tomó el acuerdo de dar conformidad para su tramitación, a la tesis doctoral titulada "*El papel de la pasión en la Educación (The Role of Passion in Education)*", presentada por la doctoranda Dña. Zuleica Ruiz Alfonso y dirigida por los doctores D. Jaime León González-Vélez y D. Rafael Santana Hernández.

Y para que así conste, y a efectos de lo previsto en el Art. 5.5 del Reglamento de Estudios de Doctorado de esta Universidad, firmo la presente en Las Palmas de Gran Canaria, a uno de junio de dos mil diecisiete.

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FACULTAD DE CIENCIAS DE LA EDUCACIÓN

DOCTORADO EN FORMACIÓN DEL PROFESORADO

Título de la tesis

THE ROLE OF PASSION IN EDUCATION

Tesis Doctoral presentada por Dª Zuleica Ruiz Alfonso

Dirigida por el Dr. D. Jaime León González-Vélez

Codirigida por el Dr. D. Rafael Santana Hernández

Las Palmas de Gran Canaria, a 30 de mayo de 2017

A mis padres, por su esfuerzo, constancia y dedicación continua para hacer de mí lo que soy.

Por su amor infinito.

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A mi familia, a mis padres y a Ángel.

Gracias a mi madre, por enseñarme a leer, por creer ciegamente que puedo conseguir lo que me proponga, por enseñarme el valor del esfuerzo y la importancia de la autoexigencia. Por los cincuenta euros tras cada sobresaliente en el instituto y por creer que nunca es suficiente.

Gracias a mi padre, por confiar plenamente en mí, por su paciencia infinita explicándome las ecuaciones, por ayudarme a estudiar historia, por aguantar mis enfados, mis lágrimas y mis crisis de ansiedad cuando creía que no daría la talla. Por su comprensión y su apoyo incondicional. Por estar ahí, siempre y para todo.

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A mi director de tesis, Jaime León, por acogerme, guiarme y trabajar codo a codo conmigo. Por enseñarme el valor de la puntualidad, el trabajo duro y la constancia.

A Félix Guillén, por iniciarme en el apasionante mundo de la investigación y por creer en mí desde el principio. Por enseñarme a dar los primeros pasos y escribir conmigo mi primer artículo. Por verme crecer y por haber estado ahí durante todos estos años, en lo personal y lo profesional.

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A Hipólito Marrero y Mabel Urrutia por acogerme y hacerme sentir como en casa. Por su humanidad, su humildad y por enseñarme la bonita y posible combinación entre vida profesional y personal.

A todas las personas, amigos, compañeros o conocidos que han hecho, de forma constante o puntual, el camino más bonito y fácil de transitar

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PRÓLOGO

Siempre he sido una persona curiosa, con ansias de conocer y aprender. A menudo siento la necesidad de explicar lo que ocurre a mi alrededor, de encontrar respuesta a mis preguntas, de conocer por qué pasa lo que pasa. Me encanta conocer a las personas y disfruto mucho de las conversaciones de tú a tú, donde el que está en frente es capaz de desnudarse y mostrar su parte más pura. Me encanta preguntar y saber por qué la gente actúa o es de un modo determinado.

Desde pequeña siempre me gustaron la música y el deporte, disciplinas a las que dediqué mucho tiempo y que me hicieron muy feliz. Pensé en estudiar periodismo, filosofía, filología hispánica, psicología, trabajo social, educación física, criminología o ciencias del mar, tratando de encontrar la que yo creía que era la combinación perfecta entre seguir satisfaciendo mi necesidad de conocer y la de poder aportar mi granito de arena para “hacer cosas buenas por el mundo”.

Finalmente descubrí, gracias a mi profesora de música de 4º de la ESO, que yo también quería dedicarme a la enseñanza. Desde aquel entonces ya me parecía que la educación era una de las herramientas más poderosas para cambiar el mundo, y que los profesores tenían cada día la enorme suerte, privilegio y oportunidad de mejorar la realidad de sus alumnos y hacer, a través de ellos, un mundo mejor.

Estudié la Diplomatura de Maestro, en la especialidad de Educación Musical, porque me gustaba la idea de educar a través de la música y las emociones. De hecho, era la única

manera que me planteaba de enseñar. Me imaginaba contagiando a mis alumnos mi pasión por la música clásica, enseñándoles a entender lo que escuchaban y haciendo de ellos personas más sensibles y creativas. Sin embargo, a medida que avanzaba la carrera comenzó a interesarme el mundo de la investigación. Preguntaba por la carrera investigadora a profesores, comencé a ir a la defensa de tesis doctorales y, de una manera prácticamente desapercibida, surgieron en mi cabeza multitud de temas sobre los que creía que se podía investigar.

En 2012 realicé mi trabajo final de grado con Félix Guillén García, uno de los mejores profesores que tuve en magisterio. Realizamos un estudio experimental en el que analizamos la influencia de la música en el rendimiento físico y lo publicamos en una revista de impacto. La experiencia me encantó y desde ese momento lo tuve claro: quería investigar, descubrir cosas nuevas, mejorar aspectos concretos de la realidad basándome en evidencias científicas. A continuación, tras obtener una beca de colaboración para la iniciación a la investigación del Ministerio de Educación, Cultura y Deporte, realicé un máster universitario en Procesos Educativos, con el único objetivo de realizar al año siguiente los cursos de doctorado.

Durante el primer año de doctorado, tuve la suerte de conocer a Jaime León. Aún hoy, y después de tres años trabajando juntos, considero que es el mejor profesor que me podría haber dirigido la tesis. Duro, exigente y un poco cabezota, pero siempre al tanto de todas las becas y convocatorias, siempre leyendo los últimos artículos científicos y contagiando a sus alumnos su pasión por la investigación y sus ganas de mejorar la realidad. Solicité junto a él una beca de formación de personal investigador de la

Universidad de Las Palmas de Gran Canaria y, desde entonces y hasta hoy, hemos estado trabajando para intentar mejorar la realidad educativa de nuestras aulas.

RESUMEN

1. INTRODUCCIÓN

La pasión, entendida como una fuerte inclinación hacia una actividad, objeto o persona, es un concepto que está presente en muchísimos contextos y que todos sabríamos, de una manera u otra, identificar y definir. Durante siglos, la pasión ha despertado el interés de diferentes disciplinas, siendo objeto de estudio de numerosos filósofos, principal eje temático de películas y novelas, y una característica fácilmente atribuible a personas que han destacado por alcanzar la excelencia en un ámbito en concreto. No obstante, la popularidad del término ha desembocado en que, a lo largo de la historia, haya ido adquiriendo diferentes significados y sea bastante habitual conferirle distintas interpretaciones: desde la pasión religiosa, vinculada al sufrimiento de determinados acontecimientos evangélicos; hasta la pasión sexual, entendida como un estado emocional en el que la persona desea involucrarse en una actividad sexual.

En esta Tesis Doctoral, sin embargo, se aborda el concepto de pasión desde una perspectiva psicológico-motivacional. Aunque desde esta perspectiva diferentes autores han interpretado el término como una tendencia motivacional del individuo para alcanzar sus metas y objetivos, el primer estudio empírico en el que se analiza la

pasión hacia una actividad y como constructo motivacional se remonta a Vallerand et al. (2003). En este estudio, los autores, además de definir el concepto, plantean el Modelo Dualístico de la Pasión y proponen una escala para medirla. A partir de entonces han sido numerosos los estudios que, contextualizados en este marco teórico, han demostrado que la pasión, entre otros, facilita la persistencia, favorece la concentración, promueve que las personas se involucren plenamente en una actividad durante un tiempo prolongado y favorece una mayor productividad académica y un mayor bienestar de los estudiantes. En este sentido, aunque durante los últimos años el número de investigaciones ha ido en aumento, son notablemente insuficientes los estudios que han analizado el papel de la pasión en el contexto educativo. Así, esta Tesis Doctoral surge ante la necesidad de dar respuesta a numerosas cuestiones que emergen a partir de esta carencia: ¿Es importante la pasión en el contexto educativo? ¿Cuáles son sus beneficios? ¿Pueden los alumnos de Educación Secundaria sentir pasión hacia una asignatura en concreto y puede eso afectar a su rendimiento? ¿Es posible fomentar la pasión en los alumnos? ¿Qué características o comportamientos concretos y específicos de los profesores pueden favorecer la pasión del alumnado?

Para responder a estas cuestiones y conocer en mayor profundidad el papel de la pasión en el contexto educativo, se han realizado las tres investigaciones que componen el cuerpo principal de esta tesis. Con el objetivo de contextualizar la investigación y facilitar la comprensión del término y de los estudios presentados, en este resumen se realizará en primer lugar una conceptualización del constructo, así como una breve comparación del mismo con otros términos relacionados. A continuación se expondrán, por este orden, los objetivos generales de la Tesis Doctoral, los principales resultados con su

discusión y las conclusiones finales que se derivan de los mismos, con sus correspondientes limitaciones, futuras líneas de investigación e implicaciones para la comunidad educativa.

2. EL CONCEPTO DE PASIÓN

La pasión es una fuerte inclinación hacia una actividad, objeto o persona, que a un individuo le gusta mucho (o ama), con la que se siente identificado (siente que forma parte de su identidad), a la que concede importancia y a la que dedica mucho tiempo y energía de forma prolongada en el tiempo (Vallerand et al., 2003). Esta definición es la más extendida y está enmarcada en el Modelo Dualístico de la Pasión, que constituye el eje principal sobre el que se desarrollan la mayoría de investigaciones realizadas hasta el momento. En este modelo, Vallerand et al. (2003) proponen dos tipos de pasión – la pasión armoniosa y la pasión obsesiva – que se diferencian en función del modo en que la actividad es interiorizada en la identidad del sujeto e implican que la persona experimente diferentes sensaciones y consecuencias. Así, la pasión armoniosa es el resultado de una interiorización autónoma de la actividad en la identidad del sujeto, y se produce cuando el individuo se involucra de forma libre en la realización de la actividad y siente que lo que hace está en consonancia con sus propios valores y otras actividades o aspectos importantes en su vida. Este tipo de pasión favorece la manifestación de conductas adaptativas, y facilita que el individuo experimente altos niveles de concentración, afecto, *flow* y energía mientras realiza la actividad (Vallerand, 2015). Por otra parte, la pasión obsesiva deriva de una interiorización controlada de la actividad, lo que se produce cuando la persona se siente presionada (interna o externamente) para involucrarse en la misma. Al contrario de lo que ocurre con la pasión

armoniosa, los individuos obsesivamente apasionados experimentan sensaciones negativas mientras realizan la actividad, tienen dificultades para permanecer concentrados y sienten que la actividad está en conflicto con otros aspectos de su vida (Bonneville-Roussy, Lavigne y Vallerand, 2011; Bonneville-Roussy, Vallerand, & Bouffard, 2013; Vallerand, 2015; Vallerand et al., 2003). En esta Tesis Doctoral, se ha centrado la atención en la pasión armoniosa debido a sus considerables beneficios en el contexto educativo (Bonneville-Roussy et al., 2011, 2013; Ruiz-Alfonso y León, 2016; Stoeber, Childs, Hayward y Feast, 2011; Vallerand et al. 2007).

Aunque la conceptualización de Vallerand et al. (2003) es la más extendida y aceptada, dentro del contexto educativo otros autores también han tratado de definir, aunque de forma no tan rigurosa, qué es la pasión. Así, Coleman y Guo (2013) utilizan el término "pasión hacia el aprendizaje" para referirse al interés focalizado del estudiante hacia una asignatura en concreto, que persiste a lo largo del tiempo y que está, a su vez, asociado con un relativo desinterés hacia otras actividades que resultan atrayentes para sus compañeros. Por otra parte, Day (2004) define la pasión hacia la enseñanza como algo más allá de una mera expresión de entusiasmo, se trata de la pasión de los profesores hacia la asignatura que imparten y hacia sus alumnos, y de la creencia apasionada de que su forma de ser y enseñar puede marcar una clara diferencia en la vida de sus estudiantes. Por último, Liston y Garrison (2004) también describen la pasión hacia la enseñanza como el amor de los profesores hacia las ideas, hacia la acción de educar a otras personas y hacia sus alumnos.

3. PASIÓN Y OTROS CONSTRUCTOS RELACIONADOS

La pasión comparte algunas características conceptuales con otros constructos motivacionales que origina que, de forma habitual e indistinta, se utilicen diferentes conceptos para representar la misma idea. De este modo, la pasión es a menudo confundida con términos como motivación intrínseca, *flow*, entusiasmo o *grit*[1]. Sin embargo, cada uno de estos conceptos representa una idea diferente.

La diferencia entre pasión y motivación radica, principalmente, en la internalización de la actividad en la identidad del sujeto (Vallerand et al., 2003, 2007). Aunque ambos constructos comparten el amor hacia la actividad y la implicación en la misma por placer y disfrute, una persona intrínsecamente motivada no internaliza la actividad en su propia identidad, es decir, no siente que la actividad forme parte de quién es (Vallerand et al., 2003, 2007). En este sentido, también se han obtenido evidencias de que la pasión facilita, mejor que la motivación, la predicción de consecuencias a largo plazo y permite a los investigadores predecir resultados específicos a lo largo del tiempo (Vallerand, 2015). Aunque existen dos tipos de motivación extrínseca - motivación integrada y motivación identificada – que comparten con la pasión la internalización de la actividad en la identidad del individuo (Ryan y Deci, 2000), se diferencian de la pasión en que estos tipos de motivación implican que la persona realice la actividad para obtener una recompensa ajena al mero disfrute de la propia actividad (Vallerand, 2015).

[1] Como no existe una palabra equivalente en español, se ha decidido mantener el término “grit” del inglés.

Por otra parte, el *flow*, definido por Csikszentmihalyi (1975) como "la completa absorción del yo en el momento presente, cuando cada contenido de la consciencia está en armonía con el otro", es un constructo cognitivo y no motivacional y varía, al igual que la motivación, en duración (Vallerand, 2015), ya que es un estado cognitivo que se experimenta por periodos más cortos de tiempo.

Por último, el entusiasmo (Peterson y Seligman, 2004) se define como un rasgo apasionado en el que una persona muestra interés por la mayoría de aspectos de su vida, y el *grit* (Duckworth, Peterson, Matthews y Kelly, 2007) como un rasgo que refleja altos niveles de perseverancia a largo plazo. Aunque ambos términos son constructos motivacionales que implican que la persona dedique tiempo, energía y persistencia hacia una actividad significativa (Vallerand, 2015), ninguno de estos conceptos se centra en una actividad en específico como lo hace la pasión. Del mismo modo tampoco comparten la dualidad de la pasión, por lo que, mientras que el Modelo Dualístico de la Pasión propone dos tipos de pasión asociados con diferentes consecuencias y resultados, estos constructos están hipotéticamente relacionados, únicamente, con conductas adaptativas (Vallerand, 2015).

Estas diferencias, así como la comparación de la pasión con otros constructos de uso menos frecuente, se exponen de forma minuciosa en el primer capítulo que compone esta Tesis Doctoral.

4. OBJETIVOS GENERALES DE LA TESIS DOCTORAL

La finalidad de esta Tesis Doctoral ha sido contribuir al conocimiento del papel de la pasión en el contexto educativo y está dirigida, principalmente, a alcanzar los siguientes objetivos:

1. Conocer qué es la pasión y ofrecer un análisis sobre su papel en la educación.

2. Comprender por qué es importante la pasión en el contexto educativo: cuáles son sus consecuencias.

3. Analizar de qué manera se puede transmitir o fomentar la pasión: cuáles son sus predictores.

De forma específica, cada uno de los estudios presentados en los capítulos dos, tres, y cuatro, ha tratado de dar respuesta a las siguientes preguntas de investigación:

Preguntas de investigación del primer estudio ("The role of passion in Education: A systematic review")

- ¿Qué entienden los diferentes autores por el término pasión?
- ¿Cuáles son las consecuencias de la pasión?
- ¿Cuáles son los predictores o variables que promueven la pasión?

Preguntas de investigación del segundo estudio ("Passion for math: Relationships between teachers' emphasis on class contents usefulness, motivation and grades")

- ¿Perciben los estudiantes la pasión armoniosa y la motivación intrínseca para aprender como constructos diferentes?
- ¿Predice la pasión armoniosa el rendimiento de los alumnos en matemáticas?

- ¿La relación entre pasión y rendimiento está mediada por la motivación intrínseca para aprender?

- ¿Predice el énfasis del profesor en la utilidad de los contenidos de clase la pasión armoniosa de los alumnos?

Preguntas de investigación del tercer estudio (Teaching quality: Relationships between passion, deep estrategy to learn and epistemic curiosity in math)

- ¿Influye la calidad didáctica en la pasión armoniosa de los alumnos?

- ¿Predice la pasión armoniosa la estrategia profunda para aprender?

- ¿Predice la pasión armoniosa la curiosidad hacia el conocimiento?

5. PRINCIPALES RESULTADOS Y DISCUSIÓN

El cuerpo principal de esta Tesis Doctoral está compuesto por tres estudios realizados con el propósito de atender a los siguientes objetivos generales:

1. Conocer qué es la pasión y ofrecer un análisis sobre su papel en la educación

2. Comprender por qué es importante la pasión en el contexto educativo: cuáles son sus consecuencias.

3. Analizar de qué manera se puede promover la pasión: cuáles son sus consecuencias y cuáles son sus predictores

Para ello, se realizó una revisión sistemática con el objetivo de conocer, en primer lugar, el estado de la cuestión: qué entendían los diferentes autores por pasión y cuáles eran, hasta el momento, sus consecuencias y predictores en el contexto educativo. A continuación, tomando como base los resultados de esta revisión sistemática, se

realizaron otros dos estudios en los que se analizó la relación entre la pasión y otras consecuencias y predictores hasta entonces no examinados. Así, en el segundo artículo se analizó la relación entre el énfasis del profesor en la utilidad de los contenidos de clase y la pasión armoniosa de los estudiantes, su motivación para aprender y su rendimiento en la asignatura de matemáticas. Por otro lado, en el tercer estudio se evaluó la relación entre tres características específicas de los profesores (plantean actividades que se ajustan al nivel de la clase, ofrecen un feedback positivo y se centran en el proceso y no solo en el resultado) y la pasión armoniosa de los alumnos, su curiosidad intelectual y la estrategia profunda hacia el aprendizaje.

A continuación, se presentan los principales resultados obtenidos en relación a cada uno de los objetivos planteados, así como una breve discusión sobre los mismos

5.1. Conocer qué es la pasión y ofrecer un análisis sobre su papel en la educación

Este primer objetivo se abordó especialmente a través del primer estudio, en el que se realizó una revisión sistemática para determinar qué entendían los diferentes autores por pasión y cuáles eran los elementos o características que la definían. En esta revisión se analizaron 13 estudios publicados entre 2004 y 2013, de los cuales seis utilizaron en sus análisis una metodología cuantitativa y siete una metodología cualitativa. A través de esta revisión identificamos seis definiciones de pasión. Aunque la totalidad de los estudios cuantitativos utilizaron la conceptualización de Vallerand et al. (2003), la mayoría de los autores de los estudios cualitativos tendieron a utilizar sus propias definiciones. No obstante, se detectaron varias características comunes a lo largo de las

diferentes conceptualizaciones. Para identificarlas, los dos autores de la revisión leyeron las definiciones y extrajeron las características utilizadas por los investigadores para describir el concepto. Estas fueron: a) una actividad amada o que al sujeto le gusta mucho: una actividad caracterizada por una fuerte inclinación positiva del sujeto hacia ella (ej. "Estoy deseando que sea viernes porque toca baloncesto y me encanta"); b) identificación: es el grado en el que el sujeto utiliza la actividad para definirse, siente que la actividad forma parte de su persona, de quién es (ej. "No toco únicamente el violín, sino que me siento violinista"); c) dedicación: el tiempo dedicado de forma continua, diaria o semanalmente, a la actividad (ej. "Me encanta resolver problemas de matemáticas y dedico muchas de mis tardes libres a resolverlos"); d) persistencia: el interés hacia la actividad es estable en el tiempo y perdura durante muchos años o incluso toda la vida (ej. "A los 12 años descubrí que mi verdadera pasión era pintar. Desde entonces y durante más de 15 años he estado tomando clases en diferentes academias"); e) cuidado: los profesores apasionados muestran interés y preocupación por sus alumnos (ej. "Realmente siento interés hacia mis estudiantes, hacia sus gustos personales y hacia cómo se sienten en clase"; f) relaciones positivas: buenas relaciones con los compañeros y los estudiantes (ej. "Generalmente, me llevo muy bien con mis alumnos y los otros profesores"); g) contexto de apoyo: estar rodeado de personas que apoyan la pasión del sujeto (ej. "Me encanta la asignatura de música y por eso mis padres y profesores me han animado a que haga las pruebas de admisión al conservatorio para ampliar mis conocimientos"); h) emociones positivas: buenos sentimientos y sensaciones mientras el sujeto está realizando la actividad que le apasiona ("Me siento vivo y feliz cuando resuelvo nuevas ecuaciones matemáticas"); i) actividad específica: la persona está interesada en una actividad en concreto y muestra

relativo desinterés hacia las demás (ej. "Lo que más me gusta en el colegio es la asignatura de geografía, por eso, cuando estoy en clase de lengua o de matemáticas me abstraigo intentando recordar las capitales de algunos países o dibujando las últimas banderas que me aprendí).

En total, se identificaron nueve elementos o características de la pasión. Como los estudios cuantitativos utilizaron la definición de Vallerand et al. (2003), todos ellos compartieron elementos idénticos. De este modo, en todos los artículos cuantitativos se definió la pasión como una fuerte inclinación hacia una actividad que a una persona le gusta mucho (o ama), valora, con la que se siente identificada, y a la que dedica mucho tiempo de forma estable y regular (persistencia y dedicación). Sin embargo, los estudios cualitativos presentaron una mayor disparidad en los elementos utilizados para describir la pasión. Dos estudios (Clark, 2012; Oliver y Venville, 2011) coincidieron con Vallerand et al. (2003) al referirse a la actividad apasionada como una actividad que el sujeto ama y uno (Fredricks et al., 2010), al incluir la identificación, dedicación y la valoración de la actividad en la definición de pasión. Por otro lado, Coleman and Guo (2013) hicieron referencia a la persistencia y al dominio específico, Hobbs (2012) y Clark (2012) al sentimiento de cuidado, preocupación y a las relaciones positivas, y Day (2004) y Oliver y Venville (2011) a las emociones positivas.

De este modo, se observó que la característica más usual entre las diferentes definiciones de pasión fue la dedicación (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Oliver y Venville, 2011; Vallerand et al., 2003), lo que sugiere que las personas que sienten más pasión hacia una actividad son las que emplean más tiempo de forma

continua en la misma. El amor hacia la actividad (Clark, 2012; Oliver y Venville, 2011; Vallerand et al., 2003), sentirse identificado con la misma (Vallerand et al., 2003; Fredricks et al., 2010; Oliver y Venville, 2011) y experimentar sensaciones positivas fueron también características que compartieron las diferentes conceptualizaciones de pasión. Sin embargo, a pesar de estos elementos o características en común, se observó que únicamente algunos autores habían definido claramente en qué consistía el concepto de pasión (Coleman y Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver y Venville, 2011; Vallerand et al., 2003) y, de ellos, únicamente Vallerand et al. (2003) proporcionaron una fundamentación teórico-científica lo suficientemente consistente, lo que hace que actualmente su teoría y conceptualización de pasión sea la más aceptada y extendida entre la comunidad científica.

5.2. Comprender por qué es importante la pasión en el contexto educativo: cuáles son sus consecuencias

El segundo objetivo de esta Tesis Doctoral se abordó a través de los tres estudios que componen su cuerpo principal. En el primero, la revisión sistemática, se realizó un análisis de la literatura para conocer por qué era importante la pasión y cuáles eran las consecuencias que se le habían atribuido hasta el momento en el contexto educativo. En el segundo y tercer artículo, se analizó la relación de la pasión con otras variables del alumnado no estudiadas hasta entonces (motivación intrínseca hacia el aprendizaje, rendimiento en matemáticas, curiosidad hacia el conocimiento y estrategia profunda para aprender), contribuyendo de este modo a ampliar la información en cuanto a los resultados o consecuencias de la pasión en el ámbito de la educación.

Así, los resultados de la revisión sistemática revelaron que la consecuencia más relevante (o más estudiada) de la pasión en el contexto educativo fue la orientación a la tarea (Bonneville-Roussy et al., 2011; Fredricks et al., 2010; Hobbs, 2012; Phelps y Benson, 2012; Vallerand et al., 2007). De este modo, se pone de manifiesto que a mayor pasión de los alumnos, específicamente a mayor pasión armoniosa, mayor será su tendencia a centrarse en la mejora de la competencia personal y, por ende, mejor será su rendimiento académico. El bienestar de los alumnos también fue una consecuencia apreciable de la pasión, destacando varios estudios (Bonneville-Roussy et al., 2011, 2013; Vallerand et al., 2007) el impacto de la pasión armoniosa en una mayor sensación de bienestar subjetivo y satisfacción con la vida de los estudiantes. Por otra parte, la dedicación o el tiempo dedicado de forma continua (diaria o semanalmente) a la actividad, fue otro de los efectos más analizados de la pasión, coincidiendo varios estudios (Bonneville-Roussy et al., 2011; Stoeber et al., 2011; Vallerand et al., 2007) en que los alumnos más apasionados de forma armoniosa dedicaban más tiempo a realizar la actividad académica que les apasionaba, por lo que previsiblemente, esto estaría también relacionado con un mayor rendimiento académico de los alumnos. Por último, los estudios revisados también evidencian el efecto de la pasión armoniosa en una mayor persistencia (Bonneville-Roussy et al., 2013), compromiso académico (Stoeber et al., 2011) y creatividad (Luh y Lu, 2012) de los discentes.

Por otro lado, en los estudios dos y tres que se presentan en esta Tesis Doctoral, se analizó la pasión armoniosa de los estudiantes en relación a otras consecuencias o resultados hasta entonces no examinados: el rendimiento académico en matemáticas, la motivación intrínseca para aprender, la estrategia profunda hacia el aprendizaje y la

curiosidad intelectual hacia el conocimiento. Así, los resultados del segundo estudio ofrecen evidencias del efecto de la pasión armoniosa de los estudiantes hacia una actividad específica relacionada con las matemáticas en su rendimiento en la asignatura. Estos resultados, que reflejaron que a mayor pasión armoniosa de los alumnos mayor era su rendimiento, coincidieron con las conclusiones de estudios anteriores en los que también se analizó la relación entre estas variables, tanto dentro (ej. Bonneville-Roussy et al., 2011; Mageau et al., 2009; Vallerand et al., 2007) como fuera del contexto educativo (ej. Mageau et al., 2009; Thorgren y Wincent, 2015; Vallerand et al., 2008). Asimismo, estos resultados también coincidieron con la literatura anterior (ej. Coleman y Guo, 2013; Fuster, Chamarro, Carbonell y Vallerand, 2014; Stoeber et al., 2011) al advertir que la relación entre pasión armoniosa y rendimiento no era directa, sino que estaba mediada, en este caso, por la motivación intrínseca hacia el aprendizaje. De este modo, los resultados de este estudio aportaron evidencias de que a mayor pasión armoniosa de los estudiantes hacia las matemáticas, mayor era su motivación intrínseca para aprender, lo que a su vez repercutía en un mayor rendimiento en la asignatura.

En el tercer estudio también se analizó la relación entre la pasión armoniosa de los estudiantes y su influencia en la estrategia profunda para aprender y su curiosidad intelectual hacia el conocimiento. Aunque estudios previos habían sugerido, en diferentes contextos, el efecto de la pasión armoniosa sobre algunos procesos cognitivos como la concentración (ej. Forest, Mageau, Sarrazin y Morin, 2011; Ho, Wong y Lee, 2011), la resiliencia y la fortaleza mental (ej. Gucciardi, Jackson, Hanton y Reid, 2015) y la absorción (Stoeber et al., 2011), hasta este momento las variables planteadas en este estudio no se habían considerado como posibles consecuencias de la pasión

armoniosa de los estudiantes. Así, los resultados de esta investigación también amplían el conocimiento sobre los efectos de la pasión en el contexto educativo, mostrando evidencias de que la pasión armoniosa de los estudiantes influye, por un lado, en su capacidad para implicarse en una actividad de un modo significativo, comprendiendo, analizando y relacionando la información nueva con sus experiencias o conocimientos previos y, por otro, en su anhelo de adquirir nuevos conocimientos por el mero hecho, principalmente, de disfrutar haciéndolo.

5.3. Analizar de qué manera se puede transmitir y fomentar la pasión: cuáles son sus predictores

El tercer objetivo de esta Tesis Doctoral se abordó, del mismo modo, a través de los tres estudios que la componen, detectándose en primer lugar en la revisión sistemática qué predictores de la pasión en el contexto educativo se habían analizado hasta el momento para proponer, en las dos investigaciones posteriores, nuevas relaciones entre la pasión armoniosa y otras características o aspectos del profesor que podían fomentarla.

Los resultados de la revisión sistemática desvelaron que, mientras los estudios cuantitativos se centraron en analizar las consecuencias de la pasión, las características que la fomentaban fueron exploradas principalmente por las investigaciones cualitativas. Así, ofrecer un contexto de apoyo (Coleman y Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver y Venville, 2011; Phelps y Benson, 2012) y fomentar las relaciones positivas (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Phelps y Benson, 2012) fueron las variables que más se relacionaron con el fomento de la pasión. En este

sentido, los estudios destacaron la importancia de las familias, compañeros y profesores en el desarrollo de la pasión y enfatizaron que los alumnos que recibían apoyo de su contexto más cercano eran más propensos a incrementar y mantener esa pasión en el tiempo. El apoyo a la autonomía por parte de los profesores (Bonneville-Roussy et al., 2013; Fredricks et al., 2010) y sentirse identificado con la actividad que se realizaba (Bonneville-Roussy et al., 2013; Fredricks et al., 2010; Oliver y Venville, 2011) también fueron predictores destacados de la pasión en el contexto educativo.

Una vez analizados los resultados de la revisión sistemática, en los estudios dos y tres se examinó la relación entre cuatro características o estrategias específicas del profesor y la pasión armoniosa de sus alumnos. Así, en el segundo estudio se analizó la influencia del énfasis del profesor en la utilidad de los contenidos de clase en la pasión armoniosa de los estudiantes, mostrando los resultados que los profesores que tendían a explicar por qué los contenidos de clase eran útiles y relevantes favorecían el desarrollo de la pasión armoniosa de los alumnos. Del mismo modo, los resultados del tercer estudio también mostraron la importancia de tres estrategias del profesor que ejercieron como predictores de la pasión armoniosa de sus alumnos: plantear actividades que se ajustaban al nivel de los estudiantes, ofrecer un feedback positivo a los alumnos y centrarse en el proceso y no solo en el resultado. Aunque ninguna investigación había analizado previamente y de forma explícita la influencia de estas cuatro características en la pasión de los alumnos, desde la Teoría de la Autodeterminación (Deci & Ryan, 1985, 2017) se considera que la utilización de estas estrategias favorece la autonomía del alumnado (Tessier, Sarrazin y Ntoumanis, 2010), por lo que los resultados obtenidos fueron consistentes con aquellos estudios que revelaron una relación positiva entre el

apoyo a la autonomía por parte de los profesores y la pasión de sus alumnos (ej. Bonneville-Roussy, Vallerand y Bouffard, 2013; Coleman y Guo, 2013; Fredricks, Alfeld y Eccles, 2010).

6. CONCLUSIONES FINALES

6.1. Conclusiones generales

A partir de los resultados obtenidos en cada uno de los estudios que componen esta Tesis Doctoral, se pueden extraer las siguientes conclusiones finales:

- La conceptualización de pasión más aceptada, extendida y validada es la de Vallerand et al. (2003), que la define como una fuerte inclinación hacia una actividad que a una persona le gusta mucho (o ama), valora, con la que se siente identificada, y a la que dedica mucho tiempo de forma estable y regular (persistencia y dedicación).

- La dedicación, el amor hacia la actividad, sentirse identificado con la misma y experimentar sensaciones positivas mientras se realiza la actividad son características que la mayoría de autores atribuyen a una persona apasionada.

- La pasión y la motivación intrínseca son constructos diferentes, y la principal diferencia radica en la interiorización de la actividad que una persona apasionada, frente a una intrínsecamente motivada, realiza en su identidad.

- El estudio de la pasión desde una perspectiva psicológico-motivacional es muy reciente, y el análisis de su papel en el contexto educativo es aún muy escaso en comparación con otros ámbitos como el deporte, los videojuegos o el contexto laboral.

- Una de las consecuencias más importantes de la pasión armoniosa en el contexto educativo es la orientación a la tarea, por lo que los estudiantes con mayores niveles de pasión armoniosa tienden a estar más centrados en la mejora de su competencia personal.

- La pasión armoniosa también afecta al bienestar de los alumnos, al tiempo que le dedican a una actividad, a la persistencia, al compromiso académico y a la creatividad. También está relacionada con su motivación intrínseca hacia el aprendizaje, su rendimiento académico, su estrategia profunda para aprender y su curiosidad intelectual.

- La pasión no es una característica estable en las personas, por lo que existen determinadas estrategias que los profesores pueden utilizar para fomentarla en sus alumnos. Entre los predictores más relevantes de la pasión se puede destacar: ofrecer un contexto de apoyo, fomentar las relaciones positivas y apoyar la autonomía del alumno.

- Enfatizar la utilidad de los contenidos de clase, plantear actividades que se ajusten al nivel de los estudiantes, ofrecer un feedback positivo y centrarse en el proceso y no solo

en el resultado son estrategias concretas y específicas que los profesores pueden llevar a cabo para facilitar el desarrollo de la pasión en sus alumnos.

6.2. Limitaciones generales y futuras líneas de investigación

Los resultados de esta Tesis Doctoral se deben interpretar atendiendo a una serie de limitaciones. Por un lado, puesto que el objetivo de este trabajo fue examinar el papel de la pasión en el contexto educativo, no se analizaron en profundidad otras investigaciones fuera del ámbito escolar (ej. Bélanger, Lafrenière, Vallerand y Kruglanski, 2013; Carpentier, Mageau y Vallerand, 2012; Froh et al., 2010; Mageau y Vallerand, 2007; Vallerand, 2008) que podrían haber aportado información significativa sobre diversos predictores y consecuencias de la pasión. En este sentido, futuras investigaciones podrían tener en cuenta estos trabajos y analizar dentro del contexto educativo las múltiples relaciones entre pasión y otras variables que proponen sus autores.

La segunda limitación está vinculada a las características de los estudios dos y tres. Puesto que ambas investigaciones son transversales y no longitudinales, no se han podido establecer relaciones causales entre las variables planteadas. Por ello, sería recomendable que se realizaran futuras investigaciones de carácter longitudinal para valorar estas relaciones y determinar si las variables mediadoras se pueden interpretar como mecanismos para establecer relaciones evidentes entre las variables analizadas (Kazdim, 2007).

Por otra parte, la tercera limitación está relacionada específicamente con el segundo estudio, en el que se utilizaron las notas de los alumnos en matemáticas como único indicador de su rendimiento en la asignatura. De este modo, aunque las notas tienen un impacto real en el nivel académico y el progreso de los estudiantes (Sánchez-Pérez, Fuentes, Pina, López-López y González-Salinas, 2015) y predicen el logro educativo y el éxito (Thorsen y Cliffordson, 2012), sería interesante que futuros estudios utilicen pruebas estandarizadas, como por ejemplo el Test de Procesamiento de Magnitud Simbólica (Brankaer, Ghesquière y De Smedt, 2016).

Asimismo, se propone que futuras líneas de investigación se encaminen a identificar qué otras variables dentro del contexto educativo se relacionan con la pasión de los alumnos, identificando en primer lugar cuáles son sus beneficios y analizando posteriormente qué otras variables, como determinadas características del profesor o del contexto, pueden influir en el desarrollo de esa pasión. En este sentido, se recomienda que las investigaciones en torno a los predictores de la pasión se centren en características lo más concretas y específicas posibles, con el objetivo de facilitar su instrucción a través de intervenciones y su posterior aplicación por parte de los docentes.

6.3. Implicaciones en el contexto educativo

Teniendo en cuenta los resultados de los tres estudios presentados en esta Tesis Doctoral y de investigaciones previas en las que se destaca la importancia de la pasión en el contexto educativo y la capacidad de los agentes externos de moldearla, se invita

en primer lugar a los docentes a advertir la importancia que adquieren en el desarrollo de la pasión de sus alumnos. Así, nuestra primera recomendación es que los profesores tomen conciencia del importante papel que desempeñan a la hora de fomentar la pasión en sus estudiantes, que aprovechen el grandísimo privilegio de tener cada día a treinta "mentes hambrientas" delante para contagiarles y ayudarles a explotar esa pasión, tanto hacia la asignatura que imparten como hacia otras actividades fuera del aula, ya que esto influirá también en su interés hacia las actividades de clase (Fredricks et al., 2010; Haerens, Vansteenkiste, Aelterman y Van den Bergh, 2016).

Del mismo modo, esta Tesis Doctoral proporciona herramientas útiles y prácticas que los profesores (en principio de matemáticas, pero probablemente extrapolable a otras asignaturas) podrían tener en cuenta con la finalidad de favorecer la pasión de sus alumnos. De este modo, se recomienda en primer lugar a los profesores que no se centren únicamente en la explicación de conceptos, sino que en su lugar enfaticen la utilidad y la relevancia de los contenidos que explican en clase, así como la aplicación práctica de esos contenidos en otras asignaturas o en la vida diaria de los alumnos. Por otra parte, también es importante que los docentes destaquen la importancia de internalizar el significado y la utilidad de las actividades de clase, valorando para ello el proceso y no solo el resultado final que obtienen los estudiantes. Las actividades propuestas, además, han de ajustarse al nivel de la clase y no ser demasiado fáciles ni demasiado difíciles. Por último, se recomienda a los profesores que ofrezcan un feedback positivo a sus alumnos, es decir, que los orienten a mejorar mediante instrucciones redactadas de manera constructiva y positiva, haciendo hincapié en lo que los alumnos han hecho bien, lo que deben mejorar y cómo hacerlo.

INTRODUCTION

Passion, a way of understanding life. For some, perhaps, the only one.

Passion, as a strong inclination toward an activity, object or person, is a concept that is present in many contexts and that everybody could identify and define. For centuries passion has aroused the interest of different disciplines, it has been studied by many philosophers, it has been the main thematic axis of novels and films, and it is an easily attributable characteristics to people who have surpassed for achieving the excellence in a specific field. Nevertheless, the popularity of the term has led it to acquire, throughout history, different meanings, and it is quite common to confer it different interpretations: from the religious passion, linked to the suffering of certain evangelical events, to the sexual passion, understood as an emotional state in which the person wants to engage in a sexual activity.

In this dissertation, however, passion is approached from a psychological-motivational perspective. Although from this perspective different authors have interpreted the term as a motivational tendency of the individual to reach its goals and purposes, the first

empirical study analyzing the passion for an activity and as a motivational construct goes back to Vallerand et al. (2003). In this study, in addition to define the concept, the authors propose the Dualistic Model of Passion and suggest a scale to measure the construct. Since then and from this theoretical framework, there have been numerous studies that have demonstrated that passion, among others, propels persistence, impels concentration, eases people to fully engage in an activity for a long time and promotes a better students' academic performance and well being. In this sense, although in recent years the number of studies has been increasing, studies analyzing the role of passion in the educational context are still scarce.

Thus, this dissertation arises from the desire to answer the questions that emerge from this lack of literature: Is passion important in the educational context? What are the benefits of passion? Can high school students feel passion for a specific subject and can it affect their performance? It is possible to foster students' passion? What are the specific teachers' characteristics or behaviors that foster students' passion?

In order to answer this questions and to shed light about the role of passion in the educational context, the main section of this dissertation presents three studies in which we analyze, first and by a systematic review, what the different authors understand by passion, and what are the consequences and promoters in education studied so far. Once inferred the importance of passion in the educational context and based on the results of the systematic review, we studied the relationship between passion and other consequences and promoters not analyzed yet. Thus, in the second study we analyze the relationship between a specific teachers' characteristic (teacher emphasis on the

usefulness of class content) and students' harmonious passion, their intrinsic motivation to learn, and their performance in math. Finally, the third study also analyze three specific teachers' characteristics (providing optimal challenge, focusing on the process and not only on the result, and offering positive feedback), and how they relate with students' harmonious passion and this, in turn, with their deep strategy to learn and epistemic curiosity. Specifically, the dissertation is structured as follows:

Chapter 1 is devoted to the theoretical framework, and it introduces the concept of passion, the differences between passion and related constructs, and summarize the previous research of passion in the educational context. It also introduces the constructs of teaching quality, intrinsic motivation to learn, epistemic curiosity, and deep strategy to learn, and it shows the previous contributions in which they are related with the concept of passion.

Chapter 2 shows the first study, in which we performed a systematic review of studies within the context of education trying to answer these questions: How do researchers define passion? What are the outcomes of passion? What variables ignite passion? After conducting a search in major electronic databases, we presented the primary findings of 13 articles from 2004 to 2013. This review indicated that the most shared features of passion´s conceptualization were dedication, persistence, identification with and love for the activity. Passion research in education revealed a diversity of consequences, such as engagement, creativity, the subject's election or mastery goals, and a diversity of promoters, such as positive relationships, supportive context or an innovative cognitive style. An understanding of passion is important in fostering students' adjustment and

knowledge. We concluded this review with some theoretical and methodological suggestions for future research.

Chapter 3 is devoted to the second study. The purpose of this study was to examine the relationship between teacher emphasis on the usefulness of class content and students' harmonious passion, intrinsic motivation to learn, and math achievement in 1170 high school students. Data were analyzed using multilevel structural equation model and results showed support for the hypotheses tested. First, we found that harmonious students perceived passion and intrinsic motivation to learn as different constructs. Second, harmonious passion was positively associated with math achievement. Third, the relationship between harmonious passion and math performance was mediated by intrinsic motivation to learn. Fourth, teacher emphasis on class contents usefulness predicted students' harmonious passion. Finally, findings were discussed in terms of their implications for educational practice and methodological suggestions for future research.

Chapter 4 shows the third study. The purpose of this study was to examine the relationship between teaching quality and students' harmonious passion, deep strategy to learn and epistemic curiosity in math in 1113 high school students. Data were analyzed using multilevel structural equation model and results showed support for the hypotheses tested. First, we found that teaching quality - specifically providing optimal challenge, focusing on the process, and offering positive feedback – affects students' harmonious passion. Second, students' harmonious passion predicts, at the individual and class level, students' deep strategy to learn. Third, students' harmonious passion

predicts, at the individual and class level, students' epistemic curiosity. Findings were discussed in terms of their implications for educational practice and methodological suggestions for future research.

Chapter 5 summarizes the main results obtained and presents a brief discussion of them.

Chapter 6 concludes the dissertation summarizing the main conclusions and limitations, and outlining the future research.

CHAPTER 1: THEORETICAL FRAMEWORK

Passion is a promising approach for a better educational future. It leads individuals to dedicate themselves fully to an activity, propels persistence despite obstacles and enables individuals to remain dedicated to a specific activity for years or even a lifetime, engendering the high levels of commitment and everyday practices necessary to achieve excellence (Vallerand et al., 2007; Vallerand, 2008; Bonneville-Roussy et al., 2011). Passion has also been linked to academic productivity (Martínez, Floyd, & Erichsen, 2011; Mayrath, 2007), students' well-being and positive affect (Fredricks et al., 2010).

Despite its importance in the educational context and the fact that passion for an activity has received much attention from popular culture, attention from scholars has been limited (Coleman & Guo, 2013; Fredricks et al., 2010). In fact, most empirical studies have focused on romantic passion (Hatfield & Walster, 1978) and only a few studies have been conducted empirically on one's passion for an activity (Carbonneau, Vallerand, Fernet, & Guay, 2008; Luh & Lu, 2012). Thus, this dearth of literature within the

educational context and on how passion is experienced by children (Coleman & Guo, 2013), associated with the use of the concept to represent different ideas, results in the lack of a clear and accepted definition.

1. THE CONCEPT OF PASSION

Most extended definitions of passion come from the dualistic model of passion in Vallerand et al. (2003), in which Vallerand and colleagues define passion as "a strong inclination toward a self-defining activity that one likes (or loves), finds important, and in which one invests a significant amount of time and energy". In this model, Vallerand et al. (2003) proposed two types of passion, harmonious and obsessive, each type associated with different experiences, outcomes and manners in which to merge an activity into one's identity. People participating in an activity with harmonious passion believe that the activity is consistent with their values and the manner in which these individuals understand life; that is, harmonious passion comes from an autonomous internalization of the activity and leads people to freely engage in that activity.

Conversely, obsessive passion originates from a controlled internalization and leads people to experience an uncontrollable urge to engage in an activity (Bonneville-Roussy et al., 2011, 2013; Carbonneau et al., 2008; Luh & Lu, 2012; Vallerand et al., 2007). This controlled internalization occurs when individuals engage in an activity because they feel pressured and controlled by the social environment or because external contingencies as feelings of self-esteem or social acceptance (Vallerand, 2015). Obsessive passion leads to fewer adaptive outcomes than harmonious passion. It causes

the individual to experience and display negative emotions during the activity and to believe that the activity is controlling the person. The activity also occupies nearly the entirety of the person's identity, causing conflicts with other aspects of the person's life (Vallerand et al., 2003). Vallerand (2015) explains that although the first internalization process that occurs could initially determine the predominant type of passion, the types are not fixed and may fluctuate for significant reasons. The first reason is that people when are older and more mature increasingly use adaptive processes, which implies an increase in harmonious passion. This relationship is explained because harmonious passion results from an autonomous internalization process, so this provides full access to adaptive self-process (Vallerand, 2015). Thus, when people grew older they are more likely to use adaptive self-processes (Sheldon, Kasser, Houser-Marko, Jones, & Turban, 2005), so passion tends to become harmonious over time.

The second reason why passion can vary concerns the situational context in which the internalization process occurs. According to Vallerand (2015), although both types of passion are present in a person, controlling social and personal situational factors renders it possible to convert one type of passion into another. Thus, a person's initial harmonious passion will slowly evolve into obsessive passion if the person regularly engages in a controlling environment; conversely, an autonomous supportive environment can help an obsessive passion become harmonious.

Within educational settings, scholars have primarily studied the concept of passion from two perspectives: (1) the passion that students may feel toward a particular topic and (2) the passion that teachers have for their profession, the subject they teach or various

aspects of teaching and learning. Hence, Coleman and Guo (2013) use the term *passion for learning* to refer to a focused interest in a particular domain that persists over time and is associated with relative disinterest in other activities that are interesting to peers. Liston and Garrison (2004) describe passion in education as an educator's love for ideas, love for educating others and love for students. According to Day (2004), to be passionate about teaching not only comprises expressing enthusiasm; passionate teachers have a passion for their subject and their pupils and a passionate belief that who they are and how they teach can make a difference in their students' lives. Within this context, passionate teachers feel a deep love for their jobs (Elliott & Crosswell, 2001); experience lower levels of burnout and higher levels of work satisfaction; show positive attitudes toward the context; embrace collaboration and maintain strong and positive connections with students, parents and peers, thus positively influencing students' academic performance.

2. PASSION AND RELATED CONSTRUCTS

Passion's framework shares conceptual similarities with other motivational constructs (Vallerand et al., 2003); thus, the use of the concept to represent different ideas is common, an unfortunate "conceptual confusion" that occurs too often in our field (Murphy & Alexander, 2000). It may be easy to overlap different concepts that appear to represent the same idea. Thus, terms such as motivation, flow, zest, grit, well-developed interests, talent-related activities and commitment are frequently confused with passion.

According to Vallerand et al. (2003, 2007), the difference between passion and motivation lies in the internalization or non-internalization of the activity into one's identity. Intrinsic motivation and passion share the engagement in an activity for pleasure and enjoyment (Vallerand et al., 2007); in addition, both involve a love for the activity (Vallerand, 2015). However, when a person feels intrinsically motivated toward an activity, that activity is not internalized into the person's identity, but emerges from the person-task interaction on the short-term level (Koestner & Losier, 2002). Thus, passion portends longer-term consequences than motivation, and it allows researchers to predict more specific outcomes over time (Houlfort, Philippe, Vallerand, & Ménard, 2014). Moreover, intrinsic motivation to learn refers to the reasons why students engage in learning, while passion refers to a more stable feeling toward an activity that one likes, loves, or highly values, and it implies longer periods of time and energy (Ruiz-Alfonso & León, 2016). As well, people frequently display intrinsic motivation toward activities of little personal value (Vallerand, 2015). The theory of intrinsic motivation does not share the duality of passion (Vallerand, 2015), it means that, while the Dualistic Model of Passion proposes two types of passion associated with different outcomes, intrinsic motivation theory is is hypothetically related only to adaptive outcomes (Deci & Ryan, 2000; Vallerand, 2015).

Conversely, the difference between passion and extrinsic motivation is the absence of linking to the activity; extrinsically motivated people perform and enjoy the activity because of something outside of the activity (Vallerand et al., 2003). In this regard, although there are also different types of extrinsic motivation as integrated and identified regulation (Ryan & Deci, 2000a) that share with passion the internalization of

the activity into one's identity, the difference between these types of regulation and passion is that the former refers to engage in an activity to obtain something separate form it, and not for the love for the activity itself, even though it involves a valuation and internalization of the activity into the person's identity (Vallerand, 2015).

These differences between passion and motivation have been empirically supported by various studies. Vallerand et al. (2003) showed that passion correlates only moderately at best with extrinsic and intrinsic motivation. In addition, researchers, such as Houlfort, Philippe, Vallerand, and Ménard (2014) and Bélanger, Lafrenière, Vallerand, and Kruglanski (2013), have shown that after controlling for intrinsic and extrinsic motivation, the role of passion in the prediction of outcomes does not change.

According to Csikszentmihalyi (1975) flow, "the complete absorption of the self in the present moment, when all contents of consciousness are in harmony with [the] other", is a cognitive and not a motivational construct and varies in duration (Vallerand, 2015). As Vallerand et al. (2003) demonstrated in their study, harmonious, passionate people experience more flow than people who are less passionate.

Zest and grit are also motivational constructs related to passion. Zest (Peterson & Seligman, 2004) is defined as a passionate trait in which one displays passion for most things in life, and grit (Duckworth et al., 2007) is a trait that reflects high levels of perseverance for long term-goals. Although zest and grit share with passion that they are motivational constructs that involve spending time, energy and persistence toward a meaningful activity (Vallerand, 2015), they do not focus on a specific activity as passion

does, nor do zest and grit share the duality issue (Vallerand, 2015). Similarly, talent-related activities (Rathunde, 1996) and well-developed interests (Renninger, 1992), are affective and not motivational constructs (Vallerand, 2015), and although these activities and interests share the passionate interest in and valuing of an activity, these concepts do not distinguish between types of interest or talent according to the different types of engagement, as passion does (Vallerand et al., 2007). Finally, commitment (Meyer & Allen, 1997), although perceived as a motivational construct, does not imply a love for an activity and internalizing to merge into one's identity (Vallerand, 2015).

3. ON THE ROLE OF PASSION IN ACADEMIC PERFORMANCE

Although more than 100 studies have addressed the concept of passion on different topics (Vallerand, 2015), research is still scarce within the educational context. A recent systematic review conducted by Ruiz-Alfonso and León (2016) shows that only 13 studies have analyzed passion and its relationship with causes and consequences in the educational context.

Concerning the relationship between passion and academic performance, Bonneville-Roussy et al. (2011) noticed that harmonious passion predicted students' achievement via mastery goals in a sample of music and college students. The high level of performance needed to achieve excellence is also largely reached by an extensive amount of time devoted to the activity. Thus, Bonneville-Roussy et al. (2011) and Vallerand et al. (2007) observed that harmonious passion predicts dedication in music

and dramatic arts students. Similarly, the relationship between passion and persistence within the educational context was also analyzed by Bonneville-Roussy et al. (2013), who observed that students retain harmonious passion along with strong interest for the activity.

In view of the above, even though passion influences performance, it is assumed that this relationship is not direct (Vallerand, 2015) and might be mediated by other variables, such as deliberate practice (Vallerand, 2015), persistence (Mageau et al., 2009), or motivation to learn (Stoeber et al., 2011).

4. ON THE RELATIONSHIP BETWEEN PASSION, INTRINSIC MOTIVATION TO LEARN, AND MATH GRADES

While evidence suggests that harmonious passion is associated with intrinsic motivation in other domains, there is a lack of studies in the educational context. Regarding this association, Vallerand et al. suggest a close relationship between harmonious passion and intrinsic motivation, gathering evidence that more harmonious passion leads to more intrinsic motivation. Although several studies outside the classroom have supported this claim (Back, Lee, & Stinchfield, 2011; Curran, Appleton, Hill, & Hall, 2011; Fuster, Chamarro, Carbonell, & Vallerand, 2014; Lee, Chung, & Bernhard, 2013; Wang, Khoo, Liu, & Divaharan, 2008; Wang, Liu, Chye, & Chatzisarantis, 2011), to the best of our knowledge, few studies in the educational context have analyzed how passion affects motivation. In this regard, Stoeber et al. (2011) observed in a sample of college students that the more harmonious passion they possessed, the greater their

autonomous motivation to learn. Similarly, Bonneville-Roussy et al. (2011), Coleman and Guo (2013), and Vallerand et al. (2007), also observed that harmonious passion was positively related to a motivational construct: mastery goals (Fairchild, Horst, Finney, & Barron, 2005; Murphy & Alexander, 2000).

On the other hand, academic motivation is a widely studied topic in educational psychology (Stover, De la Iglesia, Boubeta, & Liporace, 2012). For over three decades, it has been identified as a main factor in explaining school performance (Leroy & Bressoux, 2016). Students are intrinsically motivated when they study merely for the sake of learning new content, without expecting any reward (Taylor et al., 2015). A large body of studies shows that intrinsic motivation to learn predicts positive characteristics, processes, and outcomes (Stoeber et al., 2011).

Likewise, if we compare mathematics with other school domains, this subject has the worst levels of students' motivation, which could be a reason for students' poor performance (Leroy & Bressoux, 2016). Thus, although previous studies suggest that intrinsic motivation to learn predicts achievement and learning in math (Areepattamannil, Freeman, & Klinger, 2011; Murayama, Pekrun, Lichtenfeld, & vom Hofe, 2013; Spinath, Spinath, Harlaar, & Plomin, 2006), no studies have analyzed the effects of passion on motivation concerning high school students' math achievement.

5. ON HARMONIOUS PASSION AND COGNITIVE PROCESSES: DEEP STRATEGY TO LEARN AND EPISTEMIC CURIOSITY

Drawing on the theoretical framework of the Dualistic Model of Passion (Vallerand et al., 2003), specifically harmonious passion significantly influences cognitive processes. Harmoniously passionate people are highly involved in the activity they love, they are more aware and attentive, they fully partake in the activity with a mindful attention, and they are more likely to think about the passionate activity when they are not engaged on it (Vallerand, 2015).

Thus, researchers have analyzed in different contexts how harmonious passion positively affects diverse cognitive process as on-task attention and concentration (e.g., Forest, Mageau, Sarrazin, & Morin, 2011; Ho, Wong, & Lee, 2011; Vallerand et al., 2003), resilience and mental toughness (e.g. Gucciardi, Jackson, Hanton, & Reid, 2015), absorption (e.g., Ho et al., 2011; Stoeber et al., 2011), and mindfulness (e.g. St-Louis, Verner-Filion, Bergeron, & Vallerand, 2016). However, although it would be expected that harmonious passion affects cognitive processes such as students' approaches to learning or epistemic curiosity, to date the role of passion has not yet been studied within the nexus of these variables.

Students' approach to learning refers to how students cope with their study and how they use diverse strategies to process and learn the contents they receive in class (León, Núñez, & Liew, 2015). These approaches are not characteristics of the students, but are the result of the interaction between the students and the context (Struyven, Dochy, Janssens, & Gielen, 2006); and they vary from memorizing the contents without

reasoning or thinking critically to analyzing and comparing the information presented in the classroom with previous knowledge and other subjects knowledge (Cano-Garcia, García, Justicia, & García-Berben, 2014; Duncan & McKeachie, 2005). Within the educational literature, there are mainly three approaches that have been described in detail in several publications: the surface, deep, and achieving approach; with an underlying motive and strategy (e.g., Biggs & Tang, 2007; Dinsmore & Alexander, 2012; Struyven et al., 2006). Students adopt a deep approach when they engage in the task meaningfully, comprehending, analyzing, and relating the new ideas with their previous knowledge or experience (Biggs & Tang, 2007; Fox, McManus, & Winder, 2001; Struyven et al., 2006). Within this, we can assess students deep strategies of going about learning (how they study), or students deep motives for learning (why they study) (Biggs, 1979). In this sense, we focus on the former.

On the other hand, epistemic curiosity (EC) refers to the "drive to know", the desire for knowledge that motivates the acquisition of new ideas and an exploratory behavior (Berlyne, 1954). According to Litman and Jimerson (2004)'s theoretical model of curiosity, there are two types of epistemic curiosity regarding the different motives for acquiring the new information, and each associated with different outcomes (Litman, 2008). Thus, interest type epistemic curiosity (I-type EC) refers to the anticipated pleasure for acquiring new knowledge and discoveries, just for the intrinsic pleasure of doing it. Conversely, deprivation type epistemic curiosity (D-type EC) refers to the individual's need to reduce and eliminate undesirables states of ignorance (Litman, 2008; Piotrowski, Litman, & Valkenburg, 2014).

Although no study to date has analyzed the relationship between students' deep strategy, epistemic curiosity, and harmonious passion, a positive relation between them is expected. On the one hand, as we explained above, harmonious passion has been linked with different cognitive processes (e.g., Gucciardi et al., 2015; Ho et al., 2011; St-Louis et al., 2016) and, on the other, both deep strategy and epistemic curiosity has been associated with students who enjoy studying and engage voluntary in the learning process (e.g., Chin & Brown, 2000; Dinsmore & Alexander, 2012; Litman, 2008; Piotrowski et al., 2014).

6. ON TEACHING QUALITY AND PASSION

Teaching quality refers to teacher aspects that promote positive educational outcomes (Cochran-Smith & Fries, 2005), and it has been a growing research topic in recent years (Kunter et al., 2013; Trautwein, Dumont, & Dicke, 2015). Several different terms are used to discuss classroom processes related to student learning and are often used interchangeably, for example, *teaching effectiveness* (Marsh & Roche, 1997; Seidel & Shavelson, 2007), *quality of teaching* (Hattie, 2009), *instructional quality* (Rjosk et al., 2014) or *teacher quality* (Zablotsky & Rosenber, 2013). Research on this topic has shown that classroom processes are a predictor of students' learning and outcomes (Hattie & Anderman, 2013; Zablotsky & Rosenber, 2013).

To determine teachers' specific characteristics that promote students' positive educational outcomes is a growing research topic and a priority issue in recent years (Hagger & Chatzisarantis, 2015; Hagger & Hardcastle, 2014; Opdenakker & Van Damme,

2006; Stroet, Opdenakker, & Minnaert, 2015a). Teachers affect students' learning in class through their quality and the interactions they have with them (Dietrich, Dicke, Kracke, & Noack, 2015; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014), they play a central role in enhancing students' academic functioning, and effective teachers make students reach their full potential (Maulana, Helms-Lorenz, & van de Grift, 2015). Moreover, the role of teachers in engaging students in more meaningful learning experiences is particularly important for secondary math teachers, since at this stage students meaningfully lose interest for school (Kiemer, Gröschner, Pehmer, & Seidel, 2015; Stroet, Opdenakker, & Minnaert, 2015b).

However, there is still a lack of knowledge in explaining the specific characteristics of math teachers that lead to students' optimal functioning (Rimm-Kaufman, Baroody, Larsen, Curby, & Abry, 2014), which warrants special attention if we consider the importance of math skills on other school subjects (Gaspard et al., 2015) and its increasingly influence on the students' future professional performance (Seaton, Parker, Marsh, Craven, & Yeung, 2014). Therefore, there is no doubt that there is a social and educational need to better understand how teachers can promote in their students a better learning towards mathematics.

From the Self Determination Theory (SDT; Deci & Ryan, 1985, 2017), researchers consider that a teaching of quality is when teachers support students' needs of autonomy, competence and relatedness (Assor, Kaplan, & Roth, 2002). In this sense, in the educational context students feel autonomous, among others, when they consider that schoolwork helps them to achieve their interests (Wang & Eccles, 2013). Thus,

teachers explaining why class content or schoolwork are relevant and useful helps students to grasp why what they learn in class contributes to pursuing their interests (Assor, Kaplan, & Roth, 2002; Guay, Ratelle, Larose, Vallerand, & Vitaro, 2013). As well, among other strategies, teachers providing optimal challenge, focusing on the process, and offering positive feedback also ease teachers to achieve this purpose (Tessier et al., 2010). Therefore, in this dissertation we focus on these four teachers' specific aspects that are an indicator of autonomy support. In detail, teachers' emphasis on the usefulness of class content refers to teachers striving to explain the usefulness of class content, illustrating why class content is useful and relevant, and explaining to students how they might be able to apply what they are learning to real life or to other subjects. Teachers provision of optimal challenge refers to teachers accounting for students' level when teaching or assigning class activities instead of assigning difficult or easy tasks, so students improve and progress according to their own level and capacities (Cheon & Reeve, 2015). To focus on the process denotes that teachers stress the importance of internalizing the meaning and utility of class activities, valuing the procedure and not just the final result (Kusurkar, Croiset, & Ten Cate, 2011; Tessier et al., 2010). Finally, the provision of positive feedback alludes to teachers guiding students for improvement through instructions phrased in a constructive and positive way, teachers stressing both what the students has done well and what should be improved and how (Kusurkar et al., 2011).

Although research on developing students' passion remains scarce, different studies have also found that certain teachers' aspects help to promote students' passion. For example, Coleman and Guo (2013) and Fredricks et al. (2009) observed that students

who perceived their teachers to be encouraging, supportive, and caring were more passionate. Fredricks et al. (2009) also noticed that students were more likely to develop passion for activities when they had challenges and more opportunities for choice, as well as toward those activities that were congruous with their own interests. Bonneville-Roussy et al. (2013) and Fredricks et al. (2009) also noticed that students who perceived their teachers to be supportive of autonomy rather than controlling, displayed higher levels of passion. These studies suggest that students' passion can be developed by supporting their autonomy, that is, the sense of performing an activity from their self and without external pressures, feeling the origin, agent, and cause of the beginning and maintenance of the activity (Stefanou, Perencevich, Dicintio, & Turner, 2004).

In this regard, although some studies have suggested that autonomy support promotes passion, only one of them (Bonneville-Roussy et al., 2013) has gathered empirical evidence. Moreover, no specific teacher's aspect that promotes passion has yet been examined, nor any detailed aspect of autonomy support such as those analyzed in this dissertation, with respect to the development of passion. Therefore, efforts to examine the potential influence of teaching quality for promoting students' passion and to better understand how this influences students' performance are warranted.

CHAPTER 2: STUDY 1. THE ROLE OF PASSION IN EDUCATION: A SYSTEMATIC REVIEW

The present study's primary purpose is to utilize a systematic review procedure to identify the characteristics of passion that authors use to define the concept. The existing theoretical framework on passion reveals that, although the vast majority of studies follow Vallerand et al. (2003)'s conceptualization, there are other scholars that have studied the concept. Thus, it seems useful to identify the set of passion characteristics used by authors to define the concept, responding to our first research question: 'What researchers mean by the term of passion?'.

In addition, the theoretical framework also reveals a great variety of passion's consequences, so, to reveal passion's importance and what can it bring to education it is essential to focus on passion outcomes, synthesizing in this systematic review the outcomes analyzed by researchers. Thus, our second research question was: 'What are the outcomes of passion?'.

Finally, bearing this in mind the benefits of passion, it is quite clear the need to know how to promote it, therefore, our last research question was: 'What variables ignite passion?' To sum up, our specific research questions in this review were as follows:

What do researchers mean by the term "passion"?

What are the outcomes of passion?

What variables ignite passion?

1. METHOD

1.1. Literature review

The literature search was conducted in the ERIC, PsycINFO and Web of Science electronic databases because these databases contain the most publications regarding educational research. We used the term "passion" and a combination of educational terms ("academic achievement", "academic performance", school, university, college, student, education and learn*). The search was limited to research articles in English.

1.2. Inclusion criteria

In a systematic review the inclusion criteria are usually an issue that warrants a lot of attention. Passion has been used to discuss about topics such as sex, religion, or even fruit, but in the educational context all authors understand it as a strong inclination toward an activity, thus, our first criteria was that researchers understood passion from a psychological (not biological or philosophical) perspective and as a strong inclination toward an activity. The second criterion we used was that the research was carried out in the educational contest and, lastly, because sometimes researchers just mention the

word passion in the topic, the third criterion we used was that passion was assessed, either quantitatively or qualitatively.

To review, from the research studies, we selected only those articles in which passion: a) was analyzed from a psychological perspective and was understood to be a strong inclination toward an activity; b) was related to some aspect of the academic context; and c) was assessed, either quantitatively or qualitatively. Also, we chose to include studies examining students' passion (e.g., passion for learning) and those studies that analyzed passion from the point of view of teachers (e.g. teacher's passion toward their profession or the subject they teach) because, in addition to met the inclusion criteria, both studies about students and teachers' passion reveal interesting and useful information for researchers and practitioners.

1.3. Procedure

We began by searching in the previously mentioned databases. We identified 590 articles in ERIC, 434 in WOS and 238 in PsycINFO. This search resulted in a total of 1262 articles, and then we imported all results to Mendeley reference manager to begin the screening process. The first step in screening was checking for duplicates, resulting in 162 articles being removed (See *Figure 1*).

The next step (Step 2 in screening) was to eliminate all articles, on the basis of title and abstract, that included the terms Bible, Catholic, Christ, God, intimacy, Jesus, Lord, love, "passion flower", "passion fruit", religion, romantic, sex and theology* that were clearly

outside our area of study (72 documents removed). In all of those articles, passion was not understood to be an inclination toward an activity (e.g., sex, religion, fruit [941 studies removed]). Articles that studied passion unrelated to academia (27 articles) and one article that was not a scientific article were also removed. In this step, when abstracts did not contain sufficient information to determine inclusion or exclusion, we read the full text. When there were reservations regarding whether the studies met the inclusion criteria, two researchers read the articles and included or discarded by agreement.

Step 3 was to remove, on the basis of the full text, all articles in which passion and education were not the objective of the study (42 articles removed) as well as articles that did not contain a method with which to measure or evaluate passion (4 articles removed). Ultimately, 13 articles were selected.

1.4. Encoding the results

From all of the articles that met the criteria, we extracted the author, year of publication, purpose, design, sample, assessment instruments, definition and primary results (See Table 1).

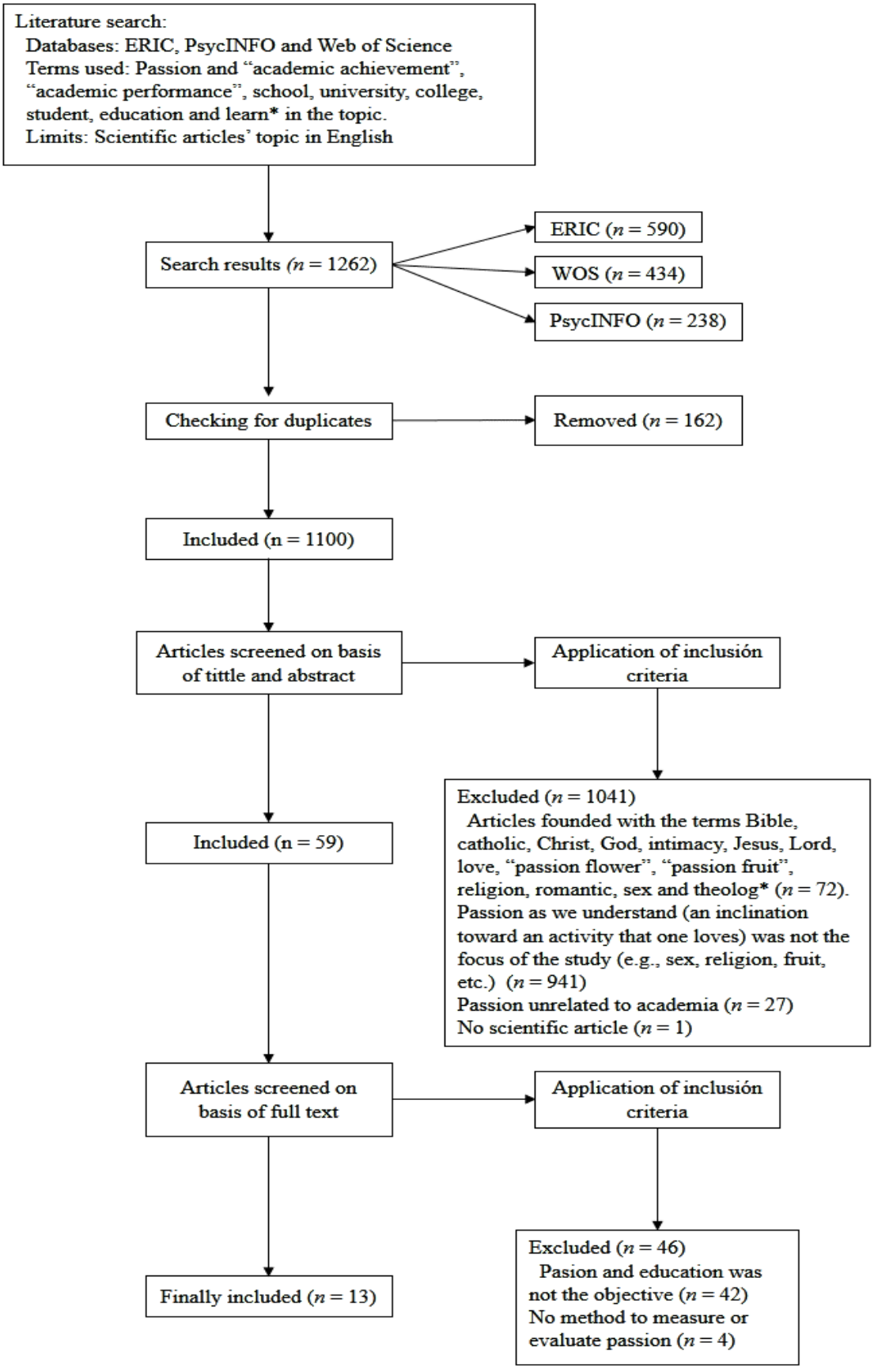

Figure 1. Steps for the systematic review.

Table 1.
Primary results of reviewed articles

Citation	Purpose	Design	Sample	Evaluation/Assessment	Passion definition	Primary results
Bonneville-Roussy et al. (2013)	To examine the role of autonomy support, psychological control, identity and passion in the persistence of students involved in higher music education	Correlational	Study 1: 144 music students (60 men and 84 women) from two international summer music academies in Canada with a mean age of 21.67 years and an average of 10.74 years of experience playing their instrument Study 2: 218 full-time students (116 men and 102 women), music majors from a college in Quebec, Canada, with a mean age of 18.06 years and an average of 7.23 years playing their instruments	Perceived autonomy support: Scale derived from existing measures of autonomy support (Lavigne, Vallerand, & Miquelon, 2007; Pelletier, Fortier, Vallerand, & Bri, 2001). Passion: The Passion Scale (Vallerand et al., 2003), adapted to music (Bonneville-Roussy et al., 2011; Mageau et al., 2009). Negative self-evaluation: Two items from the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). The self-esteem scale (Rosenberg, 1965) Persistence: A single item ("After my studies in music, I intend to become a professional musician.") Proof of registration in a music program for winter 2010 Identity: The French version (Amiot, Blanchard, & Gaudreau, 2008) of the Identity Scale (Jackson, 2002) adapted to music students Perceived autonomy support and psychological control: The Perceived Autonomy Support Scale for employees (PASS-E; Moreau &	"Passion is a strong inclination toward an activity that one finds important, likes (and even loves), to which one devotes daily time and energy and represents the vigour underlying the persistent involvement needed to excel" (Vallerand et al., 2003).	Study 1: Harmonious passion (HP) and autonomy support (AS) predicted persistence after accounting for gender, experience and age. Study 2: AS and identity predicted persistence via HP. Identity and psychological control predicted obsessive passion (OP).

				Mageau, 2012) adapted for music teachers		
Coleman and Guo (2013)	To explore the experiences of children with a passion for learning (PFL) in any domain.	Qualitative	7 students in middle school with a mean age of 13 years who showed persistent and intense engagement in a domain for a year or longer and their respective families	A ten-question interview to understand the origin, feelings, duration, frequency of activity and future goals regarding their passionate activity Three questions for parents regarding the first time they noticed their children's intense interest and their children's behavior	PFL is a focused interest in a particular domain that persists over time and is associated with relative disinterest in other activities that are interesting to peers.	Author utilized interviews, summarized that passion is an internal, intense and persistent force that directs action to a particular domain rather than being global, such as arts, academics or athletics Families are receptive and supportive Participants appear to be intrinsically motivated. Different passions appeared at different chronological ages.
Luh and Lu (2012)	To examine the mediating effect of passion on the relation between the cognitive style in students and their creative achievement in the design field	Correlational	276 undergraduate students (114 men and 162 women) from Taiwan.	Creative Achievement: Creative Achievement Questionnaire (CAQ; Carson, Peterson, & Higgins, 2005) Passion: The Passion Scale (Vallerand et al., 2003) translated into Chinese (Li, Chi, & Peng, 2007) Cognitive style: The Kirton Adaption–Innovation Inventory (KAI) (Kirton, 1976) Communicative competence: A self-rating scale (Canary & Cody, 1996)	Vallerand's (2003) definition	HP mediated the effect of innovative cognitive style to creativity. Innovative cognitive style predicted creativity via HP

Clark (2012)	To examine the importance of passion in recruitment advertisements and to study what passion means to early childhood teachers	Mixed (qualitative and quantitative)	246 recruitment advertisements 9 early childhood education teachers	Survey with two Likert-type items and one open question assessing the importance and meaning of passion in early childhood teachers	According to the author, participants conceive passion as a sense of loving their work	50 of 246 recruitment advertisements used the word passion or a derivative. 5 of 9 considered passion to be extremely important. The author summarized the open questions considering that the participants perceive passion as a sense of loving the work.
Hobbs (2012)	To explore the efficacy of a Deweyan framework to examine relations among teacher knowledge, identity and passion	Qualitative	Primary school teachers	Classroom observation and recorded video Interviews with each teacher in different moments of the process A focus group discussion to explore emerging themes	Day's (2004) definition and a report that participants perceived passion to be a sense of caring and commitment	Perceived passion to be a sense of caring and commitment Considered that the teachers showed passion for the subject matter, for promoting student engagement with the subject, and for teaching in general
Phelps and Benson (2012)	To describe commonalities among teachers who have a sustained passion for teaching	Qualitative	13 teachers with an average of 19 years of experience nominated by their principals for exhibiting a continuous passion for teaching	Open-ended interview questions regarding their feelings about teaching, pre-service and in-service sources of effects and advice for peers or future teachers	A driving force for career success	Teachers who have sustained their passion for the profession revealed the importance of positive attitudes, acceptance of change, embracing

			collaboration, pursuing professional development activities, and building and maintaining strong relationships with students and parents. When teachers realize the powerful effect they have on their students and the world in general, their sense of passion remains Teachers who maintain their passion for the education profession are teachers who seek, accept and embrace change. Maintaining passion requires maintaining strong connections with other positive and passionate teachers and having strong relationships with parents and students Teachers identified time pressures, paperwork and

						parents' expectations as impediments and barriers to developing passion.
Bonneville-Roussy et al. (2011)	Examined the role of meditation in performance goals and the deliberate practice of passion and performance. To explore potential differences between professional and expert student musical performers	Correlational	187 participants (86 men, 99 women, two unknown) with a mean age of 26.54 years. 143 were music performance students in conservatories (*n* = 42), colleges or universities (*n* = 93) or students who took private lessons outside a specific institution (*n* = 6); 44 were professional performers, and 2 did not specify the information.	Passion: The Passion Scale (Vallerand et al., 2003), adapted to music Achievement goals: 12-item scale (Elliot & Church, 1997) Deliberate practice: Two scales (Vallerand et al., 2007, 2008) adapted for the specific purposes of the study Life satisfaction: The French-Canadian validation (Blais, Vallerand, Pelletier, & Brière, 1989) of the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) Performance index: A question regarding the number of solo concerts participants had performed in their career	Vallerand's (2003) definition	HP predicted life satisfaction. Performance was predicted by HP via mastery goals and practice. Performance was negatively predicted by OP by performance approach and avoidance goals
Stoeber, Childs, Hayward, and Feast (2011)	To investigate the relations between harmonious and obsessive passion for studying, academic engagement and burnout	Correlational	103 students (11 males and 92 females) in psychology programs, with a mean age of 20.0 years	Passion: The Passion Scale (Vallerand et al., 2003), adapted to passion for studying psychology Academic engagement: The Utrecht Work Engagement Scale-Student (UWES-S; Schaufeli, Salanova, González-Roma, & Bakker, 2002) Academic burnout: The Maslach Burnout Inventory-Student Survey (MBI-SS; (Schaufeli, Martínez, Pinto, Salanova, & Bakker, 2002)	Vallerand's (2003) definition	After considering autonomous and controlled motivation, with regard to engagement indicators: a) vigor was predicted by HP and OP, b) Dedication was predicted by HP, c) absorption was predicted by OP.

						And, with regard to burnout indicators: a) cynicism was negatively predicted by HP, b) inefficacy was negatively predicted by HP and OP.
Oliver and Venville (2011)	To explore attitudes toward school science and science as presented in the Olympiad summer camp	Qualitative	69 highly gifted students participating in the Australian Science Olympiad, ages 15 to 17	A two-tier survey with five items extracted and adapted from a survey by Bennett & Hogarth (2009) regarding students' attitudes toward school science A survey directly targeting the students' reflections on and perceptions of the Olympiad summer camp In-depth interviews with six summer camp participants	Passion is an extremely strong or intense positive emotion regarding something. Passion for science may look like students' feelings of immersion, extension, emotion, inclusion, achievement, mastery and identity.	The Science Olympiad summer camp develops students' feelings of immersion, extension, emotion, inclusion, achievement, mastery and identity, which may be what passion for science looks like. To develop a passion for science, a program must enable students to incorporate science into their identities and cause students to feel a sense of achievement and inclusiveness.

Fredricks et al. (2009)	To explore how passion is manifested in academic and non-academic contexts, what supports passion	Qualitative	25 adolescents and young adults identified as gifted in elementary school and 41 adolescents who are passionate regarding non-academic fields, such as sports, arts or drama	To assess talent sample: semi-structured in-depth interview to prompt discussion regarding each adolescent's involvement in their activity from childhood to adolescence To assess the gifted sample: interviews regarding their lives in general and their experiences with growing up gifted	Authors believe that for an activity to become a passion, an individual perceives the activity to be valuable, devotes significant time and energy to the activity, has mastery goals, chooses to engage in challenging tasks, experiences positive outcomes during task involvement (i.e., positive emotions, flow or concentration), and incorporates the activity into his or her identity	Passion is more characteristic of non-academic activities, such as sports and music, than academic activities. Many of the gifted interviewees are motivated primarily by grades and maintaining their image as a good student rather than learning or mastering new skills. School settings appear to undermine rather than support passion.
Carbonneau et al. (2008)	To analyze causal ordering between teachers' passion, burnout, work satisfaction, and perceptions of student behaviors	Correlational	494 French-Canadian teachers (373 women, 119 men, and 2 unknown) with a mean age of 43.07 years 306 were elementary teachers, 120 were high school teachers, 20 were teachers in adult education, 46 were teachers in vocational	Passion: The Passion Scale (Vallerand et al., 2003) Work Satisfaction: The French-Canadian version (Vallerand, Blais, Brierè, & Pelletier, 1989) of the Satisfaction with Life Scale (Diener et al., 1985) adapted to work life Burnout: French-Canadian version (Dion & Tessier, 1994) of the Maslach Burnout Inventory (Maslach & Jackson, 1986)	Vallerand's (2003) definition	OP at T1 predicted positive student behavior and OP at T2. HP at T1 predicted positive student behaviors, work satisfaction and negative burnout at T2.

			and technical education, and 2 did not specify the information.	Teacher-perceived student behaviors: Three items from the French-Canadian version (Fernet & Senecal, 2004) of the Pupil Behaviour Patterns Scale (Friedman, 1995)		
Vallerand et al. (2007)	To test the Dualistic Model of Passion in the field of the dramatic arts and (Study 2) to examine the role of achievement goals in linking passion to deliberate practice and, ultimately, to performance	Correlational	Study 1: 143 (52 male, 91 female) dramatic arts students from various theater schools and colleges from Quebec, with a mean age of 23.8 years Study 2: 130 undergraduate students (19 men, 111 women) with a mean age of 23.84 years	Passion: The Passion Scale (Vallerand et al., 2003) Study 1: Subjective Well-Being: The (Diener et al., 1985) Satisfaction with Life Scale 1 A five-item version of the Subjective Vitality Scale (Ryan & Frederick, 1997) Deliberate practice: A list made by participants of five activities that artists may engage in during their free time when they are seeking to improve their performance Performance: A consensual validation approach (Amabile, 1982) to develop an indicator of performance attainment. 1 Study 2: Deliberate practice: A four-item scale adapted from Pintrich, Smith, García, & McKeachie (1993) 2 A five item version of the Subjective Vitality Scale (Ryan & Frederick, 1997) 2 Subjective Well-Being: Short version of the positive and negative affect scales (five items	Vallerand's (2003) definition	Study 1: Well-being was predicted by HP. Performance was predicted by HP and OP via practice Study 2: Well-being is predicted by HP and negatively predicted by OP. HP predicted performance via mastery goals and practice. OP predicted performance via mastery goals and practice. OP predicted performance via performance-approach goals.

				each) of the PANAS (Watson, Clark, & Tellegen, 1988) 2 Performance: Students' scores on their mid-term and final exams Achievement goals: a 12-item version of Elliot & Church (1997) questionnaire 2		
Day (2004)	To explore the nature of head teachers' passion with regard to achievement, care, collaboration, commitment, trust and inclusivity	Qualitative	10 head teachers (6 male and 4 female) whose schools exhibited a general increase in the last four years and whose school reports were described as excellent	Interviews assumed but not specified	Passion is a motivational drive that generates energy, determination, conviction, commitment and even obsession. Passion is often unconscious.	The author concluded that the head teachers are highly passionate about achieving, trusting and caring for others, collaborating with the rest of the team, being committed to the school, and displaying a sense of connectedness among the school community.

2. RESULTS

2.1. Description of included studies

Three studies (23.08%) used university students, three studies (23.08%) used middle or high school students, two studies (15.38%) used elementary or high school teachers, two studies (15.38%) used teachers at unspecified levels, two studies (15.38%) used music students or professional performers, one study (7.69%) used head teachers, one study (7.69%) used teachers in adult education, one study (7.69%) used teachers in vocational and technical education, one (7.69%) study used dramatic arts students, and one (7.69%) study included participants' families (See Table 1). The total sample does not correspond to the number of studies because some studies used multiple samples.

2.2. Methodology and assessment method

Because passion is an emerging issue, the articles reviewed were published between 2004 and 2013. Of these articles, according to the methodology, six were quantitative (46.15%, all correlational), and the rest were qualitative (*n* = 7; 53.85%). With regard to the assessment method, the authors assessed passion using interviews, open surveys, self-report scales and observation (See Figure 2). The most utilized were interviews (37.5%) and self-report scales (43.75%); of the latter, the most common was *The Passion Scale* (Vallerand et al., 2003).

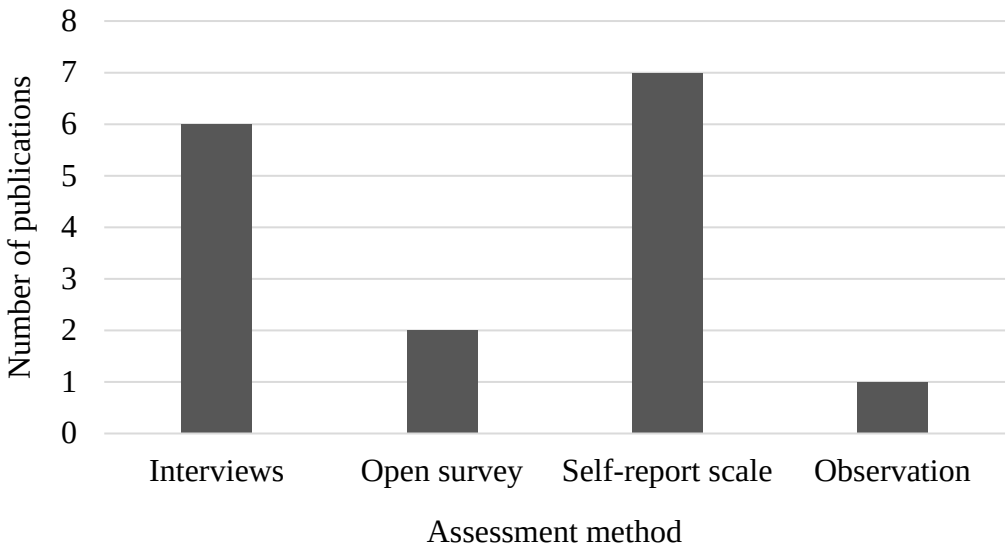

Figure 2. Assessment method used in the various publications. Studies that used different methods were included in each group

2.3. Identification of passion's elements

To identify the elements of passion, we read the conceptualizations and extracted the features used by authors to define the concept. Because all quantitative studies used Vallerand et al. (2003)'s conceptualization and in this definition the elements of passion were fairly clear, only the first author coded the studies. This coding was verified by the second author. However, when coding qualitative studies, all were discussed by the two author and selected or discarded by consensus.

The features extracted from author's definitions of passion were: a) a loved activity: an activity characterized by a positive, strong inclination (e.g., I am looking forward to Thursday because it is mathematics day.); b) identification: the feeling that the activity is something within the self and a component of what the person is; identification is the degree to which one uses the passionate activity to define oneself (e.g., I don't just play the trumpet; I feel like a trumpeter.); c) dedication: time spent daily or weekly on the

activity (e.g., I love doing mathematical problems, and many days I spend a great deal of my free time on math.); d) persistence: interest in the activity is sustained over time for many years or even a lifetime (e.g., I loved art education in high school, and for many years I have been expanding my knowledge of painting in an outside academy.); e) caring: teachers show interest in and concern for students (e.g., I feel truly interested in my students, what they like to do and how they feel in college); f) positive relations: good relationships with colleagues and/or students (e.g., Generally, I get along very well with everyone); g) supportive context: to feel surrounded by people who support one's passion (e.g., My teachers and parents encouraged me to participate in the national history competition because I really enjoy history.); h) positive emotions: good feelings when one is engaged in the activity (e.g., I feel excited when solving new chemical equations.); i) domain specific: a person is interested in a particular activity and shows relative disinterest in other activities (e.g., What I like most in school is music; when I am in mathematics or language classes, I am often attempting to compose new themes or thinking about how to improve last piece of music I composed.).

Nine elements were identified to define passion from the different works (see Table 2). Quantitative studies used Vallerand et al. (2003)´s definition, all studies sharing identical elements. Thus, all of the quantitative articles defined passion as an inclination toward a loved activity with which one identifies and persistently spends regular time on. The qualitative studies presented a greater disparity in the elements used to describe passion. Of all of those studies, two (Clark, 2012; Oliver & Venville, 2011) shared an element with Vallerand´s definition, referring to passionate activity as a loved activity. Fredricks et al. (2009), consistent with Vallerand et al. (2003), included identification, dedication,

supportive context and valuable activity in passion's definition. Coleman and Guo (2013) mentioned persistence. Hobbs (2012) perceived passion as a sense of caring, characterized by positive relations, elements shared with Clark (2012). Day (2004) and Oliver and Venville (2011) included feeling positive emotions in their definition. Finally, Coleman and Guo (2013) specified that passion is domain specific; that is, students may feel passion for a butterfly but not for science in general.

Table 2
P*assion's elements*

Citation	Loved activity	Identification	Dedication	Persistence	Caring	Positive relations	Supportive context	Positive emotions	Domain specific
Bonneville-Roussy et al. (2013)	Yes	Yes	Yes	Yes	-	-	-	-	-
Coleman and Guo (2013)	-	-	-	Yes	-	-	-	-	Yes
Luh and Lu (2012)	Yes	Yes	Yes	Yes	-	-	-	-	-
Clark (2012)	Yes	-	-	-	-	Yes	-	-	-
Hobbs (2012)	-	-	Yes	-	Yes	Yes	-	Yes	-
Phelps and Benson (2012)	-	-	-	-	-	-	-	-	-
Bonneville-Roussy et al. (2011)	Yes	Yes	Yes	Yes	-	-	-	-	-
Stoeber et al. (2011)	Yes	Yes	Yes	Yes	-	-	-	-	-
Oliver and Venville (2011)	Yes	Yes	Yes	-	-	-	-	Yes	-
Fredricks et al. (2009)	Yes	Yes	Yes	-	-	-	Yes	-	-
Carbonneau et al. (2008)	Yes	Yes	Yes	Yes	-	-	-	-	-
Vallerand et al. (2007)	Yes	Yes	Yes	Yes	-	-	-	-	-
Day (2004)	-	-	Yes	-	-	-	-	Yes	-

2.4. Passion's outcomes

To analyze the importance of passion, we have gathered information regarding passion's outcomes (see Table 3). Research on passion in the educational context revealed a great diversity of consequences. Regarding the relation between passion and performance, Bonneville-Roussy et al. (2011), with music students, and Vallerand et al. (2007), with college students, observed that although passion predicted performance, the types of passion followed different paths: Whereas the effects of harmonious passion on performance were mediated by mastery goals and deliberate practice, the effects of obsessive passion were a result of performance goals.

Bonneville-Roussy, Vallerand, and Bouffard (2013) explored the effect of passion on persistence, observing that harmonious passion predicted students' registration in an intensive program one year following the passion assessment. Similar to persistence, dedication was predicted by harmonious passion in Bonneville-Roussy et al. (2011) and by both harmonious and obsessive passion in Vallerand et al. (2007). Stoeber, Childs, Hayward, and Feast (2011) studied the effect of passion on the three aspects of academic engagement - vigor, dedication and absorption - and observed that although dedication was predicted by both types of passion, academic engagement was only predicted by harmonious, not obsessive, passion. Those authors also analyzed the relation between passion and autonomous motivation to study, observing that more harmonious passion led to more autonomous motivation in students.

Bonneville-Roussy et al. (2013) and Vallerand et al. (2007) explored the influence of passion on well-being, both studies noting that harmonious passion, but not obsessive

passion, is positively correlated with life satisfaction and subjective well-being. Luh and Lu (2012) investigated the mediating role of passion between creative achievement and cognitive style in design students, noting that harmonious but not obsessive passion conveys higher levels of creative achievement. Carbonneau et al. (2008) examined passion's influence on teachers' perceptions of students' classroom behaviors and concluded that passion, regardless of the type, is associated with positive perceptions of students' behavior.

Finally, the most studied variable was goal orientation and competence. In this area, Vallerand et al. (2007) and Bonneville-Roussy et al. (2011) observed that whereas harmonious passion predicted mastery goals, obsessive passion predicted performance approach and avoidance goals and slightly predicted mastery goals. Fredricks et al. (2009) also showed that talented and passionate children, compared with gifted and non-passionate children, were more likely to develop mastery goals and appreciate activities with moderate levels of difficulty, which enhances interest and feelings of competence. Phelps and Benson (2012) also evaluated passion in teachers and observed that when teachers perceive the powerful effect they have on their pupils, their sense of passion persists.

Table 3
Passion's outcomes

Citation	Performance	Persistence	Dedication	Academic engagement	Autonomous motivation for studying	Well-being	Creativity	Positive students behaviors	Subject election	Goals orientation/ competence
Bonneville-Roussy et al. (2013)	-	HP - Yes	-	-	-	HP - Yes	-	-	-	-
Coleman and Guo (2013)	-	-	-	-	-	-	-	-	-	-
Luh and Lu (2012)	-	-	-	-	-	-	Yes	-	-	-
Clark (2012)	-	-	-	-	-	-	-	-	-	-
Hobbs (2012)	-	-	-	-	-	-	-	-	-	-
Phelps and Benson (2012)	-	-	-	-	-	-	-	-	-	Yes
Bonneville-Roussy et al. (2011)	Yes	-	HP - Yes	-	-	HP - Yes	-	-	-	Yes
Stoeber et al. (2011)	-	-	Yes	Yes	HP - Yes	-	-	-	-	-
Oliver and Venville (2011)	-	-	-	-	-	-	-	-	Yes	-
Fredricks et al. (2009)	-	-	-	-	-	-	-	-	-	Yes
Carbonneau et al. (2008)	-	-	-	-	-	-	-	Yes	-	-
Vallerand et al. (2007)	Yes	-	Yes	-	-	HP - Yes	-	-	-	Yes
Day (2004)	-	-	-	-	-	-	-	-	-	-

2.5. Passion's predictors

Concerning predictors, this review also reveals a great variety of variables (see Table 4). Regarding the relation between passion and identity, Bonneville-Roussy et al. (2013) observed, in advanced music students, that a person who identifies more with the activity will display more harmonious passion. Fredricks et al. (2009) and Oliver and Venville (2011) also perceived, after interviewing passionate students, that identity is central to passion.

Bonneville-Roussy et al. (2013) observed that autonomy support was positively linked to harmonious passion, observing that students who perceived their teachers to be autonomy supportive manifested a higher harmonious level of passion whereas students who perceived their teachers to be controlling showed higher levels of obsessive passion. Fredricks et al. (2009) noted that the activities that interviewees felt passion for were activities in which the participants had more opportunities for choice, challenges and to work on varied activities and activities that were more consistent with their personal interests and future plans.

With regard to positive relations, Day (2004) and Phelps and Benson (2012), interviewing passionate teachers and head teachers, observed that a common feature was that those educators maintained strong and positive relations with peers, parents and students; Day (2004) also perceived head teachers' sense of collectivism rather than an individual will to succeed.

Table 4
Passion's predictors

Citation	Identity	Autonomy support	Psychological control	Positive relations	Supportive context	Innovative cognitive style	Caring
Bonneville-Roussy et al. (2013)	Yes	HP - Yes	OP - Yes	-	-	-	-
Coleman and Guo (2013)	-	-	-	-	Yes	-	-
Luh and Lu (2012) (Luh & Lu, 2012)	-	-	-	-	-	Yes	-
Clark (2012)	-	-	-	-	-	-	-
Hobbs (2012)	-	-	-	Yes	-	-	-
Phelps and Benson (2012)	-	-	-	Yes	Yes	-	-
Bonneville-Roussy et al. (2011)	-	-	-	-	-	-	-
Stoeber et al. (2011)	-	-	-	-	-	-	-
Oliver and Venville (2011)	Yes	-	-	-	Yes	-	-
Fredricks et al. (2009)	Yes	Yes	-	Yes	Yes	-	Yes
Carbonneau et al. (2008)	-	-	-	-	-	-	-
Vallerand et al. (2007)	-	-	-	-	-	-	-
Day (2004)	-	-	-	Yes	Yes	-	Yes

Supportive context was the most frequently analyzed variable. Coleman and Guo (2013) and Fredricks et al. (2009) highlighted the importance of a supportive context in the development of passion, observing that people who perceived their families and teachers to be supportive and encouraging were more likely to be passionate. Fredricks et al. (2009) and Oliver and Venville (2011) also emphasized the importance of peer support, preferably peers with similar abilities and motivational levels (Frederick et al., 2009).

Luh and Lu (2012), in their study on passion in design students, noted that cognitive style could also predict passion. Those authors observed that an innovative cognitive style, understood as the innovative manner in which an individual copes with a problem, is positively correlated with harmonious but not obsessive passion, indicating that an innovative cognitive style predicts harmonious passion and that harmonious passion, in turn, predicts creative achievement. Finally, with regard to caring, Day (2004) concluded that passionate head teachers truly care for other people, and Fredricks et al. (2009) argued that teachers who were caring would ignite students´ passion.

3. DISCUSSION

The primary purpose of this systematic review was to identify the characteristics that define the concept and determine passion's antecedents and outcomes. This review provides evidence of the importance of passion within the academic context and reveals a great variety of passion's positive effects in students and teachers as competence, dedication, well-being, performance, creativity, and persistence.

The reviewed articles were published between 2004 and 2013, and 69.2% of the articles were published within the last four years, confirming the growing interest in this area. This increasing interest could be because of Vallerand´s (2003) seminal work on passion in which he explicitly conceptualized and tested passion's outcomes. That study may have aroused scientific interest in the topic; certainly, most researchers have considered his ideas.

Despite the number of studies on passion within educational context is still scarce and research in this are needs to grow much, we concluded the following from the articles reviewed: (a) study samples vary widely; some researchers focused on teachers, and other researchers focused on students. In those studies that focused on students, the students were from middle school, high school, university or even conservatories; (b) there is no clear methodology to address passion, nor is there an assessment method, although the self-report scale appears to be used most often; (c) the vast majority of studies followed Vallerand's (2003) conceptualization whereas there was more diversity defining passion within the qualitative studies; (d) there is a wide variety of studied variables that render the creation of a consistent body of knowledge regarding outcomes and predictors difficult.

3.1. Passion's conceptualization

We identified six primary definitions of passion. Although all of the quantitative studies used Vallerand et al.'s (2003) definition, most authors of qualitative studies tended to use their own definitions. Nevertheless, various commonalities were observed among

the numerous conceptualizations. The most commonly shared feature was dedication (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Oliver & Venville, 2011; Vallerand et al., 2003), which suggests that people who feel more passion toward an activity will spend more time and focused practice on that activity. The need to love the activity (Clark, 2012; Oliver & Venville, 2011; Vallerand et al., 2003), to identify with the activity (Vallerand et al., 2003; Fredricks et al., 2009; Oliver & Venville, 2011) and to feel positive emotions during the activity (Day, 2004; Hobbs, 2012; Oliver & Venville, 2011) were also elements authors used frequently to describe passion.

Despite these common features, only a few authors clearly defined passion (Coleman & Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver & Venville, 2011; Vallerand et al., 2003); thus, there is no comprehensive view of what passion connotes. Consistent with Vallerand, of all the identified elements of passion, the most common features are a loved activity, identification, dedication, persistence and being domain-specific. A passionate biology student who loves to study insects and bugs will dedicate much of his spare time to this pursuit, will persist in working in this area despite any obstacle and will feel like a future biologist.

3.2. Passion's outcomes

We identified great diversity in the variables explored and observed that quantitative studies consider passion's consequences whereas qualitative studies focus more on promoters. Thus, a wide range of variables, sometimes not tested, render it difficult to

define a consistent body of passion's predictors and outcomes although the reviewed studies reported useful data regarding both predictors and outcomes.

In passion's outcomes, goal orientation was the most relevant result. Authors (Bonneville-Roussy et al., 2011; Fredricks et al., 2010; Hobbs, 2012; Phelps & Benson, 2012; Vallerand et al., 2007) agree in their findings that more passion leads to more mastery. According to Achievement Goal Theory (Elliot & Church, 1997), there are three types of achievement goals: mastery goals, which lead people to be focused on the improvement of personal competence; performance-approach goals, which lead people to be focused on being better than others; and performance-avoidance goals, which lead people to avoid feeling worse or incompetent compared to other people. Vallerand et al. (2007) and Bonneville-Roussy et al. (2011) observed that harmonious passion is strongly related to mastery goals and that obsessive passion is related to performance avoidance and approach goals and related slightly to mastery goals.

Well-being and dedication were also relevant consequences. The articles reviewed (Bonneville-Roussy et al., 2011, 2013; Vallerand et al., 2007) indicated that harmonious but not obsessive passion leads to life satisfaction and subjective well-being whereas dedication causes some controversy. Vallerand et al. (2007) and Stoeber et al. (2011) concluded that both harmonious and obsessive passion can predict the time spent daily or weekly on an activity whereas Bonneville-Roussy et al. (2011) observed that only harmonious passion produces dedication. Other variables, such as performance, persistence, academic engagement, creativity and subject election, were predicted by

passion, which also provides useful information regarding how to change for a more high-quality education.

3.3. Passion's antecedents

Conversely, regarding passion's predictors, which were studied primarily in qualitative studies, supportive context (Coleman & Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver & Venville, 2011; Phelps & Benson, 2012) and positive relations (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Phelps & Benson, 2012) appear to be the most influential features in the development of passion. Studies stress the essential role of families, peers and teachers in the enhancement of passion, emphasizing that a person who receives support from his or her context is more likely to develop and maintain his or her passion.

Finally, two studies (Fredricks et al., 2010; Oliver & Venville, 2011) report information regarding the present role of schools in developing passion, comparing passion inside and outside school settings. On the one hand, Oliver and Venville (2011) compared students' attitudes toward Science as a school subject and Science as presented in a Science Olympiad summer camp, observing that students did not show the characteristics of a passionate person when referring to science in the school settings but toward science outside the traditional school context. On the other hand, Fredricks et al. (2010) also explored how passion is manifested in academic and nonacademic context, noting that in school compared with nonacademic activities, the vast majority of gifted students were more motivated by getting good marks, maintaining their "good

student" image, and demonstrating their high abilities rather than study because they really loved learning o because they were really passionate toward a specific subject. Students in nonacademic activities such as sports, music or arts showed high levels of passion, they feeling completely involved in the activity, experiencing pleasant emotions as joy or emotional liberation from participating and defining themselves through the activity. Both studies concluded that traditional schools settings do not tend to support passion, but may hinder its development.

In this regard, Vallerand (2015) also explained that a contextual moderator on the relation between passion and intrapersonal outcomes is the activity domain. Thus, although activities such as sports, performing arts and leisure activities are normally freely chosen and people freely engage in such activities, in other contexts, such as work or education, engagement is generally mandated, rendering the effects of obsessive passion or lack of passion stronger than in other domains.

3.4. Future directions

Because the goal of this review was the examination of passion in educational settings, we have not included some truly interesting studies from outside this focus although such studies could have significant applications (see Bélanger, Lafrenière, Vallerand, & Kruglanski, 2013; Carpentier, Mageau, & Vallerand, 2012; Froh et al., 2010; Mageau & Vallerand, 2007; Vallerand, 2008). Future researchers could glean ideas from these studies and test multiple relations between passion and different igniters and consequences within education. Considering Bélanger et al. (2013), who analyzed the

effects of failure and success on passionate people's performance, an interesting test would be whether passion, obsessive or harmonious, could ignite a change in students after a bad result or a teacher's wake up call. Considering Carpentier et al. (2012), who observed that people who had an obsessive passion tended to reflect on their passionate activity while engaging in other labors, future research could consider whether passionate students spend more time thinking critically or ruminating about class topics.

Another interesting avenue of research would be to develop new assessment methods. Currently, most studies appear to rely on self-report questionnaires; however, other methods, such as diaries or observation measures to assess, for example, how much time students spend developing their passion or how teachers foster passion during classes, could complete and enhance the reliability of the information we receive. Related to this concept is to identify cut-off values to establish whether a student is passionate or not passionate. Bonneville-Roussy et al. (2013) and Vallerand et al. (2003) did consider that problem in The Passion Scale - a Likert scale ranging from one to seven; four or more points were indicative of a passionate student. However, more information is needed on this topic. Item response theory could be useful in this endeavor.

Similarly, other studies should continue working on the identification of variables within the academic context related to passion, first, focusing on the benefits of passion for both teachers and students and then attempting to identify which variables influence the development of passion. Thus, it could be important for future studies to analyze the moderating effect of independent and dependent variables. A beneficial result

would be educational interventions to improve various aspects of education by passion. As well, it could be interesting to examine how both types of passion are developed, how a type of passion could be transformed into another and how they fluctuate over life. Thus, future studies could examine longitudinally, for example, the relationship between harmonious passion and the increased use of adaptive process over life. Finally, to clarify and support the difference between passion and related constructs, researchers should attempt to test for significant differences between constructs, for example, running a confirmatory factor analysis comparing a one- or two-factor solution with items of passion and other constructs.

CHAPTER 3: STUDY 2. PASSION FOR MATH: RELATIONSHIPS BETWEEN TEACHER EMPHASIS ON THE USEFULNESS OF CLASS CONTENTS, MOTIVATION AND GRADES

The purpose of this study was to examine the relationship between teacher emphasis on the usefulness of class content and students' harmonious passion, intrinsic motivation to learn, and math achievement. To date, no studies have examined the relationship between these variables in high school students. Additionally, no specific teacher's aspect related with autonomy support has been examined with respect to passion. Thus, this study aims to analyze how these variables relate to each other and to high school students' math achievement.

The following research questions were addressed to examine whether: (Research Question 1) students perceive harmonious passion and intrinsic motivation to learn as different constructs; (Research Question 2) harmonious passion predicts grades in high school students at the class and individual level; (Research Question 3) motivation to learn, at the class and individual level, mediate the relationship between harmonious

passion and achievement; and (Research Question 4) teacher emphasis on the usefulness of class content at the class level predicts harmonious passion in high school students. In this research question, we do not search for relationships at the individual level because teacher emphasis on the usefulness of class content is a climate construct, and our interest is not on how the individual perception affects passion, but on the relationship between teacher emphasis and students' passion (Morin, Marsh, Nagengast, & Scalas, 2014).

For the first research question, we hypothesized, according to previous studies (Bélanger, Lafrenière, Vallerand, & Kruglanski, 2013; Houlfort, Philippe, Vallerand, & Ménard, 2014; Stoeber, 2011), that passion and intrinsic motivation to learn are different constructs and that students will perceive this difference. For the second research question, and consistent with previous research on passion and performance, we hypothesized that harmonious passion will be positively associated with math achievement.

Contrary to our interpretation regarding the recommendation to use multilevel analysis when dealing with a nested data, it could be said that in these research questions we were just interested in the relationship between individual characteristic and the need of multilevel was not justified. However, the passion and motivation of students nested in classrooms is not an individual characteristic, which can be seen by its intraclass correlation (e.g. LeBreton & Senter, 2007), and the use of multilevel analysis allows us to separate the variance between the two levels of analysis (Friedrich, Flunger, Nagengast, Jonkmann, & Trautwein, 2015), providing more information on the

relationship between the studied variables, and of the variables themselves (Morin et al., 2014).

For the third research question, we examine the mediational role of intrinsic motivation to evaluate the relationship between harmonious passion and math performance. Thus, according to the work by Stoeber et al. (2011) and other research outside the educational context (Back et al., 2011; Curran et al., 2011; Fuster et al., 2014; Lee et al., 2013; Wang et al., 2008, 2011), we hypothesized that intrinsic motivation to learn will mediate the relationship between students' harmonious passion and their math achievement. Finally, following the teaching quality research, for the fourth research question, we hypothesized that teacher emphasis on the usefulness of class content will predict students' harmonious passion.

In addition to these main hypotheses, we have also examined other mediational pathways in our model to look for an indirect effect between these variables. We examined whether: (1) passion mediated the effects of teacher support on intrinsic motivation; and (2) passion and intrinsic motivation together mediate the effect of teacher support on math achievement.

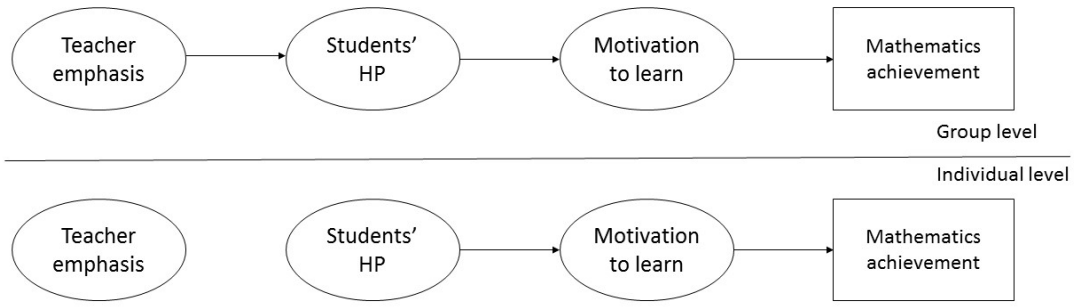

Figure 3. Multilevel model proposed

In this research, we focused our attention on the relationship between passion and an indicator of autonomy support: teacher emphasis on the usefulness of class content. Although other authors (Bonneville-Roussy et al., 2013) have analyzed the relationship between autonomy support and passion or motivation, they did not take into account the nested nature of their data. When researchers evaluate whether school, classroom, or teacher characteristics (e.g. teacher emphasis on the usefulness of class content) contribute to the prediction of students' outcomes (e.g. Harmonious passion), it is recommended to test the study hypotheses using a multilevel analysis (Lüdtke, Robitzsch, Trautwein, & Kunter, 2009; Stapleton, McNeish, & Yang, 2016).

In multilevel modeling, two kinds of group-level variables are frequently used: 1) variables that have the same value for all students in one class (e.g. teacher's years of experience), and 2) variables that are estimated based on the aggregation of students' value. In the latter case, following Marsh et al. (2012), we can distinguish between contextual and climate variables. Contextual variables are group-level aggregates of student-level variables that are specific to each student in one class (in our study: class-average math achievement, class-average intrinsic motivation, and class-average harmonious passion). Climate variables are the result of asking students about one variable common to students in the same class (in our study: teacher emphasis on the usefulness of class content). In this situation, the reference is the same for all students in one class, unlike in contextual constructs, where there is no common reference and values are assigned on individual characteristics. In this study, we were interested in a climate construct (teacher emphasis on the usefulness of class content) and on

contextual constructs (harmonious passion, intrinsic motivation to learn, and math grades). Harmonious passion, intrinsic motivation, and math grades are not only an indicator at the individual level, but if aggregated, they are also an indicator of a shared characteristic of the class.

1. METHOD

1.1. Participants

We recruited 1557 students (778 female, 766 male, 12 not specified) from nine high schools in Gran Canaria, Spain. Students were from second to fourth grades of secondary education (8th to 10th grades in the US system). Some responses were discarded because they were incomplete or because students were identified as non-passionate toward mathematics, so the final sample comprised 1171 students (591 female, 574 male, 6 not specified) from 82 classes. The students' mean age was 15.23 (*SD* = 1.06). All participants were informed of the data confidentiality and participation was strictly voluntary.

1.2. Procedure

First, we contacted schools by phone to briefly explain the study and request an appointment with the high school mathematics teachers to request their cooperation. The school principals, mathematics teachers, and parents authorized the participation in the study. Each researcher personally administered questionnaires, explaining the anonymity of the data and the need for accuracy in responses. We asked participants to

indicate which math activity or type of math activity they loved the most, and then we instructed them to complete the Passion Scale for this type of math activity. Because some students did not have a favorite math-related activity, they could not complete this section, and they were automatically classified as non-passionate toward math.

1.3. Measures

Participants answered demographic questions and completed a questionnaire with measures of harmonious passion, motivation to learn, and their teacher's emphasis on the usefulness of class content. All scales were rated on a 7-point Likert-type scale, ranging from 1 (*I do not agree at all*) to 7 (*I strongly agree*). To examine factorial validity, we performed a confirmatory factor analysis for each variable. Information about the estimation method and missing data can be found in the data analysis section. To assess reliability, we used McDonald's Omega (1999) because it has shown evidence of better accuracy than Cronbach's alpha (Revelle & Zinbarg, 2009), and factor loadings do not need to be equal for all items (Zhang & Yuan, 2016). Similar to Cronbach's alpha, McDonald's values above .80 are indicators of reliability.

1.3.1. Harmonious passion

Six items of the Passion Scale (Vallerand et al., 2003) adapted to Spanish and to the educational context were used to assess students' harmonious passion (e.g. "The new things that I discover with this activity allow me to appreciate it even more"). According to the standards for cross-cultural adaptation (Muñiz, Elosua, & Hambleton, 2013), the Spanish translation of the scale was performed by two Spanish-speaking researchers

and then revised by a bilingual specialist. Regarding the CFA, the chi-squared (χ^2) value and fit indexes were χ^2 (1170, 23) = 238,030 ($p < .001$), RMSEA = .090, $SRMR_{within}$ = .049, $SRMR_{between}$ = .155, CFI = .90 and TLI = .87, and McDonald's Omega was .95.

1.3.2. Motivation to learn

We used a subscale of the Spanish validation (Núñez & Martín-Albo, 2006) of the *Échelle de Motivation en Éducation* (EME; Vallerand, Blais, Brierè, & Pelletier, 1989). Because our aim was to assess the pleasure experienced while learning new content in mathematics, we used the four items of the Intrinsic Motivation Toward Knowledge subscale (e.g. "Because for me it is a pleasure and satisfaction to learn new things") and presented them with the stem "Why are you trying to do things well in math?" The χ^2 value and fit indexes were χ^2 (1170, 7) = 77,474 ($p < .001$), RMSEA = .093, $SRMR_{within}$= .035, $SRMR_{between}$= .079, CFI = .96 and TLI = .93, and McDonald's Omega was .88.

1.3.3. Teacher emphasis on the usefulness of class content

To assess students' perception of teacher emphasis on the usefulness of class content, we used six items (e.g. My teacher proposes useful activities) from the subscale Teacher Emphasis on the Usefulness of Class Content of the scale developed by León, Núñez, & Medina (León, Garrido, & Núñez, 2016). These items have shown evidence of reliability in prior research (León et al, 2016) as well as in the present study (ω = .94). The χ^2 value and fit indexes were χ^2 (1170, 23) = 187,426 ($p = .001$), RMSEA = .078, $SRMR_{within}$= .049, $SRMR_{between}$= .023, CFI = .91 and TLI = .89, and McDonald´s Omega was .94.

1.3.4. Math performance

To assess students' math performance, we obtained students' final course grades in mathematics, coded from 1 (lowest mark) to 10 (highest mark). The equivalence in the EEUU system would be: A+: 10; A: 9.175; B+: 8.325; B: 7.5; B-: 6.675; C+: 5.825; C: 5; C-: 4.175; D+: 3.325; D: 2.5; D-: 1.675; F: 1. Unlike in the United States or United Kingdom, where it is usual to assess student's achievement by standardized tests, in Spain, we use grades assigned by teachers to assess the knowledge, skills, and daily work of the students according to rubrics implemented by the government. These grades have a real-world impact on students' academic level and progress in grade school. They even affect the degrees or universities students can choose (Sánchez-Pérez et al., 2015; Simões & Alarcão, 2014).

1.4. Data analysis

To test our first hypothesis (H1: Students perceive harmonious passion and motivation as two different constructs) we ran two multilevel confirmatory factor analyses. In the first model, items from passion and motivation loaded on a single factor, and in the second one, items loaded on their correspondent factor. To determine which model showed a better fit to the data, we computed a χ^2 test and an examination of fit indexes for both models.

To test hypotheses two (H2: Harmonious passion will be positively associated with math achievement) and three (H3: The relationship between passion and achievement will be mediated by motivation to learn), we ran two multilevel structural equation models

(MSEMs), in which passion predicted motivation, and, in turn, math achievement at the individual and group levels. To test the mediational effect of motivation between passion and achievement, we added, in a nested MSEM, a direct effect from harmonious passion on math performance. To search for evidence of mediation, we compared both models using a χ^2 test and fit indexes. If there were no differences between both models we would hold the most parsimonious result. Moreover, we computed the unstandardized indirect effect and its standard error using the delta method (Sobel, 1982).

Finally, to examine our fourth hypothesis (H4: Teacher emphasis on class usefulness will predict students' harmonious passion) we tested a multilevel model, analyzing the effect of the Teacher Emphasis on the Usefulness of Class Content and Interest on students' Harmonious Passion, which predicted math grades via Motivation to Learn. We followed the same approach described above to test the mediational effect of: 1) Passion in the relationship between Teacher Emphasis on the Usefulness of Class Content and Interest and students' Motivation to Learn; 2) Passion and Motivation to Learn in the relationship between Teacher Emphasis on the Usefulness of Class Content and Interest and students' math grades.

There are different strategies to test a MCFA or MSEM (Stapleton, McNeish, et al., 2016; Stapleton, Yang, & Hancock, 2016). In this study, following the recommendations of Morin, Marsh, Nagengast, and Scalas (2014), we constrained factor loadings of the individual and group level to the same value. We also used standardized scores to simplify the interpretations and to reduce non-essential multicollinearity. With regard

to the estimation method, we used maximum likelihood with robust standard errors. This method has shown evidence of performing properly even when data is nonnormally distributed (Schmitt, 2011). We handled missing data using the full information maximum-likelihood method, which provides unbiased parameters in missing at random circumstances and even in cases where data is not missing at random (Enders, 2010). The calculations were conducted with Mplus 7.4 software (Muthén & Muthén, 2017).

2. RESULTS

2.1. Preliminary analysis

Mean values and standard deviations are shown in Table 1. Means varied between 3.632 (Harmonious Passion) and 5.382 (math grades), and standard deviations varied between 1.455 (Harmonious Passion) and 2.164 (math grades). At the individual level, correlations ranged from .073 (Teacher Emphasis on the Usefulness of Class Content with math grades) to .507 (Harmonious Passion with Motivation to Learn), and at the group level, they ranged from .122 (Teacher Emphasis on the Usefulness of Class Content with math grades) to .691 (Harmonious Passion with Motivation to Learn). In line with previous studies (Fauth et al., 2014; Morin et al., 2014), higher correlations were observed at the group level than at the individual level.

Table 5
Descriptive statistics and correlations between major variables

		Mean	SD	ICC	1	2	3	4
1	Teacher	4.131	1.766	.465	-	.305	.286	.073
2	Passion	3.632	1.455	.090	.470	-	.507	.113
3	Motivation	4.363	1.559	.053	.671	.691	-	.249
4	Math	5.382	2.164	.083	.122	.483	.473	-

Note. Lower diagonal triangle: Group level correlations. Upper diagonal triangle: Individual level correlations.

2.2. Passion and motivation: Different constructs

We tested whether a multilevel two-factor model in which Passion and Motivation to Learn are two different constructs fit the data better than a model in which all items loaded on a single factor. The χ^2 test and the fit indexes for the two-factor model were χ^2 (1170, 76) = 502.781 ($p < .001$), CFI = .919, TLI = .905, and RMSEA = .069, and for the one factor model were χ^2 (1170, 90) = 5288,892 ($p < .001$), CFI = .648, TLI = .599, and RMSEA = .142. The χ^2 test comparing both models was significant, and fit indexes were much better for the two-factor model. Therefore, our results showed that students perceive Passion and Motivation to Learn as two different constructs.

2.3. Students' variables: Harmonious Passion, Motivation, and Math Grades

We tested the hypothesized model, in which Harmonious Passion acts as a determinant of Motivation to Learn, which, in turn, predicts Math Grades. The χ^2 test and fit indexes

for the MSEM were χ^2 (1170, 94) = 578.236 (p = .001), RMSEA = .066, $SRMR_{within}$ = .058, $SRMR_{between}$ = .130, CFI = .914, TLI = .900. With regard to relationships between variables, at the between level, Harmonious Passion predicted Motivation (β = .775; SE = .124; p < .001), explaining 60% of its variance, and this predicted math grades (β = .526; SE = .193; p = .006), explaining 28% of its variance. At the individual level, Harmonious Passion predicted Motivation to Learn (β = .548; SE = .030; p < .001), explaining 30% of its variance, and this predicted math grades (β = .246; SE = .033; p < .001), explaining 6% of its variance.

With regard to the mediational effect of Motivation to Learn, in the relationship between Harmonious Passion and math grades, we compared the above MSEM to an MSEM with an additional path from Passion to Math. The χ^2 test and fit indexes for this MSEM were χ^2 (1170, 92) = 576.890 (p <.001), RMSEA = .067, $SRMR_{within}$ = .058, $SRMR_{between}$ = .130, CFI = .914, TLI = .897. We observed no improvement in fit indexes, and the direct effect from Harmonious Passion to math grades was not different from 0 at either the individual level (β = -.036; SE =.038; p = .353) or the group level (β =.346; SE = .428; p = .419). Moreover, both [unstandardized] indirect effects in the fully mediated model were significant different from 0 at the individual level (β = .485; SE = .077; p < .001) and at the group level (β = 1.438; SE = .710; p = .043). Therefore, there is evidence of mediation of Motivation to Learn in the relationship between Harmonious Passion and math achievement.

2.4. Teacher Emphasis on the Usefulness of Class Content on students' variables

We tested the hypothesized model, in which Teacher Emphasis on the Usefulness of Class Contents predicts students' Harmonious Passion, which determines students' Motivation to Learn and, in turn, predict math grades.

The χ^2 test and fit indexes for the MSEM were χ^2 (1170, 247) = 1061.085 (p < .001), RMSEA = .053, $SRMR_{within}$ = .056, $SRMR_{between}$= .162, CFI = .908, TLI = .898. At the group level, Teacher Emphasis on the Usefulness of Class Content predicted Harmonious Passion (β = .549; SE = .163; p < .001), explaining 30% of its variance. Harmonious Passion predicted Motivation (β = .840; SE = .103; p < .001), explaining 71% of its variance, and this predicted math grades (β = .469; SE = .193; p = .015), explaining 22% of its variance. At the individual level, Harmonious Passion predicted Motivation to Learn (β = .554; SE = .030; p < .001), explaining 31% of its variance, and this predicted math grades (β = .248; SE = .030; p < .001), explaining 6% of its variance (See Figure 2).

With regard to the mediational effect of Harmonious Passion in the relationship between Teachers' Emphasis on the Usefulness of Class Content and Motivation to Learn, we compared the above MSEM to a MSEM with an additional path from Teachers' Emphasis on the Usefulness of Class Content to Motivation to Learn. The χ^2 test and fit indexes for this MSEM were χ^2 (1170, 246) = 1056.138 (p < .001), RMSEA = .053, $SRMR_{within}$ = .056, $SRMR_{between}$ = .153, CFI = .908, TLI = .899. We can observe almost no improvement in fit indexes. The direct effect from Teachers' Emphasis on the Usefulness of Class Content and Motivation to Learn grades was marginally different from 0 (β =

.459; SE =.232; *p* = .049), and the [unstandardized] indirect effect in the fully mediated model was significantly different from 0 (β = .173; SE = .075; *p* = .020).

Regarding the mediational effect of Harmonious Passion and Motivation to Learn in the relationship between Teachers' Emphasis on the Usefulness of Class Content and math grades, we compared the proposed model to an MSEM with an additional path from Teachers' Emphasis on the Usefulness of Class Content to math grades. The χ^2 test and fit indexes for this MSEM were χ^2 (1170, 246) = 1061.595 (*p* <.001), RMSEA = .053, $SRMR_{within}$= .056, $SRMR_{between}$= .161, CFI = .908, TLI = .898. We observed almost no improvement in fit indexes. The direct effect from Teachers' Emphasis on the Usefulness of Class Contents to math grades was not significantly different from 0 (β = -.230; SE =.241; *p* = .339), neither was the [unstandardized] indirect effect in the fully mediated model (β = .242; SE = .141; *p* = .086).

In this situation, there is contradictory information to affirm that there is evidence of the mediational effect of Harmonious Passion and Motivation to Learn in the relationship between Teachers' Emphasis on the Usefulness of Class Content and math grades. On one hand, we see that the fit of both models is not significantly different, the direct path from Teachers' Emphasis on the Usefulness of Class Content to math grades is not significantly different from 0, but on the other hand, the indirect effect in the fully mediated is not significant from 0.

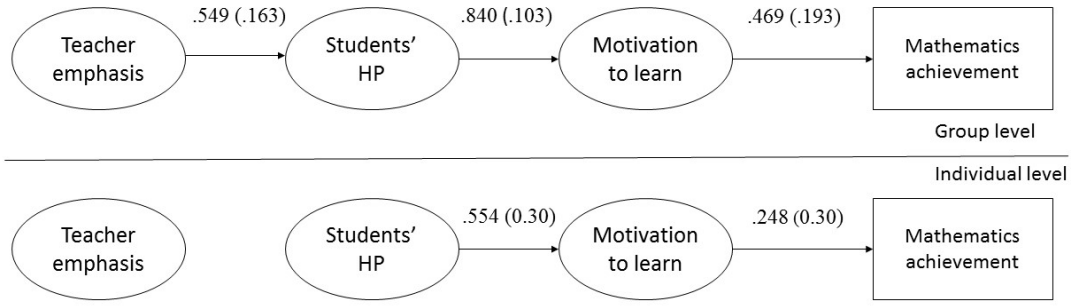

Figure 4. Multilevel structural equation model including teacher emphasis on the usefulness of class content. The standardized parameters are above the arrows; standard errors are between parentheses.

3. DISCUSSION

In this study, we attempted to elucidate the role of passion in the educational context. Our findings extend previous research analyzing the relationship between harmonious passion, intrinsic motivation, and math achievement in high school students as well as examining the effects of teacher emphasis on the usefulness of class content on students' harmonious passion. Thus, to the best of our knowledge, for the first time in the literature, we examined the effects of harmonious passion in an academic discipline such as mathematics, specifically in a sample of high school students. More importantly, we examined a specific teacher's characteristic of autonomy support – teacher emphasis on the usefulness of class content - that has never before been examined with regard to harmonious passion.

The first aim of the study was to test whether students perceive passion and motivation as different constructs. The second aim was to analyze whether harmonious passion

could predict math grades in high school students. The third aim was to analyze whether the relationship between harmonious passion and grades was mediated by motivation to learn. Finally, the fourth aim was to test whether teacher emphasis on the usefulness of class content could predict students' harmonious passion. Thus, this study provides support for the hypotheses tested. First, students perceive passion and motivation as different constructs (Hypothesis 1). At the group level, harmonious passion predicted math grades (Hypothesis 2), and this relationship was mediated by motivation to learn (Hypothesis 3). Moreover, harmonious passion was predicted by teachers' emphasis on the usefulness of class content (Hypothesis 4). Similarly, at the individual level, students who displayed higher levels of harmonious passion felt more motivated to learn and this was found to be related to higher math scores. Similarly, students with teachers that emphasized the usefulness of class content showed more harmonious passion.

3.1. Harmonious passion, intrinsic motivation, and math grades

We provided evidence of the relationship between harmonious passion and performance. This is in line with previous studies in other areas: music students (Bonneville-Roussy et al., 2011; Mageau et al., 2009), dramatic arts, and undergraduate psychology students (Vallerand et al., 2007). these findings are also consistent with findings outside the educational context, in which there is also evidence of the relationship between passion and performance (Mageau et al., 2009; Thorgren & Wincent, 2015; Vallerand et al., 2008).

On the other hand, our findings are consistent with previous research supporting the theory that the more harmonious passion, the greater the motivation. Thus, although only a few studies have analyzed how passion affects motivation within the educational context (Bonneville-Roussy et al., 2011; Coleman & Guo, 2013; Stoeber et al., 2011; Vallerand et al., 2007), the relationship between harmonious passion and motivation in other fields has been well documented (see Back, Lee, & Stinchfield, 2011; Curran, Appleton, Hill, & Hall, 2011; Fuster, Chamarro, Carbonell, & Vallerand, 2014; Lee, Chung, & Bernhard, 2013; Wang, Khoo, Liu, & Divaharan, 2008; Wang, Liu, Chye, & Chatzisarantis, 2011). We also found positive associations between motivation to learn and math achievement, and these results are in accordance with those found in previous research (see Areepattamannil et al., 2011; Murayama et al., 2013; Spinath et al., 2006).

Finally, our study provides evidence that the relationship between harmonious passion and math performance in high school students is mediated by motivation to learn, which is in agreement with previous studies, while passion is involved in high-level performance, it is not hypothesized to influence it directly (Vallerand, 2015).

4.2. Teacher emphasis on the usefulness of class content and harmonious passion

Although there is no research that has specifically used the concept of teaching quality regarding harmonious passion within the Self Determination Theory (Ryan & Deci, 2000b), previous research has shown that the more the students perceive their teachers as supportive of autonomous motivation, the more harmonious passion they display (see Bonneville-Roussy et al., 2013; Fredricks, Alfeld, & Eccles, 2010). Therefore, we

focused on a key autonomy support factor: teacher emphasis on the usefulness of class content. Our results provided consistent evidence that teachers who strive to explain the usefulness of class content and activities promote harmonious passion in their students, which predicts motivation to learn and grades. Because explaining the usefulness of class content is a strategy to support students' autonomy, our findings are consistent with Bonneville-Roussy et al. (2013) and Fredricks et al. (2010), who also showed a positive relationship between these two variables. Bonneville-Roussy et al., (2013) provided evidence that college students who perceived their tutors as supportive of autonomy manifested higher levels of harmonious passion than those who perceived their teachers to be controlling. Fredricks et al. (2010) observed that teachers who provided opportunities for choice and to work on varied activities, also promoted students' passion.

Finally, we looked at the mediational pathways of passion in the relationship between teachers' emphasis on the usefulness of class content and motivation to learn, and the mediational pathways of both passion and motivation to learn in the relationship between teacher emphasis on the usefulness of class content and math achievement. With regard to the former, we observed a significant indirect effect. Thus, we can conclude that the teacher can enhance motivation via students' passion. For example, if teachers explain why class content and activities are useful, students might feel more passion toward math, and thus, study for the pleasure of learning new things. In the relationship between teacher emphasis and math achievement regarding passion and motivation to learn, we saw a no significant indirect effect (p = .086). Thus, although we observed that teacher emphasis predicts passion, motivation to learn, and math

achievement, our data prevents us from discussing mediation. In another words, we cannot say that changes in math are exclusively due to passion and motivation to learn, accounting for teacher emphasis.

4.3. Limitations and future research

The results of this study should be understood by accounting for several limitations. The first limitation we would like to highlight is using students' math grades as the only indicator of math achievement. Although grades have a real-world impact on students' academic level and progress in grade school (Sánchez-Pérez, Fuentes, Pina, López-López, & González-Salinas, 2015) and they predict educational attainment and success (Thorsen & Cliffordson, 2012), we believe that for future research, it would be interesting to use standardized tests, such as the Woodcock Johnson Test (Woodcock, McGrew, & Mather, 2001) or the Symbolic Magnitude Processing Test (Brankaer et al., 2016).

The second limitation refers to the characteristics of the study. Because it is not a longitudinal study, we cannot establish causal relationships between the variables tested. Thus, it is important for future research to conduct longitudinal studies to test these relationships, and to assess whether the mediating variables can be understood as mechanisms to establish clear relationships between the variables (Kazdim, 2007).

Finally, it would also be interesting to test what other features of teaching quality encourage students' passion (e.g. teacher's care, class structure, acknowledgment of

positive feelings, etc.). Thus, we recommend further research to test what classroom practices promote students' passion and the application of training programs to show teachers the importance of passion and what they can do, concretely and specifically, to improve the passion of their students, which offers promising approach to improving their interest in the subject.

4.4. Conclusion

Passion is important for the field of education (Vallerand, 2016). In line with previous evidence, we found that passion influences motivation to learn, which improves academic achievement. Additionally, we have observed that teachers' emphasis on the usefulness of class content is associated with students' passion. Thus, taking into account previous research that has shown that passion leads to important outcomes, such as persistence, dedication, well-being, or competence, our first recommendation is the need for teachers to become aware of the essential role they play in helping their students to discover passionate school activities and their benefits.

Moreover, our study instructs math teachers to foster their students' passion by emphasizing the usefulness of the class content. This occurs when teachers, instead of merely explaining the concepts, illustrate why class content is useful and relevant, or when they explain to students how they might be able to apply what they are learning to real life or to other subjects. Although it is often not easy to explain the usefulness of some math content, an example may be to start a lesson on percentages by explaining

that percentages are useful for knowing the final prices on sales or to understand the quantity of ingredients in the products that they buy in the supermarket.

Teachers should also know that helping students to foster their own passion, even outside the school context, will help them to engage more easily in demanding curriculum activities (Haerens et al., 2016) and maintain their interest in classroom activities (Fredricks et al., 2010). This becomes even more important if we consider that math is a subject with lower levels of students' motivation (Leroy & Bressoux, 2016).

CHAPTER 4: STUDY 3. TEACHING QUALITY: RELATIONSHIPS BETWEEN PASSION, DEEP STRATEGY TO LEARN AND EPISTEMIC CURIOSITY

The purpose of this study was to examine the relationship between teaching quality and students' harmonious passion, deep strategy to learn and epistemic curiosity in math. To date, no studies have examined the relationship these variables. As well, never before was examined the effect of specific teachers' behaviors as providing optimal challenge, focusing on the process, and offering positive feedback on students' harmonious passion. So that, in this study we aim to analyze how these variables relate to each other within the secondary education context, specifically, regarding the subject of math.

Therefore, the following research questions were addressed to examine whether: (Research Question 1) teaching quality – specifically, providing optimal challenge, focusing on the process, and offering positive feedback – affects students' harmonious passion; (Research Question 2) students' harmonious passion predicts, at the individual and class level, students' deep strategy to learn; and (Research Question 3) students'

harmonious passion predicts, at the individual and class level, students' epistemic curiosity.

For our first research question we hypothesize, according to previous literature suggesting that certain teachers' aspects foster students' passion (e.g. Bonneville-Roussy et al., 2013; Coleman & Guo, 2013; Fredricks et al., 2010), that teaching quality – exactly providing optimal challenge, focusing on the process, and offering positive feedback – will predict students' harmonious passion. For the second and third research questions, consistent with the Dualistic Model of Passion (Vallerand et al., 2003) from which harmonious passion significantly influences cognitive processes, and previous research suggesting a close relationship between deep strategy to learn and epistemic curiosity with students who relish learning and deliberate engage on it (e.g., Chin & Brown, 2000; Dinsmore & Alexander, 2012; Litman, 2008; Piotrowski et al., 2014), we hypothesize that students' harmonious passion will be positively associated with students' deep strategy to learn and epistemic curiosity. To sum up, the following multilevel model was proposed (Fig. 1):

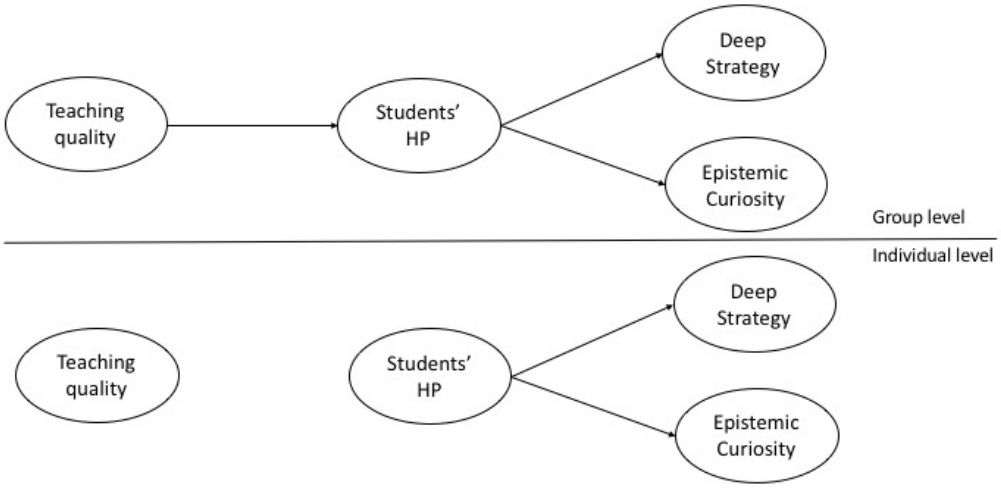

Figure 5. Multilevel model proposed

1. METHOD

1.1. Participants

We recruited 1121 students (566 females, 548 males, 7 not specified) from 7 high schools in Gran Canaria, Spain). The final sample comprised 1113 students (516 females, 482 males, 5 not specified) because responses from students identified as non-passionate towards Mathematics were discarded. Students were from second to fourth grades of secondary education (8^{th} to 10^{th} grades in the US system and their main age was 15.08 (SD = 1.0). All participants were informed about the data confidentiality and participation was strictly voluntary.

1.2. Procedure

We contacted high schools by phone to request an appointment with the high-school mathematics teachers in order to explain the study and request their cooperation. The school principals, math teachers and parents authorized students' participation in the study. Researchers personally administered questionnaires, emphasized the data anonymity and the need of accuracy in responses. Students were asked to complete the section of passion only if they loved a specific activity related to mathematics. Students who did not complete this section were detected as non passionate toward math and were removed from the final sample.

1.3. Measures

Participants completed a questionnaire with demographic questions and measures of harmonious passion, deep strategy to learn, and epistemic curiosity. Students also completed questions about three indicators of teaching quality: if teachers provide optimal challenge, focus on the process, and provide positive feedback. To examine reliability, we used McDonald's Omega (1999), since it has shown evidence of better accuracy that Cronbach's alpha (Mcneish, 2017; Revelle & Zinbarg, 2009), it does not requires data to be continuous (Bonanomi, Cantaluppi, Nai Ruscone, & Osmetti, 2015), and does not require factor loading to be equal for all items (Zhang & Yuan, 2016). To examine factorial validity, we performed a confirmatory factor analysis for each variable. We extend information about the estimation method and missing data in the data analysis section. All scales were rated on a 7-point Likert-type scale, ranging from 1 (*I do not agree at all*) to 7 (*I strongly agree).*

1.3.1. Harmonious passion

We used six items of the Passion Scale (Vallerand et al., 2003) adapted to Spanish and to the educational context to assess students' harmonious passion (e.g. "This activity reflects the qualities I like about myself"). The Spanish translation of the scale was performed by two Spanish-speaking researchers and revised by a bilingual specialist, according to the standards for cross-cultural adaptation (Muñiz et al., 2013). Regarding the CFA, the χ^2 value and fit indexes were χ^2 (1112, 18) = 614.839 (p = .00), RMSEA = .182, $SRMR_{within}$ = .044, $SRMR_{between}$ = .042, CFI = .97 and TLI = .95, and McDonald´s Omega was .89.

1.3.2. Deep strategy to learn

We used the three items (e.g. "While I am studying, I often think of real life situations to which the material that I am learning would be useful") from the Deep Strategy subscale of the Shortened Study Process Questionnaire (Fox et al., 2001). Regarding the CFA, the model is just identified, so no fit index could be computed. McDonald's Omega was .63.

1.3.3. Intellectual curiosity

We used 10 items (e.g. I find it fascinating to learn new information) from the Spanish-Argentine variant (Litman, Cosentino, & Solano, 2016) of the Epistemic Curiosity Scale (Litman & Spielberger, 2003). Regarding the CFA, the χ^2 value and fit indexes were χ^2 (1112, 18) = 775,510 (p = .00), RMSEA = .097, $SRMR_{within}$ = .039, $SRMR_{between}$ = .073, CFI = .97 and TLI = .96, and McDonald's Omega was .91.

1.3.4. Teaching quality

We used 16 items from the scale developed by (León, Garrido, & Núñez, 2016) to assess teaching quality. These items cover the students' perceptions of specific teachers behaviors of three teaching quality indicators: positive feedback (if the teacher provides specific, quick and positive feedback), optimal challenge (if the teacher explain in class and assign the activities accounting for the students level) and, focus on process (if the teacher emphasizes the importance of learning and working in class rather than just focusing on passing and getting good marks). Regarding the CFA, the χ^2 value and fit

indexes were χ^2 (1112, 18) = 13512,266 (p = .00), RMSEA = .070, $SRMR_{within}$= .041, $SRMR_{between}$= .032, CFI = .97 and TLI = .97, and McDonald's Omega was .95.

1.4. Data strategy

Because assessment of the school effects, classroom or teachers' characteristics on students' outcomes must be based on analysis performed at the group and not at the individual level (Lüdtke et al., 2009; Marsh et al., 2012; Stapleton, McNeish, et al., 2016), we tested our hypotheses running a multilevel structural equation model (MSEM) where teaching quality predicted students' harmonious passion, and this in turn, students' deep strategy to learn and epistemic curiosity.

In multilevel modelling, it is common the use of variables that have the same value for all students in the class and variables estimated according to the aggregation of students' perceptions. Regarding the latter, we can find contextual and climate variables (Marsh et al., 2012). Contextual variables are group-level aggregations of students-level variables that are specific to students in a class (in our study: Class-average harmonious passion, class-average deep strategy, and class-average epistemic curiosity), and values are assigned according to individual characteristics and not based on a common reference. On the other hand, climate variables are those resulting from asking students about one variable that is common to students in the same class (in our study: the teaching quality indicators), so the reference is the same for all students in one class. In this study, we focus on contextual (harmonious passion, deep strategy, and epistemic curiosity), and climate constructs (teaching quality).

Our goal was to test the relationships between climate and students' variables, and according to Marsh et al. (2012), teaching quality should be introduced at the classroom but not at the individual level because students' responses at this level do not reflect the contextual influences, but just their individual perceptions. Students' harmonious passion, deep strategy to learn, and epistemic curiosity, were introduced at the individual and classroom levels because it allows to separate the variance between the two levels of analysis (Friedrich et al., 2015), and to obtain more information about the relationship between the variables, and about the variables itself (Morin et al., 2014). In this sense, harmonious passion, deep strategy to learn, and epistemic curiosity are not only indicators at the individual level, but if aggregated they are also an indicator of a shared characteristic of the class. To test the mediational effect of harmonious passion between teaching quality and deep strategy and epistemic curiosity, we computed the unstandardized indirect effects and its standards errors using the delta method (Sobel, 1982).

Regarding the estimation method, we used weighted least square mean adjusted (WLSM) estimator, because the observed variables (items) were ordered categorically and this estimation method is more accurate than Maximun Likelihood (Schmitt, 2011). We also handled missing data using the full information maximum-likelihood method. It provides unbiased parameters in missing at random circumstances and even when data is not missing at random (Enders, 2010). Analysis were conducted using the software Mplus 7.4 (Muthén & Muthén, 2017).

2. RESULTS

2.1. Preliminary analysis

Means, standard deviations, intraclass correlations, and correlations between major variables are shown in Table 1. Means varied between 3.869 (Harmonious Passion) and 4.944 (Teacher Focus on the Process), and standard deviations between 1.767 (Teacher Optimal Challenge) and 1.259 (Epistemic Curiosity). With regard to correlations, at the individual level, they ranged from .346 (Deep Strategy to Learn with Focus on the Process) to .959 (Positive Feedback with Optimal Challenge), and at the group level, they ranged from .170 (Focus on the Process with Passion) to .703 (Positive Feedback with Optimal Challenge).

Table 6
Descriptive statistics and correlations between major variables

	Mean	SD	ICC	1	2	3	4	5	6
1 Deep Strategy	4.717	1.267	.067		.820	.841	.427	.565	.346
2 Curiosity	3.918	1.259	.099	.535		.722	.582	.604	.458
3 Passion	3.869	1.471	.105	.327	.498		.473	.509	.442
4 Positive feedback	4.898	1.685	.385	.294	.327	.252		.959	.949
5 Optimal challenge	4.494	1.767	.293	.255	.318	.253	.703		.935
6 Focus on process	4.944	1.729	.260	.183	.236	.170	.626	.498	

Note. Lower diagonal triangle: Group level correlations. Upper diagonal triangle: Individual level correlations.

2.2. Teaching quality, harmonious passion, deep statrategy to learn, and epistemic curiosity

We tested the hypothesized model, in which Teaching Quality predicts students' Harmonious Passion and this, in turn, predicts students' Deep Strategy to Learn and Epistemic Curiosity.

The χ^2 test and fit indexes for the MSEM were χ^2 (1112, 1100) = 10230.016 (p = .000), RMSEA = .086, $SRMR_{within}$ = .061, $SRMR_{between}$ = .108, CFI = .94, TLI = .93. As depicted in Figure 2, at the group level, Teaching Quality predicted Harmonious Passion (β = .631; SE = .099; *p* < .001), Harmonious Passion predicted Deep Strategy (β = .874; SE = .132; *p* < .001), and Epistemic Curiosity β = .953; SE = .081; *p* < .001. At the individual level, Harmonious Passion predicted Deep Strategy (β = .614; SE = .131; *p* < .001), and Epistemic Curiosity (β = .749; SE = .018; *p* < .001).

With regard to the mediational effect of Harmonious Passion in the relationship between Teaching Quality and Deep Strategy to Learn, the unstandardized effect in the fully mediated model was significantly different from 0 (β = .127; SE = .041; *p* = .002). Regarding the mediational effect of Harmonious Passion in the relationship between Teaching Quality and Epistemic Curiosity, the unstandardized effect in the fully mediated model was also significantly different from 0 (β = .152; SE = .047; *p* = .001).

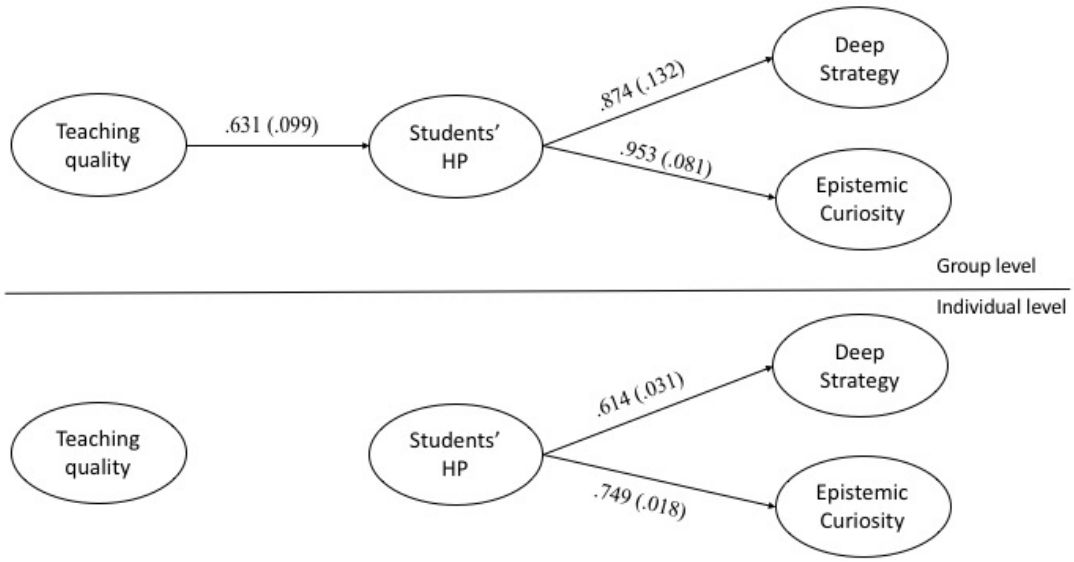

Figure 6. Results of the multilevel structural equation model. The standardized parameters are above the narrows; standard errors are between parentheses.

3. DISCUSSION

Building in prior research suggesting the role of teachers in fostering students' passion and the effect of harmonious passion in cognitive processes, in this study we attempted to analyze, on the one hand, the effect of a passion predictor: teaching quality, and, on the other, two consequences of passion: deep strategy to learn and epistemic curiosity. To the best of our knowledge, never before has been examined how the three specific teaching quality indicators tested in this study – teachers providing optimal challenge, offering positive feedback and focusing on the process – influence students' harmonious passion, and how this, in turn, affects their deep strategy to learn and epistemic curiosity. Moreover, it seems particularly important to analyze these relationships in a sample of secondary math teachers and students, since at this period the students' interest in the subject declines and it is important to offer teachers specific and concrete strategies to promote a better learning toward this subject.

This study provided support for the hypotheses tested. First, teaching quality affects students' harmonious passion (Hypothesis 1). Secondly, students' harmonious passion affects their deep strategy to learn (Hypothesis 2), and third, students' harmonious passion also predicts their epistemic curiosity (Hypothesis 3).

On the one hand, we provided evidence of the relationship between teaching quality and harmonious passion. In this sense, results indicated that a significant amount of the variance in harmonious passion (10%) was due to the context, so there is a significant scope for action and improvement to foster students' passion.

Although there is no research that has specifically tested the teachers' aspects assessed in this study, previous research on passion has shown that the more students' perceive their teachers as autonomy supportive, the more harmonious passion they display. In this sense, in this study we focused on three strategies that support students' autonomy (Tessier et al., 2010) – teachers focusing on the process, providing optimal challenge, and offering positive feedback – so our findings are consistent with those studies that showed a positive relationship between these variables (e.g. Bonneville-Roussy, Vallerand, & Bouffard, 2013; Coleman & Guo, 2013; Fredricks, Alfeld, & Eccles, 2010). Bonneville-Roussy et al. (2013) noticed that college students who perceived their teachers as autonomy supportive rather that controlling, displayed higher levels of harmonious passion. Coleman and Guo (2013) observed, in a sample of middle school students, that passionate learners tend to perceive their context as autonomy supportive. Finally, Fredricks et al. (2010) also noticed that passionate students usually perceived their teachers to be caring, encouraging and supportive, as well as they observed that their teachers usually provided opportunities for choice and to work on

varied activities. However, unlike in our study, none of these have analyzed the relationship between teaching quality and passion taking into account the nested data structure, so their results could be interpreted as reflect of individual rather that contextual differences (Hospel & Galand, 2016).

On the other hand, our results also provide evidence of the association between students' harmonious passion and their deep strategy to learn and epistemic curiosity. Although no studies to date have analyzed these connections, our results fit well within the Dualistic Model of Passion (Vallerand, 2003). Earlier studies have suggested, in different contexts, a close relationship between harmonious passion and other cognitive processes as concentration (e.g. Forest, Mageau, Sarrazin, & Morin, 2011; Ho, Wong, & Lee, 2011), resilience and mental toughness (e.g. Gucciardi, Jackson, Hanton, & Reid, 2015), or absorption (Stoeber et al., 2011). Although it is difficult to stablish comparisons between our and previous results, ours could be also in line with the vast literature that has suggested a close relationship between deep strategy to learn and epistemic curiosity with students who relish learning and they deliberate engage on it (e.g., Chin & Brown, 2000; Dinsmore & Alexander, 2012; Litman, 2008; Piotrowski et al., 2014).

Finally, to complete our model, we looked at the mediational pathways of students' harmonious passion between teaching quality and students' deep strategy and epistemic curiosity. In this sense, we observed a significant indirect effects in all relations, so we can conclude that the teaching quality can enhance students' deep strategy to learn and epistemic curiosity via their harmonious passion. For example, if teachers focus on the process and not emphasize just the final result, they offer positive

feedback and they take into account students' level when teaching, students might feel more harmonious passion toward math, and thus, engage in the subject adopting a deep approach and for the pleasure of acquiring new knowledge.

To sum up, as was expected, our study provides evidence - for the first time in the literature, in an academic discipline such as mathematics, and taking into account the nested data nature - for the effect of specific teachers' behavior as providing optimal challenge, focusing on the process, and offering positive feedback, on the students' harmonious passion. As well, we also provide evidence, for the first time, for the effect of students' harmonious passion and their deep strategy to learn and epistemic curiosity.

3.1. Limitations and future research

Despite the novel features of the present research, the results should be considered accounting for the following limitations. First, because it is a cross-sectional study, it is impossible to establish casual relationships between the variables tested. Although previous research evidences that teachers' characteristics influence on students' practices, and that harmonious passion predicts cognitive processes, in this study we cannot provide accurate information about the direction of the effects. Thus, we propose for future research to assess these directions conducting longitudinal studies, as well as to test if the mediating variables can be considered as mechanism to establish clear associations between the variables (Kazdim, 2007).

The second limitation refers to the nature of our data. Although aggregated students' perceptions are a reliable measures of classroom characteristics (Morin et al., 2014; Wentzel, Muenks, McNeish, & Russell, 2017), we suggest for future studies to be complemented by other approaches, including the own teacher perception and observers' ratings.

Finally, because no previous studies have analyzed the variables that we have tested, it is very difficult to stablish comparisons between our results and previous one. So that, more studies using multilevel analyses are needed to reproduce and give consistency to our results. As well, it is interesting for future research to test other classroom practices that promote students' passion, in order to propose training programs to show teachers how they can improve their students' passion, and the importance of passion in other aspects that contribute to the optimal functioning in the subject and the classroom.

3.2. Conclusion

We adopted a multilevel model to test if teaching quality affects students' harmonious passion and this, in turn, their deep strategy to learn and epistemic curiosity. As expected, the results confirmed the hypotheses tested. Taking into account our results and previous studies where passion has been related to other important outcomes, we encourage teachers to realize the importance they have in fostering students' passion. The results of this study contribute to instruct math teachers about three specific strategies that they can take into account to foster their students' passion: providing

students' optimal challenge, focusing on the process, and offering them positive feedback.

CHAPTER 5: MAIN RESULTS AND DISCUSSION

The main section of this dissertation is composed by three studies performed with the aim of meeting the following objectives:

1. To know what passion is and to offer an analysis about its role in education.
2. To comprehend why passion is important in the educational context: What are its benefits or consequences.
3. To analyze how passion can be promoted: What are its predictors.

Thus, we conducted a systematic review to know, first, the state of the question: what the different authors understood by passion and what were its consequences and predictors in the educational context studied so far. Then, based on the results of this systematic review, two other studies were conducted to examine the relationships between passion and other consequences and predictors never before analyzed. Hence, the second study were performed to analyze the relationship between the teachers' emphasis on the usefulness of the class content and students' harmonious passion, their intrinsic motivation to learn, and their academic performance in math. On the other

hand, the third study examined the relationship between three teachers' specific aspects (teachers providing optimal challenge, offering positive feedback, and focusing on the process) and students' harmonious passion, their epistemic curiosity, and their deep strategy to learn. Further along, we present the main results obtained in relation to each of the aims set, as well as a brief discussion on them.

1. TO KNOW WHAT PASSION IS AND TO OFFER AN ANALYSIS ABOUT ITS ROLE IN THE EDUCATIONAL CONTEXT

This first objective was specially addressed by the first study, in which a systematic review was carried out to determine what the different authors understood by passion and what were the elements or characteristics that defined it. In this review we analyzed 13 studies published between 2004 and 2013, of which six used in their analysis a quantitative methodology and seven a qualitative methodology. Through this review we identified six definitions of passion.

Although all of the quantitative studies used the conceptualization of Vallerand et al. (2003), most authors of the qualitative studies tended to use their own definitions. However, several common features were detected throughout the different conceptualizations. To identify them, the two authors of the systematic review read the definitions and extracted the features used by the researchers to describe the concept. These were: a) a loved activity or that the individual likes very much: An activity characterized by a strong positive inclination of the subject towards it (eg. "I'm looking forward to it being Friday because I play basketball and I love it"); b) identification: It is

the degree to which the individual uses the activity to define itself, he or her feels that the activity is part of who he or she is (eg. "I do not only play the violin, but I feel a violinist"); c) dedication: The time dedicated continuously, daily or weekly, to the activity (eg. "I love solving math problems and I spend many of my free afternoons solving them"); d) persistence: Interest in the activity is enduring over the time and lasts for many years or even the whole life (eg. "At the age of 12 I discovered that my true passion was to paint. Since then and for more than 15 years I have been taking classes in different academies "); e) caring: Passionate teachers show interest and concern for their students (eg. "I really feel an interest in my students, their personal hobbies and how they feel in class"); f) positive relationships: good relationships with peers and students (eg. "I get along very well with my students and other teachers"); g) supportive context: To be surrounded by people who support the individual's passion (eg. "I love the subject of music and that is why my parents and teachers have encouraged me to do the admission tests to the conservatory to expand my knowledge"); h) positive emotions: Good feelings while the person is performing the activity that he or she is passionate about (eg. "I feel alive and happy when I solve new mathematical equations"); i) specific domain: The person is interested in a particular activity and shows relative disinterest to others (eg. "What I like most in school is the subject of geography, so when I am in language class or mathematics I abstract myself by trying to remember the capitals of some countries or drawing the last flags that I learned).

In total, nine elements or characteristics of passion were identified. As the quantitative studies used the definition of Vallerand et al. (2003), all of them shared identical elements. In this way, in all quantitative studies, passion was defined as a strong

inclination towards an activity that a person likes very much (or loves), values, with which he or she feels identified, and to which he or she dedicates a lot of time in an enduring and regular time (persistence and dedication). However, the qualitative studies presented a greater disparity in the elements used to describe passion. Thus, two studies (Clark, 2012; Oliver y Venville, 2011) agreed with Vallerand et al. (2003) when referring to the passionate activity as a loved activity, and one (Fredricks et al., 2010), when including the identification, the dedication, and the value in the definition of passion. On the other hand, Coleman and Guo (2013) referred to persistence and specific domain, Hobbs (2012) and Clark (2012) to the feeling of care, concern, and positive relationships, and Day (2004) y Oliver y Venville (2011) to positive emotions.

Thus, it was observed that the most common characteristic among the different definitions of passion was dedication (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Oliver y Venville, 2011; Vallerand et al., 2003), it suggesting that people who feel more passion for an activity are those who spend more time on it. The love for the activity (Clark, 2012; Oliver y Venville, 2011; Vallerand et al., 2003), to feel identified with the activity (Vallerand et al., 2003; Fredricks et al., 2010; Oliver y Venville, 2011), and to experience positive feelings and sensations were also common characteristics of the different conceptualizations of passion. However, in spite of these common elements or characteristics, it was observed that only some authors had clearly defined the concept Coleman y Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver y Venville, 2011; Vallerand et al., 2003), and only Vallerand et al. (2003) provided a sufficiently consistent theoretical and scientific foundation, which makes its theory and conceptualization currently the most accepted and widespread among the scientific community.

2. TO COMPREHEND WHY PASSION IS IMPORTANT IN THE EDUCATIONAL CONTEXT: WHAT ARE ITS BENEFITS OR CONSEQUENCES.

The second objective of this dissertation was approached through the three studies from chapters two, three, and four. In the first study, the systematic review, we made an analysis of the literature to know why passion was important and what were the consequences that had been attributed to it in the educational context so far. In the second and third studies was analyzed the relationship between passion and other students' variables not studied until them (intrinsic motivation to learn, math performance, epistemic curiosity, and deep strategy to learn), thus contributing our studies to broaden the information regarding the results or consequences of passion in the educational context.

Thus, the results of the systematic review revealed that the most relevant (or the most studied) consequence of passion in the educational context was the goal orientation (Bonneville-Roussy et al., 2011; Fredricks et al., 2010; Hobbs, 2012; Phelps y Benson, 2012; Vallerand et al., 2007). In such a way, it becomes clear that the most passion of the students, specially the most harmonious passion, the greater will be their tendency to focus on the improvement of their personal competence and, therefore, the better will be their academic performance. Students' well being was also an appreciable consequence of passion, highlighting several studies (Bonneville-Roussy et al., 2011, 2013; Vallerand et al., 2007) the impact of harmonious passion on a greater student's sense of subjective well-being and life satisfaction. On the other hand, dedication or the regular time spent in the activity, was also one of the most analyzed effects of passion, highlighting several studies (Bonneville-Roussy et al., 2011; Stoeber et al., 2011;

Vallerand et al., 2007) that the most harmoniously passionate students spent more time performing the academic activity that they were passionate about, so that, it would be also expected a higher students' academic performance. Finally, studies reviewed also evidence the effect of harmonious passion on students' persistence (Bonneville-Roussy et al., 2013), their academic engagement (Stoeber et al., 2011) and their creativity (Luh y Lu, 2012).

On the other hand, in studies from chapters 3 and 4, harmonious passion was examined in relation to other consequences that were not examined until now: Math performance, intrinsic motivation to learn, deep strategy toward learning, and epistemic curiosity. Thus, the results of the second study provide evidences of the effect of the students' harmonious passion for a specific activity related to mathematics in their subjects' performance. These results, which showed that the more students' harmonious passion, the more their performance, agreeing with the conclusions of previous studies that also analyzed the relationships between these variables, both within (eg. Bonneville-Roussy et al., 2011; Mageau et al., 2009; Vallerand et al., 2007), and outside the educational context (ej. Mageau et al., 2009; Thorgren y Wincent, 2015; Vallerand et al., 2008). Likewise, these results also concur with previous literature (eg. Coleman y Guo, 2013; Fuster, Chamarro, Carbonell y Vallerand, 2014; Stoeber et al., 2011), noticing that the relationship between students' harmonious passion and performance was not direct, but was mediated, in this case, by the intrinsic motivation to learn. Thus, the results of this study provides evidence that the greater the students' harmonious passion, the greater was their motivation to learn, which in turn had an impact on their subject's performance.

The third study also analyzed the relationship between students' harmonious passion and their deep strategy to learn and their epistemic curiosity. Although previous studies had suggested, in different contexts, the effect of harmonious passion on some cognitive processes such as concentration (eg. Forest, Mageau, Sarrazin y Morin, 2011; Ho, Wong y Lee, 2011), resilience and mental strength (eg. Gucciardi, Jackson, Hanton y Reid, 2015) and absorption (Stoeber et al., 2011), the variables raised in this study were not considered as potential consequences of harmonious passion until now. Thus, the results of this study also expand the knowledge about the effects of passion in the educational context, showing evidences that the students' harmonious passion affects, on the one hand, to their ability to significantly engage in an activity, analyzing, comprehending, and relating the new information with their previous experiences or knowledge; on the other hand, in their desire to acquire new knowledge just, mainly, for enjoying doing it.

3. TO ANALYZE HOW PASSION CAN BE PROMOTED: WHAT ARE ITS PREDICTORS.

The third objective of this dissertation was approached, likewise, by the three studies presented. Firstly, we detected in the systematic review what passion's predictors had been analyzed in the educational context so far, to propose in the two later studies, new relations between harmonious passion and other teachers' characteristics that could promote it.

The results of the systematic review revealed that, while the quantitative studies focused on analyzing the consequences of passion, the characteristics that promote it were explored mainly by the qualitative research. Thus, to provide a supportive context (Coleman y Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver y Venville, 2011; Phelps y Benson, 2012) and to foster positive relations (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Phelps y Benson, 2012), were the variables most related to the promotion of passion. Hence, this studies emphasized the importance of families, peers, and teachers in the development of students' passion, and highlighted that those students who received support from their closest context were more likely to increase and maintain this passion over time. Teachers' autonomy support (Bonneville-Roussy et al., 2013; Fredricks et al., 2010) and to feel identified with the activity (Bonneville-Roussy et al., 2013; Fredricks et al., 2010; Oliver y Venville, 2011) were also prominent predictors of passion in the educational context.

Once analyzing the results of the systematic review, studies two and three examined the relationship between four specific teacher's characteristics and the harmonious passion of their students. Thus, in the second study we analyzed the influence of teacher's emphasis on the usefulness of the class content in students' harmonious passion. Results of this study showed that those teachers who stressed the importance of explaining why the class contents were useful and relevant, were more likely to foster their students' harmonious passion. Similarly, results from the third study also showed the significance of three specific teachers' strategies that were related with students' harmonious passion: teachers' providing optimal challenge, focusing on the process, and offering positive feedback. Although no research had previously analyzed the

influence of these four specific teachers' characteristics on students' passion, from the Self-Determination Theory (Deci & Ryan, 1985, 2017) it is considered that the use of these strategies promotes students' autonomy (Tessier, Sarrazin y Ntoumanis, 2010), so the results obtained were consistent with the literature that revealed a positive relationship between teachers' autonomy support and their students' passion (ej. Bonneville-Roussy, Vallerand y Bouffard, 2013; Coleman y Guo, 2013; Fredricks, Alfeld y Eccles, 2010).

CHAPTER 6: CONCLUSIONS

1. GENERAL CONCLUSIONS

From the results obtained in this dissertation, the following conclusion can be drawn:

- The most accepted, extended and validated conceptualization of passion comes from Vallerand et al. (2003). They define passion as a strong inclination towards an activity that one likes very much (or loves), highly values, with which the individual feels identified, and to which he or she dedicates a lot of time in a regular and endured time (dedication and persistence).

- Dedication, love for the activity, feeling identified with it and experiencing positive feelings while performing the activity are characteristics that most authors attribute to passionate people.

- Passion and intrinsic motivation are different constructs. The main difference lies in the activity's internalization that passionate people do, faced with intrinsically motivated people, in them identity.

- From a psychological-motivational perspective, the study of passion is very recent. So that, the analysis of its role in the educational context is still scarce compared to other areas such as sports, video games or the work context.

- One of the most important consequences of harmonious passion in the educational context is task orientation. So that, students with higher levels of harmonious passion tend to be more focused on improving their personal competence.
- Harmonious passion also affects to students' well-being, time spent to an activity, persistence, academic engagement and creativity. It is also related to their intrinsic motivation to learn, academic performance, deep strategy to learn and epistemic curiosity.
- Passion is not a fixed characteristic in people. Thus, there are certain strategies that teachers can apply to promote passion in their students. The most relevant predictors of passion are: Providing a supportive context, fostering positive relations, and supporting students' autonomy.
- To emphasize the usefulness of class content, to propose activities that fit the students' level, to offer positive feedback and to focus on the process and not only on the result, are specific strategies that teachers can carry out to promote passion in their students.

2. GENERAL LIMITATIONS AND FUTURE LINES OF RESEARCH

The results of this dissertation must be interpreted considering several limitations. On the one hand, since the aim of this paper was to examine the role of passion in the educational context, other researches outside the school context were not analyzed in depth (eg. Bélanger, Lafrenière, Vallerand & Kruglanski, 2013, Carpentier, Mageau & Vallerand, 2012; Froh et al., 2010; Mageau & Vallerand, 2007; Vallerand, 2008). In theory, these studies could have provided significant information on various predictors and consequences of passion. In this sense, future research could consider these studies

and analyze the multiple relationships between passion and other variables proposed by their authors into the educational context.

On the other hand, the second limitation is linked to the characteristics of studies two and three. Because both researches are cross-sectional and not longitudinal, causal relationships between the variables have not been established. Therefore, it would be advisable performing future longitudinal studies to evaluate these relationships and to determine if the mediating variables can be interpreted as mechanisms to establish clear relationships between the analyzed variables (Kazdim, 2007).

The third limitation is specifically related to the second study, in which students' math scores were used as the only indicator of their performance in the subject. Thus, although grades have a real impact on academic level and students' progress (Sánchez-Pérez, Fuentes, Pina, López-López & González-Salinas, 2015), and predict educational attainment and success (Thorsen & Cliffordson, 2012), it would be interesting that future studies use standardized tests, such as the Symbolic Magnitude Processing Test (Brankaer, Ghesquière & De Smedt, 2016).

Finally, it is interesting for future research to identify, within the educational context, other variables that could be related with students' passion, both predictors and consequences. In this sense, it is recommended that researchers focus on determined and specific teachers' characteristics as far as possible, in order to facilitate their instruction through interventions and their subsequent application by teachers.

3. IMPLICATIONS IN THE EDUCATIONAL CONTEXT

Allowing for the results of the three studies presented in this dissertation, and previous research which highlight the importance of passion in the educational context and the ability of external agents to shape it, teachers are invited to notice the importance that they acquire in the passion's development of their students. Teachers should be aware of the great privilege that they have to infect and help students to develop their passion, both towards the subject they teach and to other activities outside the classroom, because it will also influence their interest in class activities (Fredricks et al., 2010; Haerens, Vansteenkiste, Aelterman & Van den Bergh, 2016).

Likewise, this dissertation provides useful and practical tools that teachers (in theory, math's teachers but probably can be extrapolate to other subjects) could considered to improve their students' passion. In this way, it is recommended that teachers do not only focus on the explanation of concepts. They should underscore on the usefulness and relevance of the contents that they explain in class, as well as the practical application of those contents in other subjects or in the student's daily life.

Furthermore, it is also important that teachers emphasize the importance of internalizing the meaning and usefulness of class activities, valuing the process and not only the final result obtained by students. The proposed activities, moreover, must be adjusted to the class's level.

Finally, it is recommended that teachers offer positive feedback to their students, in other words, to guide them through constructive and positive instructions, emphasizing

what students have done well, what they should improved and how they can do it to develop it.

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APPENDIX I

THE ROLE OF PASSION IN EDUCATION: A SYSTEMATIC REVIEW

(Status: Published in Educational Research Review)

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Abstract How do researchers define passion? What are the outcomes of passion? What variables ignite passion? To answer these questions, we performed a systematic review of studies within the context of education. After conducting a search in major electronic databases, we presented the primary findings of 13 articles from 2004 to 2013. This review indicates that the most shared features of passion´s conceptualization are dedication, persistence, identification with and love for the activity. Passion research in education revealed a diversity of consequences, such as engagement, creativity, the subject's election or mastery goals, and a diversity of promoters, such as positive relationships, supportive context or an innovative cognitive style. An understanding of passion is important in fostering students' adjustment and knowledge. We conclude this review with some theoretical and methodological suggestions for future research.

Key words: passion, academic context, systematic review, students, performance

Passion is a promising approach for a better educational future. It leads individuals to dedicate themselves fully to an activity, propels persistence despite obstacles and enables individuals to remain dedicated to a specific activity for years or even a lifetime, engendering the high levels of commitment and everyday practices necessary to achieve excellence (Vallerand et al., 2007; Vallerand, 2008; Bonneville-Roussy et al., 2011). Passion has also been linked to academic productivity (Martínez, Floyd, & Erichsen, 2011; Mayrath, 2007), students' well-being and positive affect (Fredricks, Alfeld, & Eccles, 2010).

Despite its importance in the educational context and the fact that passion for an activity has received much attention from popular culture, attention from scholars has been limited (Coleman & Guo, 2013; Fredricks et al., 2010). In fact, most empirical studies have focused on romantic passion (Hatfield & Walster, 1978) and only a few studies have been conducted empirically on one's passion for an activity (Carbonneau, Vallerand, Fernet, & Guay, 2008; Luh & Lu, 2012). Thus, this dearth of literature within the educational context and on how passion is experienced by children (Coleman & Guo, 2013), associated with the use of the concept to represent different ideas, results in the lack of a clear and accepted definition.

The Concept of Passion

Most extended definitions of passion come from the dualistic model of passion in Vallerand et al. (2003), in which Vallerand and colleagues define passion as "a strong inclination toward a self-defining activity that one likes (or loves), finds important, and in which one invests a significant amount of time and energy". In this model, Vallerand et al. (2003) proposed two types of passion, harmonious and obsessive, each type associated with different experiences, outcomes and manners in which to merge an

activity into one's identity. People participating in an activity with harmonious passion believe that the activity is consistent with their values and the manner in which these individuals understand life; that is, harmonious passion comes from an autonomous internalization of the activity and leads people to freely engage in that activity. Conversely, obsessive passion originates from a controlled internalization and leads people to experience an uncontrollable urge to engage in an activity (Bonneville-Roussy et al., 2011; Bonneville-Roussy, Vallerand, & Bouffard, 2013; Carbonneau et al., 2008; Luh & Lu, 2012; Vallerand et al., 2007). This controlled internalization occurs when individuals engage in an activity because they feel pressured and controlled by the social environment or because external contingencies as feelings of self-esteem or social acceptance (Vallerand, 2015). Obsessive passion leads to fewer adaptive outcomes than harmonious passion. It causes the individual to experience and display negative emotions during the activity and to believe that the activity is controlling the person. The activity also occupies nearly the entirety of the person's identity, causing conflicts with other aspects of the person's life (Vallerand et al., 2003). Vallerand (2015) explains that although the first internalization process that occurs could initially determine the predominant type of passion, the types are not fixed and may fluctuate for significant reasons. The first reason is that people when are older and more mature increasingly use adaptive processes, which implies an increase in harmonious passion. This relationship is explained because harmonious passion results from an autonomous internalization process, so this provides full access to adaptive self-process (Vallerand, 2015). Thus, when people grew older they are more likely to use adaptive self-processes (Sheldon, Kasser, Houser-Marko, Jones, & Turban, 2005), so passion tends to become harmonious over time.

The second reason why passion can vary concerns the situational context in which the internalization process occurs. According to Vallerand (2015), although both types of passion are present in a person, controlling social and personal situational factors renders it possible to convert one type of passion into another. Thus, a person's initial harmonious passion will slowly evolve into obsessive passion if the person regularly engages in a controlling environment; conversely, an autonomous supportive environment can help an obsessive passion become harmonious.

Within educational settings, scholars have primarily studied the concept of passion from two perspectives: (1) the passion that students may feel toward a particular topic and (2) the passion that teachers have for their profession, the subject they teach or various aspects of teaching and learning. Hence, Coleman and Guo (2013) use the term *passion for learning* to refer to a focused interest in a particular domain that persists over time and is associated with relative disinterest in other activities that are interesting to peers. Liston and Garrison (2004) describe passion in education as an educator's love for ideas, love for educating others and love for students. According to Day (2004), to be passionate about teaching not only comprises expressing enthusiasm; passionate teachers have a passion for their subject and their pupils and a passionate belief that who they are and how they teach can make a difference in their students' lives. Within this context, passionate teachers feel a deep love for their jobs (Elliott & Crosswell, 2001); experience lower levels of burnout and higher levels of work satisfaction; show positive attitudes toward the context; embrace collaboration and maintain strong and positive connections with students, parents and peers, thus positively influencing students' academic performance.

Passion and Related Constructs

Passion's framework shares conceptual similarities with other motivational constructs (Vallerand et al., 2003); thus, the use of the concept to represent different ideas is common, an unfortunate "conceptual confusion" that occurs too often in our field (Murphy & Alexander, 2000). It may be easy to overlap different concepts that appear to represent the same idea. Thus, terms such as motivation, flow, zest, grit, well-developed interests, talent-related activities and commitment are frequently confused with passion.

According to Vallerand et al. (2003, 2007), the difference between passion and motivation lies in the internalization or non-internalization of the activity into one's identity. Intrinsic motivation and passion share the engagement in an activity for pleasure and enjoyment (Vallerand et al., 2007); in addition, both involve a love for the activity (Vallerand, 2015). However, when a person feels intrinsically motivated toward an activity, that activity is not internalized into the person's identity, but emerges from the person-task interaction on the short-term level (Koestner & Losier, 2002). People frequently display intrinsic motivation toward activities of little personal value (Vallerand, 2015). The theory of intrinsic motivation does not share the duality of passion (Vallerand, 2015), it means that, while the Dualistic Model of Passion proposes two types of passion associated with different outcomes, intrinsic motivation theory is is hypothetically related only to adaptive outcomes (Deci & Ryan, 2000; Vallerand, 2015). Conversely, the difference between passion and extrinsic motivation is the absence of linking to the activity; extrinsically motivated people perform and enjoy the activity because of something outside of the activity (Vallerand et al., 2003). In this regard, although there are also different types of extrinsic motivation as integrated and

identified regulation (Ryan & Deci, 2000) that share with passion the internalization of the activity into one's identity, the difference between these types of regulation and passion is that the former refers to engage in an activity to obtain something separate form it, and not for the love for the activity itself, even though it involves a valuation and internalization of the activity into the person's identity (Vallerand, 2015).

These differences between passion and motivation have been empirically supported by various studies. Vallerand et al. (2003) showed that passion correlates only moderately at best with extrinsic and intrinsic motivation. In addition, researchers, such as Houlfort, Philippe, Vallerand, and Ménard (2014) and Bélanger, Lafrenière, Vallerand, and Kruglanski (2013), have shown that after controlling for intrinsic and extrinsic motivation, the role of passion in the prediction of outcomes does not change.

According to Csikszentmihalyi (1975) flow, "the complete absorption of the self in the present moment, when all contents of consciousness are in harmony with [the] other", is a cognitive and not a motivational construct and varies in duration (Vallerand, 2015). As Vallerand et al. (2003) demonstrated in their study, harmonious, passionate people experience more flow than people who are less passionate.

Zest and grit are also motivational constructs related to passion. Zest (Peterson & Seligman, 2004) is defined as a passionate trait in which one displays passion for most things in life, and grit (Duckworth, Peterson, Matthews, & Kelly, 2007) is a trait that reflects high levels of perseverance for long term-goals. Although zest and grit share with passion that they are motivational constructs that involve spending time, energy and persistence toward a meaningful activity (Vallerand, 2015), they do not focus on a specific activity as passion does, nor do zest and grit share the duality issue (Vallerand, 2015). Similarly, talent-related activities (Rathunde, 1996) and well-developed interests

(Renninger, 1992), are affective and not motivational constructs (Vallerand, 2015), and although these activities and interests share the passionate interest in and valuing of an activity, these concepts do not distinguish between types of interest or talent according to the different types of engagement, as passion does (Vallerand et al., 2007). Finally, commitment (Meyer & Allen, 1997), although perceived as a motivational construct, does not imply a love for an activity and internalizing to merge into one's identity (Vallerand, 2015).

The present review

The present study's primary purpose is to utilize a systematic review procedure to identify the characteristics of passion that authors use to define the concept. The existing theoretical framework on passion reveals that, although the vast majority of studies follow Vallerand et al. (2003)'s conceptualization, there are other scholars that have studied the concept. Thus, it seems useful to identify the set of passion characteristics used by authors to define the concept, responding to our first research question: 'What researchers mean by the term of passion?'.

In addition, the theoretical framework also reveals a great variety of passion's consequences, so, to reveal passion's importance and what can it bring to education it is essential to focus on passion outcomes, synthesizing in this systematic review the outcomes analyzed by researchers. Thus, our second research question was: 'What are the outcomes of passion?'.

Finally, bearing this in mind the benefits of passion, it is quite clear the need to know how to promote it, therefore, our last research question was: 'What variables ignite passion?' To sum up, our specific research questions in this review were as follows:

What do researchers mean by the term “passion”?

What are the outcomes of passion?

What variables ignite passion?

Method

Literature review

The literature search was conducted in the ERIC, PsycINFO and Web of Science electronic databases because these databases contain the most publications regarding educational research. We used the term “passion” and a combination of educational terms (“academic achievement”, “academic performance”, school, university, college, student, education and learn*). The search was limited to research articles in English.

Inclusion criteria

In a systematic review the inclusion criteria are usually an issue that warrants a lot of attention. Passion has been used to discuss about topics such as sex, religion, or even fruit, but in the educational context all authors understand it as a strong inclination toward an activity, thus, our first criteria was that researchers understood passion from a psychological (not biological or philosophical) perspective and as a strong inclination toward an activity. The second criterion we used was that the research was carried out in the educational contest and, lastly, because sometimes researchers just mention the word passion in the topic, the third criterion we used was that passion was assessed, either quantitatively or qualitatively.

To review, from the research studies, we selected only those articles in which passion: a) was analyzed from a psychological perspective and was understood to be a strong inclination toward an activity; b) was related to some aspect of the academic context; and c) was assessed, either quantitatively or qualitatively. Also, we chose to

include studies examining students' passion (e.g., passion for learning) and those studies that analyzed passion from the point of view of teachers (e.g. teacher's passion toward their profession or the subject they teach) because, in addition to met the inclusion criteria, both studies about students and teachers' passion reveal interesting and useful information for researchers and practitioners.

Procedure

We began by searching in the previously mentioned databases. We identified 590 articles in ERIC, 434 in WOS and 238 in PsycINFO. This search resulted in a total of 1262 articles, and then we imported all results to Mendeley reference manager to begin the screening process. The first step in screening was checking for duplicates, resulting in 162 articles being removed (See *Figure 1*). The next step (Step 2 in screening) was to eliminate all articles, on the basis of title and abstract, that included the terms Bible, Catholic, Christ, God, intimacy, Jesus, Lord, love, "passion flower", "passion fruit", religion, romantic, sex and theology* that were clearly outside our area of study (72 documents removed). In all of those articles, passion was not understood to be an inclination toward an activity (e.g., sex, religion, fruit [941 studies removed]). Articles that studied passion unrelated to academia (27 articles) and one article that was not a scientific article were also removed. In this step, when abstracts did not contain sufficient information to determine inclusion or exclusion, we read the full text. When there were reservations regarding whether the studies met the inclusion criteria, two researchers read the articles and included or discarded by agreement.

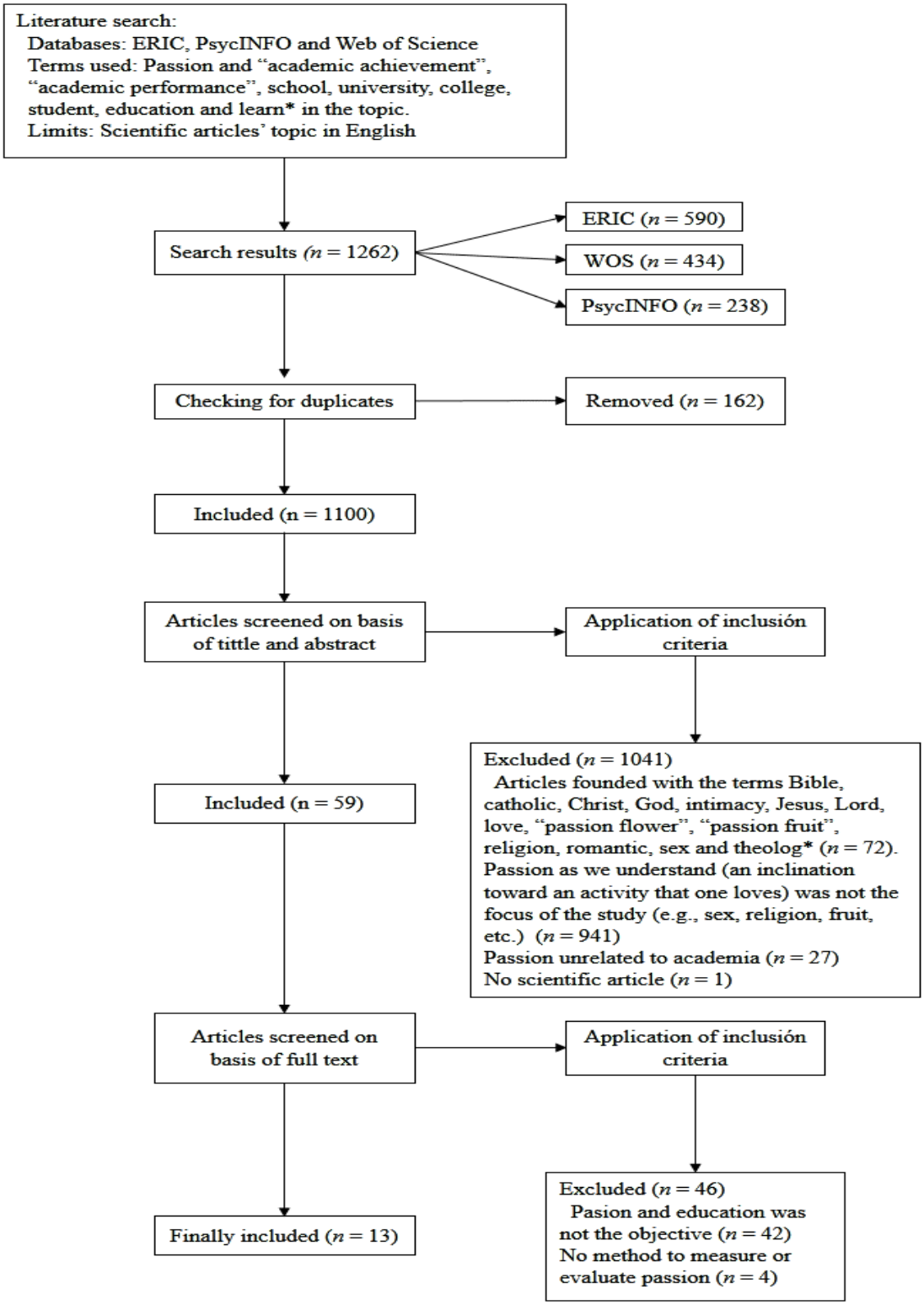

Figure 1. Steps for the systematic review.

Step 3 was to remove, on the basis of the full text, all articles in which passion and education were not the objective of the study (42 articles removed) as well as articles that did not contain a method with which to measure or evaluate passion (4 articles removed). Ultimately, 13 articles were selected.

Encoding the results

From all of the articles that met the criteria, we extracted the author, year of publication, purpose, design, sample, assessment instruments, definition and primary results (See Table 1).

Table 7.
Primary results of reviewed articles

Citation	Purpose	Design	Sample	Evaluation/Assessment	Passion definition	Primary results
Bonneville-Roussy et al. (2013)	To examine the role of autonomy support, psychological control, identity and passion in the persistence of students involved in higher music education	Correlational	Study 1: 144 music students (60 men and 84 women) from two international summer music academies in Canada with a mean age of 21.67 years and an average of 10.74 years of experience playing their instrument Study 2: 218 full-time students (116 men and 102 women), music majors from a college in Quebec, Canada, with a mean age of 18.06 years and an average of 7.23 years playing their instruments	Perceived autonomy support: Scale derived from existing measures of autonomy support (Lavigne, Vallerand, & Miquelon, 2007; Pelletier, Fortier, Vallerand, & Bri, 2001). Passion: The Passion Scale (Vallerand et al., 2003), adapted to music (Bonneville-Roussy et al., 2011; Mageau et al., 2009). Negative self-evaluation: Two items from the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). The self-esteem scale (Rosenberg, 1965) Persistence: A single item ("After my studies in music, I intend to become a professional musician.") Proof of registration in a music program for winter 2010 Identity: The French version (Amiot, Blanchard, & Gaudreau, 2008) of the Identity Scale (Jackson, 2002) adapted to music students Perceived autonomy support and psychological control: The Perceived Autonomy Support Scale for employees (PASS-E; Moreau &	"Passion is a strong inclination toward an activity that one finds important, likes (and even loves), to which one devotes daily time and energy and represents the vigour underlying the persistent involvement needed to excel" (Vallerand et al., 2003).	Study 1: Harmonious passion (HP) and autonomy support (AS) predicted persistence after accounting for gender, experience and age. Study 2: AS and identity predicted persistence via HP. Identity and psychological control predicted obsessive passion (OP).

				Mageau, 2012) adapted for music teachers		
Coleman and Guo (2013)	To explore the experiences of children with a passion for learning (PFL) in any domain.	Qualitative	7 students in middle school with a mean age of 13 years who showed persistent and intense engagement in a domain for a year or longer and their respective families	A ten-question interview to understand the origin, feelings, duration, frequency of activity and future goals regarding their passionate activity Three questions for parents regarding the first time they noticed their children's intense interest and their children's behavior	PFL is a focused interest in a particular domain that persists over time and is associated with relative disinterest in other activities that are interesting to peers.	Author utilized interviews, summarized that passion is an internal, intense and persistent force that directs action to a particular domain rather than being global, such as arts, academics or athletics Families are receptive and supportive Participants appear to be intrinsically motivated. Different passions appeared at different chronological ages.
Luh and Lu (2012)	To examine the mediating effect of passion on the relation between the cognitive style in students and their creative achievement in the design field	Correlational	276 undergraduate students (114 men and 162 women) from Taiwan.	Creative Achievement: Creative Achievement Questionnaire (CAQ; Carson, Peterson, & Higgins, 2005) Passion: The Passion Scale (Vallerand et al., 2003) translated into Chinese (Li, Chi, & Peng, 2007) Cognitive style: The Kirton Adaption–Innovation Inventory (KAI) (Kirton, 1976) Communicative competence: A self-rating scale (Canary & Cody, 1996)	Vallerand's (2003) definition	HP mediated the effect of innovative cognitive style to creativity. Innovative cognitive style predicted creativity via HP

Clark (2012)	To examine the importance of passion in recruitment advertisements and to study what passion means to early childhood teachers	Mixed (qualitative and quantitative)	246 recruitment advertisements 9 early childhood education teachers	Survey with two Likert-type items and one open question assessing the importance and meaning of passion in early childhood teachers	According to the author, participants conceive passion as a sense of loving their work	50 of 246 recruitment advertisements used the word passion or a derivative. 5 of 9 considered passion to be extremely important. The author summarized the open questions considering that the participants perceive passion as a sense of loving the work.
Hobbs (2012)	To explore the efficacy of a Deweyan framework to examine relations among teacher knowledge, identity and passion	Qualitative	Primary school teachers	Classroom observation and recorded video Interviews with each teacher in different moments of the process A focus group discussion to explore emerging themes	Day's (2004) definition and a report that participants perceived passion to be a sense of caring and commitment	Perceived passion to be a sense of caring and commitment Considered that the teachers showed passion for the subject matter, for promoting student engagement with the subject, and for teaching in general
Phelps and Benson (2012)	To describe commonalities among teachers who have a sustained passion for teaching	Qualitative	13 teachers with an average of 19 years of experience nominated by their principals for exhibiting a continuous passion for teaching	Open-ended interview questions regarding their feelings about teaching, pre-service and in-service sources of effects and advice for peers or future teachers	A driving force for career success	Teachers who have sustained their passion for the profession revealed the importance of positive attitudes, acceptance of change, embracing

			collaboration, pursuing professional development activities, and building and maintaining strong relationships with students and parents. When teachers realize the powerful effect they have on their students and the world in general, their sense of passion remains Teachers who maintain their passion for the education profession are teachers who seek, accept and embrace change. Maintaining passion requires maintaining strong connections with other positive and passionate teachers and having strong relationships with parents and students Teachers identified time pressures, paperwork and

						parents' expectations as impediments and barriers to developing passion.
Bonneville-Roussy et al. (2011)	Examined the role of meditation in performance goals and the deliberate practice of passion and performance. To explore potential differences between professional and expert student musical performers	Correlational	187 participants (86 men, 99 women, two unknown) with a mean age of 26.54 years. 143 were music performance students in conservatories (*n* = 42), colleges or universities (*n* = 93) or students who took private lessons outside a specific institution (*n* = 6); 44 were professional performers, and 2 did not specify the information.	Passion: The Passion Scale (Vallerand et al., 2003), adapted to music Achievement goals: 12-item scale (Elliot & Church, 1997) Deliberate practice: Two scales (Vallerand et al., 2007, 2008) adapted for the specific purposes of the study Life satisfaction: The French-Canadian validation (Blais, Vallerand, Pelletier, & Brière, 1989) of the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) Performance index: A question regarding the number of solo concerts participants had performed in their career	Vallerand's (2003) definition	HP predicted life satisfaction. Performance was predicted by HP via mastery goals and practice. Performance was negatively predicted by OP by performance approach and avoidance goals
Stoeber, Childs, Hayward, and Feast (2011)	To investigate the relations between harmonious and obsessive passion for studying, academic engagement and burnout	Correlational	103 students (11 males and 92 females) in psychology programs, with a mean age of 20.0 years	Passion: The Passion Scale (Vallerand et al., 2003), adapted to passion for studying psychology Academic engagement: The Utrecht Work Engagement Scale-Student (UWES-S; Schaufeli, Salanova, González-Roma, & Bakker, 2002) Academic burnout: The Maslach Burnout Inventory-Student Survey (MBI-SS; (Schaufeli, Martínez, Pinto, Salanova, & Bakker, 2002)	Vallerand's (2003) definition	After considering autonomous and controlled motivation, with regard to engagement indicators: a) vigor was predicted by HP and OP, b) Dedication was predicted by HP, c) absorption was predicted by OP.

						And, with regard to burnout indicators: a) cynicism was negatively predicted by HP, b) inefficacy was negatively predicted by HP and OP.
Oliver and Venville (2011)	To explore attitudes toward school science and science as presented in the Olympiad summer camp	Qualitative	69 highly gifted students participating in the Australian Science Olympiad, ages 15 to 17	A two-tier survey with five items extracted and adapted from a survey by Bennett & Hogarth (2009) regarding students' attitudes toward school science A survey directly targeting the students' reflections on and perceptions of the Olympiad summer camp In-depth interviews with six summer camp participants	Passion is an extremely strong or intense positive emotion regarding something. Passion for science may look like students' feelings of immersion, extension, emotion, inclusion, achievement, mastery and identity.	The Science Olympiad summer camp develops students' feelings of immersion, extension, emotion, inclusion, achievement, mastery and identity, which may be what passion for science looks like. To develop a passion for science, a program must enable students to incorporate science into their identities and cause students to feel a sense of achievement and inclusiveness.

Fredricks et al. (2009)	To explore how passion is manifested in academic and non-academic contexts, what supports passion	Qualitative	25 adolescents and young adults identified as gifted in elementary school and 41 adolescents who are passionate regarding non-academic fields, such as sports, arts or drama	To assess talent sample: semi-structured in-depth interview to prompt discussion regarding each adolescent's involvement in their activity from childhood to adolescence To assess the gifted sample: interviews regarding their lives in general and their experiences with growing up gifted	Authors believe that for an activity to become a passion, an individual perceives the activity to be valuable, devotes significant time and energy to the activity, has mastery goals, chooses to engage in challenging tasks, experiences positive outcomes during task involvement (i.e., positive emotions, flow or concentration), and incorporates the activity into his or her identity	Passion is more characteristic of non-academic activities, such as sports and music, than academic activities. Many of the gifted interviewees are motivated primarily by grades and maintaining their image as a good student rather than learning or mastering new skills. School settings appear to undermine rather than support passion.
Carbonneau et al. (2008)	To analyze causal ordering between teachers' passion, burnout, work satisfaction, and perceptions of student behaviors	Correlational	494 French-Canadian teachers (373 women, 119 men, and 2 unknown) with a mean age of 43.07 years 306 were elementary teachers, 120 were high school teachers, 20 were teachers in adult education, 46 were teachers in vocational	Passion: The Passion Scale (Vallerand et al., 2003) Work Satisfaction: The French-Canadian version (Vallerand, Blais, Brierè, & Pelletier, 1989) of the Satisfaction with Life Scale (Diener et al., 1985) adapted to work life Burnout: French-Canadian version (Dion & Tessier, 1994) of the Maslach Burnout Inventory (Maslach & Jackson, 1986)	Vallerand's (2003) definition	OP at T1 predicted positive student behavior and OP at T2. HP at T1 predicted positive student behaviors, work satisfaction and negative burnout at T2.

			and technical education, and 2 did not specify the information.	Teacher-perceived student behaviors: Three items from the French-Canadian version (Fernet & Senecal, 2004) of the Pupil Behaviour Patterns Scale (Friedman, 1995)		
Vallerand et al. (2007)	To test the Dualistic Model of Passion in the field of the dramatic arts and (Study 2) to examine the role of achievement goals in linking passion to deliberate practice and, ultimately, to performance	Correlational	Study 1: 143 (52 male, 91 female) dramatic arts students from various theater schools and colleges from Quebec, with a mean age of 23.8 years Study 2: 130 undergraduate students (19 men, 111 women) with a mean age of 23.84 years	Passion: The Passion Scale (Vallerand et al., 2003) Study 1: Subjective Well-Being: The (Diener et al., 1985) Satisfaction with Life Scale 1 A five-item version of the Subjective Vitality Scale (Ryan & Frederick, 1997) Deliberate practice: A list made by participants of five activities that artists may engage in during their free time when they are seeking to improve their performance Performance: A consensual validation approach (Amabile, 1982) to develop an indicator of performance attainment. 1 Study 2: Deliberate practice: A four-item scale adapted from Pintrich, Smith, García, & McKeachie (1993) 2 A five item version of the Subjective Vitality Scale (Ryan & Frederick, 1997) 2 Subjective Well-Being: Short version of the positive and negative affect scales (five items	Vallerand's (2003) definition	Study 1: Well-being was predicted by HP. Performance was predicted by HP and OP via practice Study 2: Well-being is predicted by HP and negatively predicted by OP. HP predicted performance via mastery goals and practice. OP predicted performance via mastery goals and practice. OP predicted performance via performance-approach goals.

				each) of the PANAS (Watson, Clark, & Tellegen, 1988) 2 Performance: Students' scores on their mid-term and final exams Achievement goals: a 12-item version of Elliot & Church (1997) questionnaire 2		
Day (2004)	To explore the nature of head teachers' passion with regard to achievement, care, collaboration, commitment, trust and inclusivity	Qualitative	10 head teachers (6 male and 4 female) whose schools exhibited a general increase in the last four years and whose school reports were described as excellent	Interviews assumed but not specified	Passion is a motivational drive that generates energy, determination, conviction, commitment and even obsession. Passion is often unconscious.	The author concluded that the head teachers are highly passionate about achieving, trusting and caring for others, collaborating with the rest of the team, being committed to the school, and displaying a sense of connectedness among the school community.

Results

Description of included studies

Three studies (23.08%) used university students, three studies (23.08%) used middle or high school students, two studies (15.38%) used elementary or high school teachers, two studies (15.38%) used teachers at unspecified levels, two studies (15.38%) used music students or professional performers, one study (7.69%) used head teachers, one study (7.69%) used teachers in adult education, one study (7.69%) used teachers in vocational and technical education, one (7.69%) study used dramatic arts students, and one (7.69%) study included participants' families (See Table 1). The total sample does not correspond to the number of studies because some studies used multiple samples.

Methodology and assessment method

Because passion is an emerging issue, the articles reviewed were published between 2004 and 2013. Of these articles, according to the methodology, six were quantitative (46.15%, all correlational), and the rest were qualitative (*n* = 7; 53.85%). With regard to the assessment method, the authors assessed passion using interviews, open surveys, self-report scales and observation (See Figure 2). The most utilized were interviews (37.5%) and self-report scales (43.75%); of the latter, the most common was *The Passion Scale* (Vallerand et al., 2003).

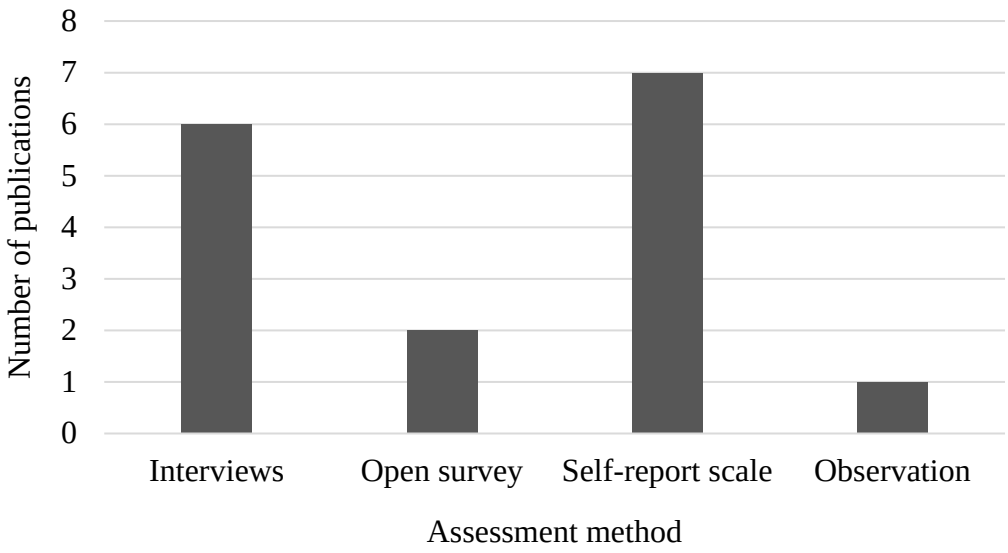

Figure 2. Assessment method used in the various publications. Studies that used different methods were included in each group.

Identification of passion's elements

To identify the elements of passion, we read the conceptualizations and extracted the features used by authors to define the concept. Because all quantitative studies used Vallerand et al. (2003)'s conceptualization and in this definition the elements of passion were fairly clear, only the first author coded the studies. This coding was verified by the second author. However, when coding qualitative studies, all were discussed by the two author and selected or discarded by consensus. The features extracted from author's definitions of passion were: a) a loved activity: an activity characterized by a positive, strong inclination (e.g., I am looking forward to Thursday because it is mathematics day.); b) identification: the feeling that the activity is something within the self and a component of what the person is; identification is the degree to which one uses the passionate activity to define oneself (e.g., I don't just play the trumpet; I feel like a trumpeter.); c) dedication: time spent daily or weekly on the activity (e.g., I love doing

mathematical problems, and many days I spend a great deal of my free time on math.); d) persistence: interest in the activity is sustained over time for many years or even a lifetime (e.g., I loved art education in high school, and for many years I have been expanding my knowledge of painting in an outside academy.); e) caring: teachers show interest in and concern for students (e.g., I feel truly interested in my students, what they like to do and how they feel in college); f) positive relations: good relationships with colleagues and/or students (e.g., Generally, I get along very well with everyone); g) supportive context: to feel surrounded by people who support one's passion (e.g., My teachers and parents encouraged me to participate in the national history competition because I really enjoy history.); h) positive emotions: good feelings when one is engaged in the activity (e.g., I feel excited when solving new chemical equations.); i) domain specific: a person is interested in a particular activity and shows relative disinterest in other activities (e.g., What I like most in school is music; when I am in mathematics or language classes, I am often attempting to compose new themes or thinking about how to improve last piece of music I composed.).

Nine elements were identified to define passion from the different works (see Table 2). Quantitative studies used Vallerand et al. (2003)´s definition, all studies sharing identical elements. Thus, all of the quantitative articles defined passion as an inclination toward a loved activity with which one identifies and persistently spends regular time on. The qualitative studies presented a greater disparity in the elements used to describe passion. Of all of those studies, two (Clark, 2012; Oliver & Venville, 2011) shared an element with Vallerand´s definition, referring to passionate activity as a loved activity. Fredricks et al. (2010), consistent with Vallerand et al. (2003), included identification, dedication, supportive context and valuable activity in passion's

definition. Coleman and Guo (2013) mentioned persistence. Hobbs (2012) perceived passion as a sense of caring, characterized by positive relations, elements shared with Clark (2012). Day (2004) and Oliver and Venville (2011) included feeling positive emotions in their definition. Finally, Coleman and Guo (2013) specified that passion is domain specific; that is, students may feel passion for a butterfly but not for science in general.

Table 2

Passion's elements

Citation	Loved activity	Identification	Dedication	Persistence	Caring	Positive relations	Supportive context	Positive emotions	Domain specific
Bonneville-Roussy et al. (2013)	Yes	Yes	Yes	Yes	-	-	-	-	-
Coleman and Guo (2013)	-	-	-	Yes	-	-	-	-	Yes
Luh and Lu (2012)	Yes	Yes	Yes	Yes	-	-	-	-	-
Clark (2012)	Yes	-	-	-	-	Yes	-	-	-
Hobbs (2012)	-	-	Yes	-	Yes	Yes	-	Yes	-
Phelps and Benson (2012)	-	-	-	-	-	-	-	-	-
Bonneville-Roussy et al. (2011)	Yes	Yes	Yes	Yes	-	-	-	-	-
Stoeber et al. (2011)	Yes	Yes	Yes	Yes	-	-	-	-	-
Oliver and Venville (2011)	Yes	Yes	Yes	-	-	-	-	Yes	-
Fredricks et al. (2010)	Yes	Yes	Yes	-	-	-	Yes	-	-
Carbonneau et al. (2008)	Yes	Yes	Yes	Yes	-	-	-	-	-
Vallerand et al. (2007)	Yes	Yes	Yes	Yes	-	-	-	-	-
Day (2004)	-	-	Yes	-	-	-	-	Yes	-

Passion's outcomes

To analyze the importance of passion, we have gathered information regarding passion's outcomes (see Table 3). Research on passion in the educational context revealed a great diversity of consequences. Regarding the relation between passion and performance, Bonneville-Roussy et al. (2011), with music students, and Vallerand et al. (2007), with college students, observed that although passion predicted performance, the types of passion followed different paths: Whereas the effects of harmonious passion on performance were mediated by mastery goals and deliberate practice, the effects of obsessive passion were a result of performance goals.

Bonneville-Roussy, Vallerand, and Bouffard (2013) explored the effect of passion on persistence, observing that harmonious passion predicted students' registration in an intensive program one year following the passion assessment. Similar to persistence, dedication was predicted by harmonious passion in Bonneville-Roussy et al. (2011) and by both harmonious and obsessive passion in Vallerand et al. (2007). Stoeber, Childs, Hayward, and Feast (2011) studied the effect of passion on the three aspects of academic engagement - vigor, dedication and absorption - and observed that although dedication was predicted by both types of passion, academic engagement was only predicted by harmonious, not obsessive, passion. Those authors also analyzed the relation between passion and autonomous motivation to study, observing that more harmonious passion led to more autonomous motivation in students.

Bonneville-Roussy et al. (2013) and Vallerand et al. (2007) explored the influence of passion on well-being, both studies noting that harmonious passion, but not obsessive passion, is positively correlated with life satisfaction and subjective well-being. Luh and Lu (2012) investigated the mediating role of passion between creative

achievement and cognitive style in design students, noting that harmonious but not obsessive passion conveys higher levels of creative achievement. Carbonneau et al. (2008) examined passion's influence on teachers' perceptions of students' classroom behaviors and concluded that passion, regardless of the type, is associated with positive perceptions of students' behavior.

Finally, the most studied variable was goal orientation and competence. In this area, Vallerand et al. (2007) and Bonneville-Roussy et al. (2011) observed that whereas harmonious passion predicted mastery goals, obsessive passion predicted performance approach and avoidance goals and slightly predicted mastery goals. Fredricks et al. (2010) also showed that talented and passionate children, compared with gifted and non-passionate children, were more likely to develop mastery goals and appreciate activities with moderate levels of difficulty, which enhances interest and feelings of competence. Phelps and Benson (2012) also evaluated passion in teachers and observed that when teachers perceive the powerful effect they have on their pupils, their sense of passion persists.

Table 3

Passion´s outcomes

Citation	Performance	Persistence	Dedication	Academic engagement	Autonomous motivation for studying	Well-being	Creativity	Positive students behaviors	Subject election	Goals orientation/ competence
Bonneville-Roussy et al. (2013)	-	HP - Yes	-	-	-	HP - Yes	-	-	-	-
Coleman and Guo (2013)	-	-	-	-	-	-	-	-	-	-
Luh and Lu (2012)	-	-	-	-	-	-	Yes	-	-	-
Clark (2012)	-	-	-	-	-	-	-	-	-	-
Hobbs (2012)	-	-	-	-	-	-	-	-	-	-
Phelps and Benson (2012)	-	-	-	-	-	-	-	-	-	Yes
Bonneville-Roussy et al. (2011)	Yes	-	HP - Yes	-	-	HP - Yes	-	-	-	Yes
Stoeber et al. (2011)	-	-	Yes	Yes	HP - Yes	-	-	-	-	-
Oliver and Venville (2011)	-	-	-	-	-	-	-	-	Yes	-
Fredricks et al. (2010)	-	-	-	-	-	-	-	-	-	Yes
Carbonneau et al. (2008)	-	-	-	-	-	-	-	Yes	-	-
Vallerand et al. (2007)	Yes	-	Yes	-	-	HP - Yes	-	-	-	Yes
Day (2004)	-	-	-	-	-	-	-	-	-	-

Passion's predictors

Concerning predictors, this review also reveals a great variety of variables (see Table 4). Regarding the relation between passion and identity, Bonneville-Roussy et al. (2013) observed, in advanced music students, that a person who identifies more with the activity will display more harmonious passion. Fredricks et al. (2010) and Oliver and Venville (2011) also perceived, after interviewing passionate students, that identity is central to passion.

Bonneville-Roussy et al. (2013) observed that autonomy support was positively linked to harmonious passion, observing that students who perceived their teachers to be autonomy supportive manifested a higher harmonious level of passion whereas students who perceived their teachers to be controlling showed higher levels of obsessive passion. Fredricks et al. (2010) noted that the activities that interviewees felt passion for were activities in which the participants had more opportunities for choice, challenges and to work on varied activities and activities that were more consistent with their personal interests and future plans.

With regard to positive relations, Day (2004) and Phelps and Benson (2012), interviewing passionate teachers and head teachers, observed that a common feature was that those educators maintained strong and positive relations with peers, parents and students; Day (2004) also perceived head teachers' sense of collectivism rather than an individual will to succeed.

Table 4

Passion's predictors

Citation	Identity	Autonomy support	Psychological control	Positive relations	Supportive context	Innovative cognitive style	Caring
Bonneville-Roussy et al. (2013)	Yes	HP - Yes	OP - Yes	-	-	-	-
Coleman and Guo (2013)	-	-	-	-	Yes	-	-
Luh and Lu (2012) (Luh & Lu, 2012)	-	-	-	-	-	Yes	-
Clark (2012)	-	-	-	-	-	-	-
Hobbs (2012)	-	-	-	Yes	-	-	-
Phelps and Benson (2012)	-	-	-	Yes	Yes	-	-
Bonneville-Roussy et al. (2011)	-	-	-	-	-	-	-
Stoeber et al. (2011)	-	-	-	-	-	-	-
Oliver and Venville (2011)	Yes	-	-	-	Yes	-	-
Fredricks et al. (2010)	Yes	Yes	-	Yes	Yes	-	Yes
Carbonneau et al. (2008)	-	-	-	-	-	-	-
Vallerand et al. (2007)	-	-	-	-	-	-	-
Day (2004)	-	-	-	Yes	Yes	-	Yes

Supportive context was the most frequently analyzed variable. Coleman and Guo (2013) and Fredricks et al. (2010) highlighted the importance of a supportive context in the development of passion, observing that people who perceived their families and teachers to be supportive and encouraging were more likely to be passionate. Fredricks et al. (2010) and Oliver and Venville (2011) also emphasized the importance of peer support, preferably peers with similar abilities and motivational levels (Frederick et al., 2009).

Luh and Lu (2012), in their study on passion in design students, noted that cognitive style could also predict passion. Those authors observed that an innovative cognitive style, understood as the innovative manner in which an individual copes with a problem, is positively correlated with harmonious but not obsessive passion, indicating that an innovative cognitive style predicts harmonious passion and that harmonious passion, in turn, predicts creative achievement. Finally, with regard to caring, Day (2004) concluded that passionate head teachers truly care for other people, and Fredricks et al. (2010) argued that teachers who were caring would ignite students´ passion.

Discussion

The primary purpose of this systematic review was to identify the characteristics that define the concept and determine passion's antecedents and outcomes. This review provides evidence of the importance of passion within the academic context and reveals a great variety of passion's positive effects in students and teachers as competence, dedication, well-being, performance, creativity, and persistence.

The reviewed articles were published between 2004 and 2013, and 69.2% of the articles were published within the last four years, confirming the growing interest in this

area. This increasing interest could be because of Vallerand´s (2003) seminal work on passion in which he explicitly conceptualized and tested passion's outcomes. That study may have aroused scientific interest in the topic; certainly, most researchers have considered his ideas.

Despite the number of studies on passion within educational context is still scarce and research in this are needs to grow much, we concluded the following from the articles reviewed: (a) study samples vary widely; some researchers focused on teachers, and other researchers focused on students. In those studies that focused on students, the students were from middle school, high school, university or even conservatories; (b) there is no clear methodology to address passion, nor is there an assessment method, although the self-report scale appears to be used most often; (c) the vast majority of studies followed Vallerand's (2003) conceptualization whereas there was more diversity defining passion within the qualitative studies; (d) there is a wide variety of studied variables that render the creation of a consistent body of knowledge regarding outcomes and predictors difficult.

Passion's conceptualization

We identified six primary definitions of passion. Although all of the quantitative studies used Vallerand et al.'s (2003) definition, most authors of qualitative studies tended to use their own definitions. Nevertheless, various commonalities were observed among the numerous conceptualizations. The most commonly shared feature was dedication (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Oliver & Venville, 2011; Vallerand et al., 2003), which suggests that people who feel more passion toward an activity will spend more time and focused practice on that activity. The need to love the activity (Clark, 2012; Oliver & Venville, 2011; Vallerand et al., 2003), to identify with the

activity (Vallerand et al., 2003; Fredricks et al., 2010; Oliver & Venville, 2011) and to feel positive emotions during the activity (Day, 2004; Hobbs, 2012; Oliver & Venville, 2011) were also elements authors used frequently to describe passion.

Despite these common features, only a few authors clearly defined passion (Coleman & Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver & Venville, 2011; Vallerand et al., 2003); thus, there is no comprehensive view of what passion connotes. Consistent with Vallerand, of all the identified elements of passion, the most common features are a loved activity, identification, dedication, persistence and being domain-specific. A passionate biology student who loves to study insects and bugs will dedicate much of his spare time to this pursuit, will persist in working in this area despite any obstacle and will feel like a future biologist.

Passion's outcomes

We identified great diversity in the variables explored and observed that quantitative studies consider passion's consequences whereas qualitative studies focus more on promoters. Thus, a wide range of variables, sometimes not tested, render it difficult to define a consistent body of passion's predictors and outcomes although the reviewed studies reported useful data regarding both predictors and outcomes.

In passion's outcomes, goal orientation was the most relevant result. Authors (Bonneville-Roussy et al., 2011; Fredricks et al., 2010; Hobbs, 2012; Phelps & Benson, 2012; Vallerand et al., 2007) agree in their findings that more passion leads to more mastery. According to Achievement Goal Theory (Elliot & Church, 1997), there are three types of achievement goals: mastery goals, which lead people to be focused on the improvement of personal competence; performance-approach goals, which lead people to be focused on being better than others; and performance-avoidance goals, which

lead people to avoid feeling worse or incompetent compared to other people. Vallerand et al. (2007) and Bonneville-Roussy et al. (2011) observed that harmonious passion is strongly related to mastery goals and that obsessive passion is related to performance avoidance and approach goals and related slightly to mastery goals.

Well-being and dedication were also relevant consequences. The articles reviewed (Bonneville-Roussy et al., 2011, 2013; Vallerand et al., 2007) indicated that harmonious but not obsessive passion leads to life satisfaction and subjective well-being whereas dedication causes some controversy. Vallerand et al. (2007) and Stoeber et al. (2011) concluded that both harmonious and obsessive passion can predict the time spent daily or weekly on an activity whereas Bonneville-Roussy et al. (2011) observed that only harmonious passion produces dedication. Other variables, such as performance, persistence, academic engagement, creativity and subject election, were predicted by passion, which also provides useful information regarding how to change for a more high-quality education.

Passion's antecedents

Conversely, regarding passion's predictors, which were studied primarily in qualitative studies, supportive context (Coleman & Guo, 2013; Day, 2004; Fredricks et al., 2010; Oliver & Venville, 2011; Phelps & Benson, 2012) and positive relations (Day, 2004; Fredricks et al., 2010; Hobbs, 2012; Phelps & Benson, 2012) appear to be the most influential features in the development of passion. Studies stress the essential role of families, peers and teachers in the enhancement of passion, emphasizing that a person who receives support from his or her context is more likely to develop and maintain his or her passion.

Finally, two studies (Fredricks et al., 2010; Oliver & Venville, 2011) report information regarding the present role of schools in developing passion, comparing passion inside and outside school settings. On the one hand, Oliver and Venville (2011) compared students' attitudes toward Science as a school subject and Science as presented in a Science Olympiad summer camp, observing that students did not show the characteristics of a passionate person when referring to science in the school settings but toward science outside the traditional school context. On the other hand, Fredricks et al. (2010) also explored how passion is manifested in academic and nonacademic context, noting that in school compared with nonacademic activities, the vast majority of gifted students were more motivated by getting good marks, maintaining their "good student" image, and demonstrating their high abilities rather than study because they really loved learning o because they were really passionate toward a specific subject. Students in nonacademic activities such as sports, music or arts showed high levels of passion, they feeling completely involved in the activity, experiencing pleasant emotions as joy or emotional liberation from participating and defining themselves through the activity. Both studies concluded that traditional schools settings do not tend to support passion, but may hinder its development.

In this regard, Vallerand (2015) also explained that a contextual moderator on the relation between passion and intrapersonal outcomes is the activity domain. Thus, although activities such as sports, performing arts and leisure activities are normally freely chosen and people freely engage in such activities, in other contexts, such as work or education, engagement is generally mandated, rendering the effects of obsessive passion or lack of passion stronger than in other domains.

Future directions

Because the goal of this review was the examination of passion in educational settings, we have not included some truly interesting studies from outside this focus although such studies could have significant applications (see Bélanger, Lafrenière, Vallerand, & Kruglanski, 2013; Carpentier, Mageau, & Vallerand, 2012; Froh et al., 2010; Mageau & Vallerand, 2007; Vallerand, 2008). Future researchers could glean ideas from these studies and test multiple relations between passion and different igniters and consequences within education. Considering Bélanger et al. (2013), who analyzed the effects of failure and success on passionate people's performance, an interesting test would be whether passion, obsessive or harmonious, could ignite a change in students after a bad result or a teacher's wake up call. Considering Carpentier et al. (2012), who observed that people who had an obsessive passion tended to reflect on their passionate activity while engaging in other labors, future research could consider whether passionate students spend more time thinking critically or ruminating about class topics.

Another interesting avenue of research would be to develop new assessment methods. Currently, most studies appear to rely on self-report questionnaires; however, other methods, such as diaries or observation measures to assess, for example, how much time students spend developing their passion or how teachers foster passion during classes, could complete and enhance the reliability of the information we receive. Related to this concept is to identify cut-off values to establish whether a student is passionate or not passionate. Bonneville-Roussy et al. (2013) and Vallerand et al. (2003) did consider that problem in The Passion Scale - a Likert scale ranging from one to seven;

four or more points were indicative of a passionate student. However, more information is needed on this topic. Item response theory could be useful in this endeavor.

Similarly, other studies should continue working on the identification of variables within the academic context related to passion, first, focusing on the benefits of passion for both teachers and students and then attempting to identify which variables influence the development of passion. Thus, it could be important for future studies to analyze the moderating effect of independent and dependent variables. A beneficial result would be educational interventions to improve various aspects of education by passion. As well, it could be interesting to examine how both types of passion are developed, how a type of passion could be transformed into another and how they fluctuate over life. Thus, future studies could examine longitudinally, for example, the relationship between harmonious passion and the increased use of adaptive process over life. Finally, to clarify and support the difference between passion and related constructs, researchers should attempt to test for significant differences between constructs, for example, running a confirmatory factor analysis comparing a one- or two-factor solution with items of passion and other constructs.

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APPENDIX II

PASSION FOR MATH: RELATIONSHIPS BETWEEN TEACHER EMPHASIS ON THE USEFULNESS OF CLASS CONTENTS, MOTIVATION AND GRADES

(Status: Ready for decision in Contemporary Educational Psychology)

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Abstract

The purpose of this study was to examine the relationship between teacher emphasis on the usefulness of class content and students' harmonious passion, intrinsic motivation to learn, and math achievement in 1170 high school students. Data were analyzed using multilevel structural equation model and results showed support for the hypotheses tested. First, we found that harmonious students perceived passion and intrinsic motivation to learn as different constructs. Second, harmonious passion was positively associated with math achievement. Third, the relationship between harmonious passion and math performance was mediated by intrinsic motivation to learn. Fourth, teacher emphasis on class contents usefulness predicted students' harmonious passion. Finally, findings were discussed in terms of their implications for educational practice and methodological suggestions for future research.

Keywords

mathematics; harmonious passion; teaching quality; intrinsic motivation to learn

1. Introduction

Passion surrounds us, permeating all aspects of our lives. The people who emphasize its importance tend to be those who have made a difference in their areas of expertise or in their lives (Vallerand, 2015). Passion propels persistence (Bonneville-Roussy, Vallerand, & Bouffard, 2013), portends performance (Bonneville-Roussy, Lavigne, & Vallerand, 2011; Vallerand et al., 2007), boosts creativity (Luh & Lu, 2012), and eases dedication (Bonneville-Roussy et al., 2011; Stoeber et al., 2011; Vallerand et al., 2007). Therefore, passion has been hypothesized to play a key role in students' academic functioning.

However, because research on passion for activities is very recent, only dating back to Vallerand et al. (2003), few researchers have passion within academia and the ways in which youth experience it (Coleman & Guo, 2013). This absence of research in the academic context is more pronounced if we consider that, to the best of our knowledge, there has been no research that analyzes the role of passion on mathematics until now.

This lack of research warrants some attention because of the relevance of math skills on other academic areas (Gaspard et al., 2015), its influence on other subjects, such as science, technology, and engineering (Wang, 2013), and its increasing importance on the students' future professional achievement (Duncan et al., 2007; Seaton, Parker, Marsh, Craven, & Yeung, 2014). Moreover, mathematics are difficult, tedious, and boring for some students (Gersten et al., 2009). Therefore, in this study, we aimed to explore the relationship between teaching quality, specifically the teacher's emphasis on the usefulness of class contents and students' harmonious passion, motivation, and math grades.

1.1. On the concept of passion

Most of the research on passion conducted to date has used the conceptualization of Vallerand et al. (2003). Vallerand defines passion as "a strong inclination toward a self-defining activity, object, concept, or person that one likes, loves, or highly values, and in which one invests a significant amount of time and energy." Additionally, Vallerand and colleagues propose, within the dualistic model of passion, two forms of passion that differ on how the activity is internalized into one's identity and reflect qualitatively different experiences and outcomes. Thus, harmonious passion comes from an autonomous internalization of the activity and leads people to freely engage in it because they feel that what they are doing is in line with their values. This type of passion is in harmony with other aspects of the self and leads to adaptive outcomes, such as experiencing high levels of concentration, positive affect, enhanced energy, and flow (Vallerand, 2015). On the other hand, obsessive passion comes from a controlled internalization of the activity into one's identity, leading people to experience an uncontrollable urge to engage in the activity and feeling controlled by internal or external pressures that command their commitment on it (Bonneville-Roussy et al., 2011, 2013; Carbonneau, Vallerand, Fernet, & Guay, 2008; Luh & Lu, 2012; Vallerand et al., 2007). In this article, we focused on harmonious passion because of its positive benefits in the educational context (Bonneville-Roussy et al., 2011, 2013; Ruiz-Alfonso & León, 2016; Stoeber et al., 2011; Vallerand et al., 2007).

1.2. On the role of passion in academic performance

Although more than 100 studies have addressed the concept of passion on different topics (Vallerand, 2015), research is still scarce within the educational context. A recent systematic review conducted by Ruiz-Alfonso and León (2016) shows that only

13 studies have analyzed passion and its relationship with causes and consequences in the educational context.

Concerning the relationship between passion and academic performance, Bonneville-Roussy et al. (2011) noticed that harmonious passion predicted students' achievement via mastery goals in a sample of music and college students. The high level of performance needed to achieve excellence is also largely reached by an extensive amount of time devoted to the activity. Thus, Bonneville-Roussy et al. (2011) and Vallerand et al. (2007) observed that harmonious passion predicts dedication in music and dramatic arts students. Similarly, the relationship between passion and persistence within the educational context was also analyzed by Bonneville-Roussy et al. (2013), who observed that students retain harmonious passion along with strong interest for the activity.

In view of the above, even though passion influences performance, it is assumed that this relationship is not direct (Vallerand, 2015) and might be mediated by other variables, such as deliberate practice (Vallerand, 2015), persistence (Mageau et al., 2009), or motivation to learn (Stoeber et al., 2011).

1.3. Passion and motivation: Different constructs

Passion shares conceptual similarities with other motivational constructs, such as intrinsic motivation and integrated and identified regulation (Vallerand, 2015). Passion and intrinsic motivation share a love for the activity and engagement in it for pleasure (Vallerand, 2015), but the non-internalization of the activity into one's identity makes the difference (Vallerand et al., 2003, 2007). When someone feels intrinsically motivated toward an activity, this activity is not internalized into the person's identity, and the intrinsic motivation emerges from the person-task interaction on the short-term

level (Koestner & Losier, 2002). Thus, passion portends longer-term consequences than motivation, and it allows researchers to predict more specific outcomes over time (Houlfort, Philippe, Vallerand, & Ménard, 2014). Moreover, intrinsic motivation to learn refers to the reasons why students engage in learning, while passion refers to a more stable feeling toward an activity that one likes, loves, or highly values, and it implies longer periods of time and energy (Ruiz-Alfonso & León, 2016). On the other hand, integrated and identified motivation are different types of extrinsic motivation that share with passion the internalization of the activity into the person's identity. However, as Vallerand (2015) explains, the difference between them is that extrinsically motivated people engage in the activity to get something alien to it, and not for the love of the activity itself. It occurs despite the fact that this type of motivation implies a valuation and internalization of the activity into the person's identity (Vallerand, 2015). Differences between these concepts have been empirically supported by other authors, such as Vallerand et al. (2003), Houlfort et al. (2014), and Bélanger et al. (2013).

1.4. On the relationship between passion, intrinsic motivation to learn, and math grades

While evidence suggests that harmonious passion is associated with intrinsic motivation in other domains, there is a lack of studies in the educational context. Regarding this association, Vallerand et al. suggest a close relationship between harmonious passion and intrinsic motivation, gathering evidence that more harmonious passion leads to more intrinsic motivation. Although several studies outside the classroom have supported this claim (Back, Lee, & Stinchfield, 2011; Curran, Appleton, Hill, & Hall, 2011; Fuster, Chamarro, Carbonell, & Vallerand, 2014; Lee, Chung, & Bernhard, 2013; Wang, Khoo, Liu, & Divaharan, 2008; Wang, Liu, Chye, & Chatzisarantis, 2011), to the best of our knowledge, few studies in the educational context have

analyzed how passion affects motivation. In this regard, Stoeber et al. (2011) observed in a sample of college students that the more harmonious passion they possessed, the greater their autonomous motivation to learn. Similarly, Bonneville-Roussy et al. (2011), Coleman and Guo (2013), and Vallerand et al. (2007), also observed that harmonious passion was positively related to a motivational construct: mastery goals (Fairchild, Horst, Finney, & Barron, 2005; Murphy & Alexander, 2000).

On the other hand, academic motivation is a widely studied topic in educational psychology (Stover, De la Iglesia, Boubeta, & Liporace, 2012). For over three decades, it has been identified as a main factor in explaining school performance (Leroy & Bressoux, 2016). Students are intrinsically motivated when they study merely for the sake of learning new content, without expecting any reward (Taylor et al., 2015). A large body of studies shows that intrinsic motivation to learn predicts positive characteristics, processes, and outcomes (Stoeber et al., 2011).

Likewise, if we compare mathematics with other school domains, this subject has the worst levels of students' motivation, which could be a reason for students' poor performance (Leroy & Bressoux, 2016). Thus, although previous studies suggest that intrinsic motivation to learn predicts achievement and learning in math (Areepattamannil, Freeman, & Klinger, 2011; Murayama, Pekrun, Lichtenfeld, & vom Hofe, 2013; Spinath, Spinath, Harlaar, & Plomin, 2006), no studies have analyzed the effects of passion on motivation concerning high school students' math achievement.

1.5. On teaching quality and passion

Teaching quality refers to teacher aspects that promote positive educational outcomes (Cochran-Smith & Fries, 2005), and it has been a growing research topic in recent years (Kunter et al., 2013; Trautwein, Dumont, & Dicke, 2015). Several different

terms are used to discuss classroom processes related to student learning and are often used interchangeably, for example, *teaching effectiveness* (Marsh & Roche, 1997; Seidel & Shavelson, 2007), *quality of teaching* (Hattie, 2009), *instructional quality* (Rjosk et al., 2014) or *teacher quality* (Hattie & Anderman, 2013). Research on this topic has shown that classroom processes are a predictor of students' learning (Hattie & Anderman, 2013).

Although research on developing students' passion remains scarce, different studies have also found that certain teachers' aspects help to promote students' passion. For example, Coleman and Guo (2013) and Fredricks et al. (2010) observed that students who perceived their teachers to be encouraging, supportive, and caring were more passionate. Fredricks et al. (2010) also noticed that students were more likely to develop passion for activities when they had challenges and more opportunities for choice, as well as toward those activities that were congruous with their own interests. Bonneville-Roussy et al. (2013) and Fredricks et al. (2010) also noticed that students who perceived their teachers to be supportive of autonomy rather than controlling, displayed higher levels of passion. These studies suggest that students' passion can be developed by supporting their autonomy, that is, the sense of performing an activity from their self and without external pressures, feeling the origin, agent, and cause of the beginning and maintenance of the activity (Stefanou, Perencevich, Dicintio, & Turner, 2004). In the educational context, students feel autonomous when they consider that schoolwork helps them to achieve their interests (Wang & Eccles, 2013). Teachers explaining why class content or schoolwork are relevant and useful helps students to grasp why what they learn in class contributes to pursuing their interests (Assor, Kaplan, & Roth, 2002; Guay, Ratelle, Larose, Vallerand, & Vitaro, 2013).

In this regard, although some studies have suggested that autonomy support promotes passion, only one of them (Bonneville-Roussy et al., 2013) has gathered empirical evidence. Moreover, no specific teacher's aspect that promotes passion has yet been examined, nor any detailed aspect of autonomy support, such as teacher emphasis the usefulness of class content, with respect to the development of passion. Therefore, efforts to examine the potential influence of teacher emphasis on the usefulness of class content for promoting students' passion and to better understand how this influences students' performance are warranted.

1.6. Teacher emphasis on the usefulness of class content: A climate variable

In this research, we focused our attention on the relationship between passion and an indicator of autonomy support: teacher emphasis on the usefulness of class content. Although other authors (Bonneville-Roussy et al., 2013) have analyzed the relationship between autonomy support and passion or motivation, they did not take into account the nested nature of their data. When researchers evaluate whether school, classroom, or teacher characteristics (e.g. teacher emphasis on the usefulness of class content) contribute to the prediction of students' outcomes (e.g. Harmonious passion), it is recommended to test the study hypotheses using a multilevel analysis (Lüdtke, Robitzsch, Trautwein, & Kunter, 2009; Stapleton, McNeish, & Yang, 2016).

In multilevel modeling, two kinds of group-level variables are frequently used: 1) variables that have the same value for all students in one class (e.g. teacher's years of experience), and 2) variables that are estimated based on the aggregation of students' value. In the latter case, following Marsh et al. (2012), we can distinguish between contextual and climate variables. Contextual variables are group-level aggregates of student-level variables that are specific to each student in one class (in our study: class-

average math achievement, class-average intrinsic motivation, and class-average harmonious passion). Climate variables are the result of asking students about one variable common to students in the same class (in our study: teacher emphasis on the usefulness of class content). In this situation, the reference is the same for all students in one class, unlike in contextual constructs, where there is no common reference and values are assigned on individual characteristics. In this study, we were interested in a climate construct (teacher emphasis on the usefulness of class content) and on contextual constructs (harmonious passion, intrinsic motivation to learn, and math grades). Harmonious passion, intrinsic motivation, and math grades are not only an indicator at the individual level, but if aggregated, they are also an indicator of a shared characteristic of the class.

1.7. The present study

To date, no studies have examined the relationship between teacher emphasis on the usefulness of class content, harmonious passion, intrinsic motivation to learn, and math achievement in high school students. Additionally, no specific teacher's aspect related with autonomy support has been examined with respect to passion. Thus, this study aims to analyze how these variables relate to each other and to high school students' math achievement. The following research questions were addressed to examine whether: (Research Question 1) students perceive harmonious passion and intrinsic motivation to learn as different constructs; (Research Question 2) harmonious passion predicts grades in high school students at the class and individual level; (Research Question 3) motivation to learn, at the class and individual level, mediate the relationship between harmonious passion and achievement; and (Research Question 4) teacher emphasis on the usefulness of class content at the class level predicts

harmonious passion in high school students. In this research question, we do not search for relationships at the individual level because teacher emphasis on the usefulness of class content is a climate construct, and our interest is not on how the individual perception affects passion, but on the relationship between teacher emphasis and students' passion (Morin, Marsh, Nagengast, & Scalas, 2014).

For the first research question, we hypothesized, according to previous studies (Bélanger, Lafrenière, Vallerand, & Kruglanski, 2013; Houlfort, Philippe, Vallerand, & Ménard, 2014; Stoeber, 2011), that passion and intrinsic motivation to learn are different constructs and that students will perceive this difference. For the second research question, and consistent with previous research on passion and performance, we hypothesized that harmonious passion will be positively associated with math achievement.

Contrary to our interpretation regarding the recommendation to use multilevel analysis when dealing with a nested data, it could be said that in these research questions we were just interested in the relationship between individual characteristic and the need of multilevel was not justified. However, the passion and motivation of students nested in classrooms is not an individual characteristic, which can be seen by its intraclass correlation (e.g. LeBreton & Senter, 2007), and the use of multilevel analysis allows us to separate the variance between the two levels of analysis (Friedrich, Flunger, Nagengast, Jonkmann, & Trautwein, 2015), providing more information on the relationship between the studied variables, and of the variables themselves (Morin et al., 2014).

For the third research question, we examine the mediational role of intrinsic motivation to evaluate the relationship between harmonious passion and math

performance. Thus, according to the work by Stoeber et al. (2011) and other research outside the educational context (Back et al., 2011; Curran et al., 2011; Fuster et al., 2014; Lee et al., 2013; Wang et al., 2008, 2011), we hypothesized that intrinsic motivation to learn will mediate the relationship between students' harmonious passion and their math achievement. Finally, following the teaching quality research, for the fourth research question, we hypothesized that teacher emphasis on the usefulness of class content will predict students' harmonious passion. In addition to these main hypotheses, we have also examined other mediational pathways in our model to look for an indirect effect between these variables. We examined whether: (1) passion mediated the effects of teacher support on intrinsic motivation; and (2) passion and intrinsic motivation together mediate the effect of teacher support on math achievement.

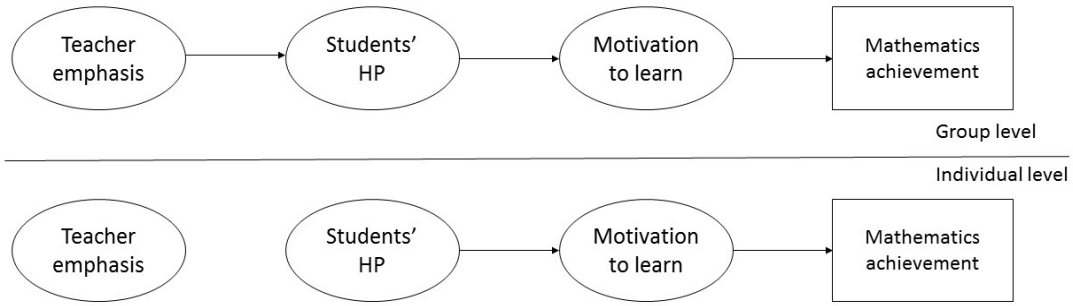

Fig. 1. Multilevel model proposed.

2. Method

2.1. Participants

We recruited 1557 students (778 female, 766 male, 12 not specified) from nine high schools in Gran Canaria, Spain. Students were from second to fourth grades of

secondary education (8th to 10th grades in the US system). Some responses were discarded because they were incomplete or because students were identified as non-passionate toward mathematics, so the final sample comprised 1171 students (591 female, 574 male, 6 not specified) from 82 classes. The students' mean age was 15.23 (*SD* = 1.06). All participants were informed of the data confidentiality and participation was strictly voluntary.

2.2. Procedure

First, we contacted schools by phone to briefly explain the study and request an appointment with the high school mathematics teachers to request their cooperation. The school principals, mathematics teachers, and parents authorized the participation in the study. Each researcher personally administered questionnaires, explaining the anonymity of the data and the need for accuracy in responses. We asked participants to indicate which math activity or type of math activity they loved the most, and then we instructed them to complete the Passion Scale for this type of math activity. Because some students did not have a favorite math-related activity, they could not complete this section, and they were automatically classified as non-passionate toward math.

2.3. Measures

Participants answered demographic questions and completed a questionnaire with measures of harmonious passion, motivation to learn, and their teacher's emphasis on the usefulness of class content. All scales were rated on a 7-point Likert-type scale, ranging from 1 (*I do not agree at all*) to 7 (*I strongly agree*). To examine factorial validity, we performed a confirmatory factor analysis for each variable. Information about the estimation method and missing data can be found in the data analysis section. To assess reliability, we used McDonald's Omega (1999) because it has shown evidence of better

accuracy than Cronbach's alpha (Revelle & Zinbarg, 2009), and factor loadings do not need to be equal for all items (Zhang & Yuan, 2016). Similar to Cronbach's alpha, McDonald's values above .80 are indicators of reliability.

2.3.1. Harmonious Passion

Six items of the Passion Scale (Vallerand et al., 2003) adapted to Spanish and to the educational context were used to assess students' harmonious passion (e.g. "The new things that I discover with this activity allow me to appreciate it even more"). According to the standards for cross-cultural adaptation (Muñiz, Elosua, & Hambleton, 2013), the Spanish translation of the scale was performed by two Spanish-speaking researchers and then revised by a bilingual specialist. Regarding the CFA, the chi-squared (χ^2) value and fit indexes were χ^2 (1170, 23) = 238,030 ($p < .001$), RMSEA = .090, $SRMR_{within}$ = .049, $SRMR_{between}$ = .155, CFI = .90 and TLI = .87, and McDonald's Omega was .95.

2.3.2. Motivation to learn

We used a subscale of the Spanish validation (Núñez & Martín-Albo, 2006) of the *Échelle de Motivation en Éducation* (EME; Vallerand, Blais, Brierè, & Pelletier, 1989). Because our aim was to assess the pleasure experienced while learning new content in mathematics, we used the four items of the Intrinsic Motivation Toward Knowledge subscale (e.g. "Because for me it is a pleasure and satisfaction to learn new things") and presented them with the stem "Why are you trying to do things well in math?" The χ^2 value and fit indexes were χ^2 (1170, 7) = 77,474 ($p < .001$), RMSEA = .093, $SRMR_{within}$= .035, $SRMR_{between}$= .079, CFI = .96 and TLI = .93, and McDonald's Omega was .88.

2.3.3. Teacher emphasis on the usefulness of class content

To assess students' perception of teacher emphasis on the usefulness of class content, we used six items (e.g. My teacher proposes useful activities) from the subscale Teacher Emphasis on the Usefulness of Class Content of the scale developed by León, Núñez, & Medina (n.d.). These items have shown evidence of reliability in prior research (León et al, n.d.) as well as in the present study (ω = .94). The χ^2 value and fit indexes were χ^2 (1170, 23) = 187,426 (p = .001), RMSEA = .078, $SRMR_{within}$= .049, $SRMR_{between}$= .023, CFI = .91 and TLI = .89, and McDonald´s Omega was .94.

2.3.4. Math grades

To assess students' math performance, we obtained students' final course grades in mathematics, coded from 1 (lowest mark) to 10 (highest mark). The equivalence in the EEUU system would be: A+: 10; A: 9.175; B+: 8.325; B: 7.5; B-: 6.675; C+: 5.825; C: 5; C-: 4.175; D+: 3.325; D: 2.5; D-: 1.675; F: 1. Unlike in the United States or United Kingdom, where it is usual to assess student's achievement by standardized tests, in Spain, we use grades assigned by teachers to assess the knowledge, skills, and daily work of the students according to rubrics implemented by the government. These grades have a real-world impact on students' academic level and progress in grade school. They even affect the degrees or universities students can choose (Sánchez-Pérez, Fuentes, Pina, López-López, & González-Salinas, 2015; Simões & Alarcão, 2014).

2.4. Data analysis

To test our first hypothesis (H1: Students perceive harmonious passion and motivation as two different constructs) we ran two multilevel confirmatory factor analyses. In the first model, items from passion and motivation loaded on a single factor, and in the second one, items loaded on their correspondent factor. To determine which

model showed a better fit to the data, we computed a χ^2 test and an examination of fit indexes for both models.

To test hypotheses two (H2: Harmonious passion will be positively associated with math achievement) and three (H3: The relationship between passion and achievement will be mediated by motivation to learn), we ran two multilevel structural equation models (MSEMs), in which passion predicted motivation, and, in turn, math achievement at the individual and group levels. To test the mediational effect of motivation between passion and achievement, we added, in a nested MSEM, a direct effect from teacher emphasis on the usefulness of class content on math performance. To search for evidence of mediation, we compared both models using a χ^2 test and fit indexes. If there were no differences between both models we would hold the most parsimonious result. Moreover, we computed the unstandardized indirect effect and its standard error using the delta method (Sobel, 1982).

Finally, to examine our fourth hypothesis (H4: Teacher emphasis on class usefulness will predict students' harmonious passion) we tested a multilevel model, analyzing the effect of the Teacher Emphasis on the Usefulness of Class Content and Interest on students' Harmonious Passion, which predicted math grades via Motivation to Learn. We followed the same approach described above to test the mediational effect of: 1) Passion in the relationship between Teacher Emphasis on the Usefulness of Class Content and Interest and students' Motivation to Learn; 2) Passion and Motivation to Learn in the relationship between Teacher Emphasis on the Usefulness of Class Content and Interest and students' math grades.

There are different strategies to test a MCFA or MSEM (Stapleton, McNeish, et al., 2016; Stapleton, Yang, & Hancock, 2016). In this study, following the recommendations

of Morin, Marsh, Nagengast, and Scalas (2014), we constrained factor loadings of the individual and group level to the same value. We also used standardized scores to simplify the interpretations and to reduce non-essential multicollinearity. With regard to the estimation method, we used maximum likelihood with robust standard errors. This method has shown evidence of performing properly even when data is nonnormally distributed (Schmitt, 2011). We handled missing data using the full information maximum-likelihood method, which provides unbiased parameters in missing at random circumstances and even in cases where data is not missing at random (Enders, 2010). The calculations were conducted with Mplus 7.4 software (Muthén & Muthén, 2016).

3. Results

3.1. Preliminary analysis

Mean values and standard deviations are shown in Table 1. Means varied between 3.632 (Harmonious Passion) and 5.382 (math grades), and standard deviations varied between 1.455 (Harmonious Passion) and 2.164 (math grades). At the individual level, correlations ranged from .073 (Teacher Emphasis on the Usefulness of Class Content with math grades) to .507 (Harmonious Passion with Motivation to Learn), and at the group level, they ranged from .122 (Teacher Emphasis on the Usefulness of Class Content with math grades) to .691 (Harmonious Passion with Motivation to Learn). In line with previous studies (Fauth, Decristan, Rieser, Klieme, & Büttner, 2014; Morin et al., 2014), higher correlations were observed at the group level than at the individual level.

Table 1

Descriptive statistics and correlations between major variables

		Mean	SD	ICC	1	2	3	4
1	Teacher	4.131	1.766	.465	-	.305	.286	.073
2	Passion	3.632	1.455	.090	.470	-	.507	.113
3	Motivation	4.363	1.559	.053	.671	.691	-	.249
4	Math	5.382	2.164	.083	.122	.483	.473	-

Note. Lower diagonal triangle: Group level correlations. Upper diagonal triangle: Individual level correlations.

3.2. Passion and motivation: Different constructs

We tested whether a multilevel two-factor model in which Passion and Motivation to Learn are two different constructs fit the data better than a model in which all items loaded on a single factor. The χ^2 test and the fit indexes for the two-factor model were χ^2 (1170, 76) = 502.781 (p < .001), CFI = .919, TLI = .905, and RMSEA = .069, and for the one factor model were χ^2 (1170, 90) = 5288,892 (p < .001), CFI = .648, TLI = .599, and RMSEA = .142. The χ^2 test comparing both models was significant, and fit indexes were much better for the two-factor model. Therefore, our results showed that students perceive Passion and Motivation to Learn as two different constructs.

3.3. Students' variables: Harmonious Passion, Motivation, and Math Grades

We tested the hypothesized model, in which Harmonious Passion acts as a determinant of Motivation to Learn, which, in turn, predicts Math Grades. The χ^2 test and fit indexes for the MSEM were χ^2 (1170, 94) = 578.236 (p = .001), RMSEA = .066, $SRMR_{within}$ = .058, $SRMR_{between}$ = .130, CFI = .914, TLI = .900. With regard to relationships between variables, at the between level, Harmonious Passion predicted Motivation (β =

.775; SE = .124; $p < .001$), explaining 60% of its variance, and this predicted math grades (β = .526; SE = .193; $p = .006$), explaining 28% of its variance. At the individual level, Harmonious Passion predicted Motivation to Learn (β = .548; SE = .030; $p < .001$), explaining 30% of its variance, and this predicted math grades (β = .246; SE = .033; $p < .001$), explaining 6% of its variance.

With regard to the mediational effect of Motivation to Learn, in the relationship between Harmonious Passion and math grades, we compared the above MSEM to an MSEM with an additional path from Passion to Math. The χ^2 test and fit indexes for this MSEM were χ^2 (1170, 92) = 576.890 (p <.001), RMSEA = .067, $SRMR_{within}$ = .058, $SRMR_{between}$ = .130, CFI = .914, TLI = .897. We observed no improvement in fit indexes, and the direct effect from Harmonious Passion to math grades was not different from 0 at either the individual level (β = -.036; SE =.038; $p = .353$) or the group level (β =.346; SE = .428; $p = .419$). Moreover, both [unstandardized] indirect effects in the fully mediated model were significant different from 0 at the individual level (β = .485; SE = .077; $p < .001$) and at the group level (β = 1.438; SE = .710; $p = .043$). Therefore, there is evidence of mediation of Motivation to Learn in the relationship between Harmonious Passion and math achievement.

3.4. Teacher Emphasis on the Usefulness of Class Content on students' variables

We tested the hypothesized model, in which Teacher Emphasis on the Usefulness of Class Contents predicts students' Harmonious Passion, which determines students' Motivation to Learn and, in turn, predict math grades.

The χ^2 test and fit indexes for the MSEM were χ^2 (1170, 247) = 1061.085 ($p < .001$), RMSEA = .053, $SRMR_{within}$ = .056, $SRMR_{between}$= .162, CFI = .908, TLI = .898. At the group level, Teacher Emphasis on the Usefulness of Class Content predicted Harmonious

Passion (β = .549; SE = .163; $p < .001$), explaining 30% of its variance. Harmonious Passion predicted Motivation (β = .840; SE = .103; $p < .001$), explaining 71% of its variance, and this predicted math grades (β = .469; SE = .193; $p = .015$), explaining 22% of its variance. At the individual level, Harmonious Passion predicted Motivation to Learn (β = .554; SE = .030; $p < .001$), explaining 31% of its variance, and this predicted math grades (β = .248; SE = .030; $p < .001$), explaining 6% of its variance (See Figure 2).

With regard to the mediational effect of Harmonious Passion in the relationship between Teachers' Emphasis on the Usefulness of Class Content and Motivation to Learn, we compared the above MSEM to a MSEM with an additional path from Teachers' Emphasis on the Usefulness of Class Content to Motivation to Learn. The χ^2 test and fit indexes for this MSEM were χ^2 (1170, 246) = 1056.138 ($p < .001$), RMSEA = .053, $SRMR_{within}$ = .056, $SRMR_{between}$ = .153, CFI = .908, TLI = .899. We can observe almost no improvement in fit indexes. The direct effect from Teachers' Emphasis on the Usefulness of Class Content and Motivation to Learn grades was marginally different from 0 (β = .459; SE =.232; $p = .049$), and the [unstandardized] indirect effect in the fully mediated model was significantly different from 0 (β = .173; SE = .075; $p = .020$).

Regarding the mediational effect of Harmonious Passion and Motivation to Learn in the relationship between Teachers' Emphasis on the Usefulness of Class Content and math grades, we compared the proposed model to an MSEM with an additional path from Teachers' Emphasis on the Usefulness of Class Content to math grades. The χ^2 test and fit indexes for this MSEM were χ^2 (1170, 246) = 1061.595 ($p < .001$), RMSEA = .053, $SRMR_{within}$= .056, $SRMR_{between}$= .161, CFI = .908, TLI = .898. We observed almost no improvement in fit indexes. The direct effect from Teachers' Emphasis on the Usefulness of Class Contents to math grades was not significantly different from 0 (β = -.230; SE

=.241; *p* = .339), neither was the [unstandardized] indirect effect in the fully mediated model (β = .242; SE = .141; *p* = .086). In this situation, there is contradictory information to affirm that there is evidence of the mediational effect of Harmonious Passion and Motivation to Learn in the relationship between Teachers' Emphasis on the Usefulness of Class Content and math grades. On one hand, we see that the fit of both models is not significantly different, the direct path from Teachers' Emphasis on the Usefulness of Class Content to math grades is not significantly different from 0, but on the other hand, the indirect effect in the fully mediated is not significant from 0.

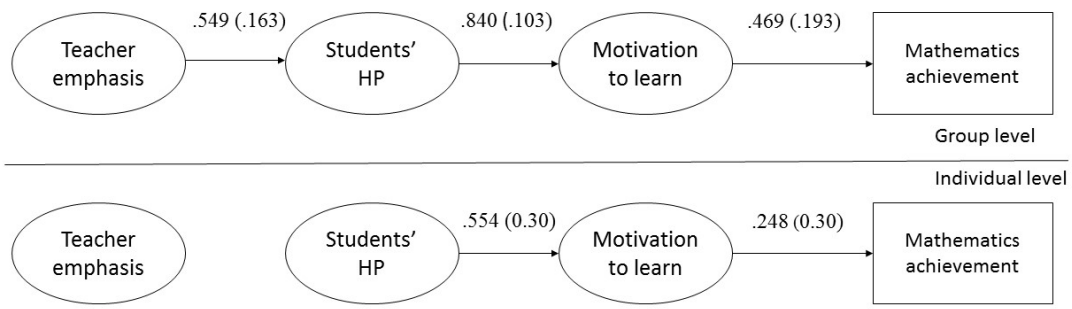

Fig. 2. Multilevel structural equation model including teacher emphasis on the usefulness of class content. The standardized parameters are above the arrows; standard errors are between parentheses.

4. Discussion

In this study, we attempted to elucidate the role of passion in the educational context. Our findings extend previous research analyzing the relationship between harmonious passion, intrinsic motivation, and math achievement in high school students as well as examining the effects of teacher emphasis on the usefulness of class content on students' harmonious passion. Thus, to the best of our knowledge, for the first time

in the literature, we examined the effects of harmonious passion in an academic discipline such as mathematics, specifically in a sample of high school students. More importantly, we examined a specific teacher's characteristic of autonomy support – teacher emphasis on the usefulness of class content - that has never before been examined with regard to harmonious passion.

The first aim of the study was to test whether students perceive passion and motivation as different constructs. The second aim was to analyze whether harmonious passion could predict math grades in high school students. The third aim was to analyze whether the relationship between harmonious passion and grades was mediated by motivation to learn. Finally, the fourth aim was to test whether teacher emphasis on the usefulness of class content could predict students' harmonious passion. Thus, this study provides support for the hypotheses tested. First, students perceive passion and motivation as different constructs (Hypothesis 1). At the group level, harmonious passion predicted math grades (Hypothesis 2), and this relationship was mediated by motivation to learn (Hypothesis 3). Moreover, harmonious passion was predicted by teachers' emphasis on the usefulness of class content (Hypothesis 4). Similarly, at the individual level, students who displayed higher levels of harmonious passion felt more motivated to learn and this was found to be related to higher math scores. Similarly, students with teachers that emphasized the usefulness of class content showed more harmonious passion.

4.1. Harmonious passion, intrinsic motivation, and math grades

We provided evidence of the relationship between harmonious passion and performance. This is in line with previous studies in other areas: music students (Bonneville-Roussy et al., 2011; Mageau et al., 2009), dramatic arts, and undergraduate

psychology students (Vallerand et al., 2007). these findings are also consistent with findings outside the educational context, in which there is also evidence of the relationship between passion and performance (Mageau et al., 2009; Thorgren & Wincent, 2015; Vallerand et al., 2008).

On the other hand, our findings are consistent with previous research supporting the theory that the more harmonious passion, the greater the motivation. Thus, although only a few studies have analyzed how passion affects motivation within the educational context (Bonneville-Roussy et al., 2011; Coleman & Guo, 2013; Stoeber et al., 2011; Vallerand et al., 2007), the relationship between harmonious passion and motivation in other fields has been well documented (see Back, Lee, & Stinchfield, 2011; Curran, Appleton, Hill, & Hall, 2011; Fuster, Chamarro, Carbonell, & Vallerand, 2014; Lee, Chung, & Bernhard, 2013; Wang, Khoo, Liu, & Divaharan, 2008; Wang, Liu, Chye, & Chatzisarantis, 2011). We also found positive associations between motivation to learn and math achievement, and these results are in accordance with those found in previous research (see Areepattamannil et al., 2011; Murayama et al., 2013; Spinath et al., 2006). Finally, our study provides evidence that the relationship between harmonious passion and math performance in high school students is mediated by motivation to learn, which is in agreement with previous studies, while passion is involved in high-level performance, it is not hypothesized to influence it directly (Vallerand, 2015).

4.2. Teacher emphasis on the usefulness of class content and harmonious passion

Although there is no research that has specifically used the concept of teaching quality regarding harmonious passion within the Self Determination Theory (Ryan & Deci, 2000), previous research has shown that the more the students perceive their teachers as supportive of autonomous motivation, the more harmonious passion they

display (see Bonneville-Roussy et al., 2013; Fredricks et al., 2010). Therefore, we focused on a key autonomy support factor: teacher emphasis on the usefulness of class content. Our results provided consistent evidence that teachers who strive to explain the usefulness of class content and activities promote harmonious passion in their students, which predicts motivation to learn and grades. Because explaining the usefulness of class content is a strategy to support students' autonomy, our findings are consistent with Bonneville-Roussy et al. (2013) and Fredricks et al. (2010), who also showed a positive relationship between these two variables. Bonneville-Roussy et al., (2013) provided evidence that college students who perceived their tutors as supportive of autonomy manifested higher levels of harmonious passion than those who perceived their teachers to be controlling. Fredricks et al. (2010) observed that teachers who provided opportunities for choice and to work on varied activities, also promoted students' passion.

Finally, we looked at the mediational pathways of passion in the relationship between teachers' emphasis on the usefulness of class content and motivation to learn, and the mediational pathways of both passion and motivation to learn in the relationship between teacher emphasis on the usefulness of class content and math achievement. With regard to the former, we observed a significant indirect effect. Thus, we can conclude that the teacher can enhance motivation via students' passion. For example, if teachers explain why class content and activities are useful, students might feel more passion toward math, and thus, study for the pleasure of learning new things. In the relationship between teacher emphasis and math achievement regarding passion and motivation to learn, we saw a no significant indirect effect (p = .086). Thus, although we observed that teacher emphasis predicts passion, motivation to learn, and math

achievement, our data prevents us from discussing mediation. In another words, we cannot say that changes in math are exclusively due to passion and motivation to learn, accounting for teacher emphasis.

4.3. Limitations and future research

The results of this study should be understood by accounting for several limitations. The first limitation we would like to highlight is using students' math grades as the only indicator of math achievement. Although grades have a real-world impact on students' academic level and progress in grade school (Sánchez-Pérez, Fuentes, Pina, López-López, & González-Salinas, 2015) and they predict educational attainment and success (Thorsen & Cliffordson, 2012), we believe that for future research, it would be interesting to use standardized tests, such as the Woodcock Johnson Test (Woodcock, McGrew, & Mather, 2001) or the Symbolic Magnitude Processing Test (Brankaer, Ghesquière, & De Smedt, 2016).

The second limitation refers to the characteristics of the study. Because it is not a longitudinal study, we cannot establish causal relationships between the variables tested. Thus, it is important for future research to conduct longitudinal studies to test these relationships, and to assess whether the mediating variables can be understood as mechanisms to establish clear relationships between the variables (Kazdim, 2007).

Finally, it would also be interesting to test what other features of teaching quality encourage students' passion (e.g. teacher's care, class structure, acknowledgment of positive feelings, etc.). Thus, we recommend further research to test what classroom practices promote students' passion and the application of training programs to show teachers the importance of passion and what they can do, concretely and specifically,

to improve the passion of their students, which offers promising approach to improving their interest in the subject.

4.4. Conclusion

Passion is important for the field of education (Vallerand, 2016). In line with previous evidence, we found that passion influences motivation to learn, which improves academic achievement. Additionally, we have observed that teachers' emphasis on the usefulness of class content is associated with students' passion. Thus, taking into account previous research that has shown that passion leads to important outcomes, such as persistence, dedication, well-being, or competence, our first recommendation is the need for teachers to become aware of the essential role they play in helping their students to discover passionate school activities and their benefits. Moreover, our study instructs math teachers to foster their students' passion by emphasizing the usefulness of the class content. This occurs when teachers, instead of merely explaining the concepts, illustrate why class content is useful and relevant, or when they explain to students how they might be able to apply what they are learning to real life or to other subjects. Although it is often not easy to explain the usefulness of some math content, an example may be to start a lesson on percentages by explaining that percentages are useful for knowing the final prices on sales or to understand the quantity of ingredients in the products that they buy in the supermarket.

Teachers should also know that helping students to foster their own passion, even outside the school context, will help them to engage more easily in demanding curriculum activities (Haerens, Vansteenkiste, Aelterman, & Van den Bergh, 2016) and maintain their interest in classroom activities (Fredricks et al., 2010). This becomes even

more important if we consider that math is a subject with lower levels of students' motivation (Leroy & Bressoux, 2016).

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Appendix

Items to assess students' harmonious passion [The English version is in brackets]

1. Esta actividad se adapta bien al resto de actividades que realizo en mi vida [This activity is well adapted to the other activities in my life]

2. Las cosas nuevas que aprendo y descubro con esta actividad hacen que me guste aún más [The new things that I discover with this activity allow me to appreciate it even more]

3. Esta actividad refleja las cualidades que más me gustan de mí mismo [This activity reflects the qualities I like the most about myself]

4. Esta actividad me permite vivir muchas y variadas experiencias [This activity allows me to life many and a variety of experiences]

5. Esta actividad está bien integrada en mi vida [This activity is well integrated in my life]

6. Esta actividad está en armonía con el resto de cosas que forman parte de mí [This activity is in harmony with the rest of things that are part of me]

Items to assess the teacher emphasis on class contents usefulness [The English version is in brackets]

1. Mi profesora sugiere diferentes tipos de actividades que ayudan a comprender lo que damos en clase [My teacher suggests different types of activities that help me to understand what we learn in class]

2. Mi profesora suele explicar utilizando ejemplos que me resultan interesantes [My teacher usually explains using examples that I find interesting]

3. Mi profesora pide nuestra opinión para plantear tareas de clase más entretenidas [My teacher asks for our opinion to pose more entertaining class tasks]

4. Mi profesora amplía las explicaciones de clase contándonos cosas interesantes [My teacher expands class explanations telling us interesting things]

5. Mi profesora busca aplicaciones prácticas de lo que aprendemos en clase [My teacher seeks practical applications of what we learn in class]

6. Mi profesora plantea actividades que son útiles para mí [My teacher raises activities that are useful to me]

APPENDIX III

TEACHING QUALITY: RELATIONSHIPS BETWEEN PASSION, DEEP STRATEGY TO LEARN, AND EPISTEMIC CURIOSITY IN MATH

(Status: Under revision in Teaching and Teacher Education)

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Abstract

The purpose of this study was to examine the relationship between teaching quality and students' harmonious passion, deep strategy to learn and epistemic curiosity in math in 1113 high school students. Data were analyzed using multilevel structural equation model and results showed support for the hypotheses tested. First, we found that teaching quality - specifically providing optimal challenge, focusing on the process, and offering positive feedback – affects students' harmonious passion. Second, students' harmonious passion predicts, at the individual and class level, students' deep strategy to learn. Third, students' harmonious passion predicts, at the individual and class level, students' epistemic curiosity. Findings were discussed in terms of their implications for educational practice and methodological suggestions for future research.

Keywords

mathematics; harmonious passion; teaching quality; high school

1. Introduction

To determine teachers' specific characteristics that promote students' positive educational outcomes is a growing research topic and a priority issue in recent years (Hagger & Chatzisarantis, 2015; Hagger & Hardcastle, 2014; Opdenakker & Van Damme, 2006; Stroet, Opdenakker, & Minnaert, 2015a). Teachers affect students' learning in class through their quality and the interactions they have with them (Dietrich, Dicke, Kracke, & Noack, 2015; Fauth, Decristan, Rieser, Klieme, & Büttner, 2014), they play a central role in enhancing students' academic functioning, and effective teachers make students reach their full potential (Maulana, Helms-Lorenz, & van de Grift, 2015). Moreover, the role of teachers in engaging students in more meaningful learning experiences is particularly important for secondary math teachers, since at this stage students meaningfully lose interest for school (Kiemer, Gröschner, Pehmer, & Seidel, 2015; Stroet, Opdenakker, & Minnaert, 2015b).

However, there is still a lack of knowledge in explaining the specific characteristics of math teachers that lead to students' optimal functioning (Rimm-Kaufman, Baroody, Larsen, Curby, & Abry, 2014), which warrants special attention if we consider the importance of math skills on other school subjects (Gaspard et al., 2015) and its increasingly influence on the students' future professional performance (Seaton, Parker, Marsh, Craven, & Yeung, 2014). Therefore, there is no doubt that there is a social and educational need to better understand how teachers can promote in their students a better learning towards mathematics.

Thus, because classrooms are one of the most powerful settings to influence youth (Pianta, Hamre, & Allen, 2012), in this paper we aim, first, to explore how math teachers quality affects another variable that is also booming: students' passion for the

subject. In this sense, previously studies have shown how certain teachers' characteristics help students to develop their passion (e.g., Bonneville-Roussy, Vallerand, & Bouffard, 2013; Coleman & Guo, 2013; Fredricks, Alfeld, & Eccles, 2010). Research on passion has also shown that the more passion, the more positive educational outcomes as academic engagement (Stoeber, Childs, Hayward, & Feast, 2011), dedication (Bonneville-Roussy, Lavigne, & Vallerand, 2011; Stoeber et al., 2011; Vallerand et al., 2007), persistence (Bonneville-Roussy et al., 2013) or competence and goals orientation (Bonneville-Roussy et al., 2011; Fredricks et al., 2010; Phelps & Benson, 2012; Vallerand et al., 2007), so secondly, in this paper we aim to explore how students' passion affects other educational outcomes as their deep strategy to learn and their intellectual curiosity.

1.1. Teaching quality: Providing optimal challenge, offering positive feedback and focusing on the process

Teaching quality refers to teachers characteristics that promote positive educational outcomes (Cochran-Smith & Fries, 2005), and it covers the aspects of teachers-students relationships in the classroom (White-Cornelius, 2007). Although there are several frameworks from which researchers have analyzed the characteristics and practices of successful teachers (Kunter et al., 2013), and there are different terms to refer the classroom processes related with students learning, as *quality of teaching* (Hattie, 2009), *instructional quality* (Rjosk et al., 2014), *teacher quality* (Zablotsky & Rosenber, 2013) or *teaching effectiveness* (Seidel & Shavelson, 2007), research in the issue has shown evidence that the classroom processes and the quality of teaching are important predictors of students' learning and outcomes (Creemers & Kyriakides, 2008; Zablotsky & Rosenber, 2013).

From the Self Determination Theory (SDT; Deci & Ryan, 1985, 2017), researchers consider that a teaching of quality is when teachers support students' needs of autonomy, competence and relatedness (Assor, Kaplan, & Roth, 2002), and among other strategies, to provide optimal challenge, to focus on the process, and to offer positive feedback, ease teachers to achieve this purpose (Tessier, Sarrazin, & Ntoumanis, 2010). Therefore, in this study we focus on these three teachers' specific aspects. In detail, teachers provision of optimal challenge refers to teachers accounting for students level when teaching or assigning class activities instead of assigning difficult or easy tasks, so students improve and progress according to their own level and capacities (Cheon & Reeve, 2015). To focus on the process denotes that teachers stress the importance of internalizing the meaning and utility of class activities, valuing the procedure and not just the final result (Kusurkar, Croiset, & Ten Cate, 2011; Tessier et al., 2010). Finally, the provision of positive feedback alludes to teachers guiding students for improvement through instructions phrased in a constructive and positive way, teachers stressing both what the students has done well and what should be improved and how (Kusurkar et al., 2011).

Although research in this issue has shown that teachers and what they do at the classroom can help students to promote their passion (Vallerand, 2016), this study will consider an unexplored relation: how teaching quality – specifically the three indicators described above– affects students' passion development.

1.2. On passion and teaching quality

Passion is "a strong inclination toward a self-defining activity, object, concept or person that one likes, loves or highly values, and in which one invest a significant amount of time and energy" (Vallerand et al., 2003). Most of the contemporary research on

passion toward activities has been conducted under the framework of the Dualistic Model of Passion (Vallerand, 2015; Vallerand et al., 2003), in which Vallerand and colleagues propose two types of passion: harmonious and obsessive. These types reflect different experiences and outcomes, and the supremacy in people of one or another depends on how the activity is internalized into their identity. Harmonious passion is a consequence of an autonomous internalization of the activity into the person's identity, and it leads to adaptive outcomes. When people are harmoniously passionate, they freely engage on the activity, perceive that the activity is in line with their values and other aspects of their life, and they experience positive affect, high levels of concentration, flow, and energy (Vallerand, 2015). On the contrary, obsessive passion results from a controlled internalization of the activity into the person's identity. Obsessive passionately people feel internal or external pressures to engage on the activity, they experience negative emotions while doing it, and they show difficulties to experience flow and to fully remain concentrated on it. As well, this type of passion heads individuals to sense that the activity is in conflict with other aspects of their life (Bonneville-Roussy et al., 2011, 2013; Luh & Lu, 2012; Vallerand, 2015; Vallerand et al., 2003).

Although research on passion in the educational context is still scarce (Coleman & Guo, 2013; Ruiz-Alfonso & León, 2016), few studies have been conducted to determine what teachers' characteristics foster students' passion. Fredricks et al. (2010), for example, explored how passion is manifested in academic context and noticed that the most passionate students were those who perceived their teachers to be caring, supportive and encouraging, as well as they displayed more passion toward those activities that were consistent with their own interests. Similarly, Coleman and

Guo (2013) observed that passionate for learning middle school students perceived their context as autonomy supportive, and Bonneville-Roussy et al. (2013) also noticed that students who perceived their teachers as autonomy supportive rather than controlling, showed higher levels of passion. Because research on this issue is still emerging, efforts to explore what teachers' aspects promote students' passion are highly warranted.

1.3. On harmonious passion and cognitive processes: Deep strategy to learn and epistemic curiosity

Drawing on the theoretical framework of the Dualistic Model of Passion (Vallerand et al., 2003), specifically harmonious passion significantly influences cognitive processes. Harmoniously passionate people are highly involved in the activity they love, they are more aware and attentive, they fully partake in the activity with a mindful attention, and they are more likely to think about the passionate activity when they are not engaged on it (Vallerand, 2015). Thus, researchers have analyzed in different contexts how harmonious passion positively affects diverse cognitive process as on-task attention and concentration (e.g., Forest, Mageau, Sarrazin, & Morin, 2011; Ho, Wong, & Lee, 2011; Vallerand et al., 2003), resilience and mental toughness (e.g. Gucciardi, Jackson, Hanton, & Reid, 2015), absorption (e.g., Ho et al., 2011; Stoeber et al., 2011), and mindfulness (e.g. St-Louis, Verner-Filion, Bergeron, & Vallerand, 2016).

However, although it would be expected that harmonious passion affects cognitive processes such as students' approaches to learning or epistemic curiosity, to date the role of passion has not yet been studied within the nexus of these variables.

Students' approach to learning refers to how students cope with their study and how they use diverse strategies to process and learn the contents they receive in class (León, Núñez, & Liew, 2015). These approaches are not characteristics of the students,

but are the result of the interaction between the students and the context (Struyven, Dochy, Janssens, & Gielen, 2006); and they vary from memorizing the contents without reasoning or thinking critically to analyzing and comparing the information presented in the classroom with previous knowledge and other subjects knowledge (Cano-Garcia, García, Justicia, & García-Berben, 2014; Duncan & McKeachie, 2005). Within the educational literature, there are mainly three approaches that have been described in detail in several publications: the surface, deep, and achieving approach; with an underlying motive and strategy (e.g., Biggs & Tang, 2007; Dinsmore & Alexander, 2012; Struyven et al., 2006). Students adopt a deep approach when they engage in the task meaningfully, comprehending, analyzing, and relating the new ideas with their previous knowledge or experience (Biggs & Tang, 2007; Fox, McManus, & Winder, 2001; Struyven et al., 2006). Within this, we can assess students deep strategies of going about learning (how they study), or students deep motives for learning (why they study) (Biggs, 1979). In this sense, we focus on the former.

On the other hand, epistemic curiosity (EC) refers to the "drive to know", the desire for knowledge that motivates the acquisition of new ideas and an exploratory behavior (Berlyne, 1954). According to Litman and Jimerson (2004)'s theoretical model of curiosity, there are two types of epistemic curiosity regarding the different motives for acquiring the new information, and each associated with different outcomes (Litman, 2008). Thus, interest type epistemic curiosity (I-type EC) refers to the anticipated pleasure for acquiring new knowledge and discoveries, just for the intrinsic pleasure of doing it. Conversely, deprivation type epistemic curiosity (D-type EC) refers to the individual's need to reduce and eliminate undesirables states of ignorance (Litman, 2008; Piotrowski, Litman, & Valkenburg, 2014).

Although no study to date has analyzed the relationship between students' deep strategy, epistemic curiosity, and harmonious passion, a positive relation between them is expected. On the one hand, as we explained above, harmonious passion has been linked with different cognitive processes (e.g., Gucciardi et al., 2015; Ho et al., 2011; St-Louis et al., 2016) and, on the other, both deep strategy and epistemic curiosity has been associated with students who enjoy studying and engage voluntary in the learning process (e.g., Chin & Brown, 2000; Dinsmore & Alexander, 2012; Litman, 2008; Piotrowski et al., 2014).

1.4. The present study

To date, no studies have examined the relationship between students' harmonious passion, deep strategy to learn, and epistemic curiosity. As well, never before was examined the effect of specific teachers' behaviors as providing optimal challenge, focusing on the process, and offering positive feedback on students' harmonious passion. So that, in this study we aim to analyze how these variables relate to each other within the context of secondary education, specifically, regarding the subject of math.

Therefore, the following research questions were addressed to examine whether: (Research Question 1) teaching quality – specifically providing optimal challenge, focusing on the process, and offering positive feedback – affects students' harmonious passion; (Research Question 2) students' harmonious passion predicts, at the individual and class level, students' deep strategy to learn; and (Research Question 3) students' harmonious passion predicts, at the individual and class level, students' epistemic curiosity.

For our first research question we hypothesize, according to previous literature suggesting that certain teachers' aspects foster students' passion (e.g. Bonneville-Roussy et al., 2013; Coleman & Guo, 2013; Fredricks et al., 2010), that teaching quality – exactly providing optimal challenge, focusing on the process, and offering positive feedback – will predict students' harmonious passion. For the second and third research questions, consistent with the Dualistic Model of Passion (Vallerand et al., 2003) from which harmonious passion significantly influences cognitive processes, and previous research suggesting a close relationship between deep strategy to learn and epistemic curiosity with students who relish learning and deliberate engage on it (e.g., Chin & Brown, 2000; Dinsmore & Alexander, 2012; Litman, 2008; Piotrowski et al., 2014), we hypothesize that students' harmonious passion will be positively associated with students' deep strategy to learn and epistemic curiosity. To sum up, the following multilevel model was proposed (Fig. 1):

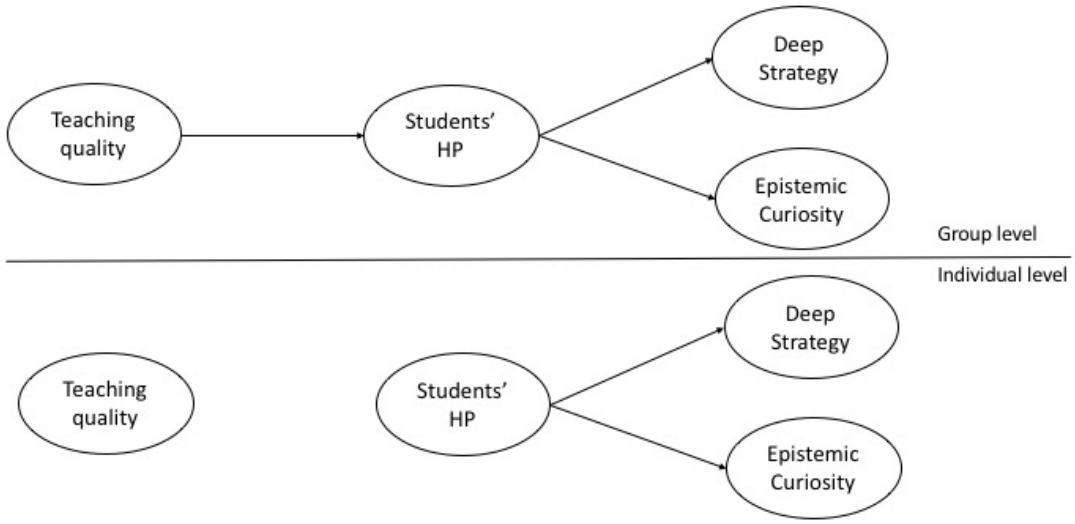

Fig. 1. Multilevel model proposed

2. Method

2.1. Participants

We recruited 1121 students (566 females, 548 males, 7 not specified) from 7 high schools in Gran Canaria, Spain). The final sample was composed by 1113 students (516 females, 482 males, 5 not specified) because responses from students identified as non-passionate towards Mathematics were discarded. Students were from second to fourth grades of secondary education (8^{th} to 10^{th} grades in the US system and their main age was 15.08 (SD = 1.0). All participants were informed of the data confidentiality and participation was strictly voluntary.

2.2. Procedure

We contacted high schools by phone calls to request an appointment with the high-school mathematics teachers in order to explain the study and request their cooperation. The school principals, math teachers and parents authorized students' participation in the study. Researchers personally administered questionnaires, emphasized the data anonymity and the need of accuracy in responses. Students were asked to complete the section of passion only if they loved a specific activity related to mathematics. If not, they should not answer this section. Students who did not complete this section were detected as non passionate toward math and were removed from the sample.

2.3. Measures

Participants completed a questionnaire with demographic questions and measures of harmonious passion, deep strategy to learn, and epistemic curiosity. Students also completed questions about three indicators of teaching quality: if they provide optimal challenge, focus on the process, and provide positive feedback. To

examine reliability, we used McDonald's Omega (1999), since it has shown evidence of better accuracy that Cronbach's alpha (Mcneish, 2017; Revelle & Zinbarg, 2009), it does not requires data to be continuous (Bonanomi, Cantaluppi, Nai Ruscone, & Osmetti, 2015), and factor loading to be equal for all items (Zhang & Yuan, 2016). To examine factorial validity, we performed a confirmatory factor analysis for each variable. We extend information about the estimation method and missing data in the data analysis section.

All scales were rated on a 7-point Likert-type scale, ranging from 1 (*I do not agree at all*) to 7 (*I strongly agree).*

2.3.1. Harmonious passion

We used six items of the Passion Scale (Vallerand et al., 2003) adapted to Spanish and to the educational context to assess students' harmonious passion (e.g. "This activity reflects the qualities I like about myself"). The Spanish translation of the scale was performed by two Spanish-speaking researchers and revised by a bilingual specialist, according to the standards for cross-cultural adaptation (Muñiz, Elosua, & Hambleton, 2013). Regarding the CFA, the χ^2 value and fit indexes were χ^2 (1112, 18) = 614.839 (p = .00), RMSEA = .182, $SRMR_{within}$ = .044, $SRMR_{between}$ = .042, CFI = .97 and TLI = .95, and McDonald´s Omega was .89.

2.3.2. Deep strategy to learn

We used the three items (e.g. "While I am studying, I often think of real life situations to which the material that I am learning would be useful") from the Deep Strategy subscale of the Shortened Study Process Questionnaire (Fox et al., 2001). Regarding the CFA, the model is just identified, so no fit index could be computed. McDonald's Omega was .63.

2.3.3. Intellectual curiosity

We used 10 items (e.g. I find it fascinating to learn new information) from the Spanish-Argentine variant (Litman, Cosentino, & Solano, 2016) of the Epistemic Curiosity Scale (Litman & Spielberger, 2003). Regarding the CFA, the χ^2 value and fit indexes were χ^2 (1112, 18) = 775,510 (p = .00), RMSEA = .097, $SRMR_{within}$ = .039, $SRMR_{between}$ = .073, CFI = .97 and TLI = .96, and McDonald's Omega was .91

2.3.4. Teaching quality

We used 16 items from the scale developed by (León, Garrido, & Núñez, 2016) to assess teaching quality. These items cover the students' perceptions of specific teachers behaviors of three teaching quality indicators: positive feedback (if the teacher provides specific, quick and positive feedback), optimal challenge (if the teacher explain in class and assign the activities accounting for the students level) and, focus on process (if the teacher emphasizes the importance of learning and working in class rather than just focusing on passing and getting good marks). Regarding the CFA, the χ^2 value and fit indexes were χ^2 (1112, 18) = 13512,266 (p = .00), RMSEA = .070, $SRMR_{within}$= .041, $SRMR_{between}$= .032, CFI = .97 and TLI = .97, and McDonald's Omega was .95.

2.4. Data strategy

Because assessment of the school effects, classroom or teachers' characteristics on students' outcomes must be based on analysis performed at the group and not at the individual level (Lüdtke, Robitzsch, Trautwein, & Kunter, 2009; Marsh et al., 2012; Stapleton, McNeish, & Yang, 2016), we tested our hypotheses running a multilevel structural equation model (MSEM) where teaching quality predicted students' harmonious passion, and this in turn, students' deep strategy to learn and epistemic curiosity.

In multilevel modelling, it is common the use of variables that have the same value for all students in the class and variables estimated according to the aggregation of students' perceptions. Regarding the latter, there are contextual and climate variables (Marsh et al., 2012). Contextual variables are group-level aggregations of students-level variables that are specific to students in a class (in our study: Class-average harmonious passion, class-average deep strategy, and class-average epistemic curiosity), and values are assigned according to individual characteristics and not based on a common reference. On the other hand, climate variables are those resulting from asking students about one variable that is common to students in the same class (in our study: Teaching quality – specifically, teachers providing optimal challenge, focusing on the process, and providing of positive feedback), so the reference is the same for all students in one class. In this study, we focus on contextual (harmonious passion, deep strategy, and epistemic curiosity), and climate constructs (teaching quality).

Our goal was to test the relationships between climate and students' variables, and according to Marsh et al. (2012), teaching quality should be introduced at the classroom but not at the individual level because students' responses at this level do not reflect the contextual influences, but just their individual perceptions. Students' harmonious passion, deep strategy to learn, and epistemic curiosity, were introduced at the individual and classroom levels because it allows to separate the variance between the two levels of analysis (Friedrich, Flunger, Nagengast, Jonkmann, & Trautwein, 2015), and to obtain more information about the relationship between the variables, and about the variables itself (Morin, Marsh, Nagengast, & Scalas, 2014). In this sense, harmonious passion, deep strategy to learn, and epistemic curiosity are not only indicators at the

individual level, but if aggregated they are also an indicator of a shared characteristic of the class.

To test the mediational effect of harmonious passion between teaching quality and deep strategy and epistemic curiosity, we computed the unstandardized indirect effects and its standards errors using the delta method (Sobel, 1982).

Regarding the estimation method, we used weighted least square mean adjusted (WLSM) estimator, because the observed variables (items) were ordered categorically and it is more accurate than Maximun Likelihood (Schmitt, 2011). We also handled missing data using the full information maximum-likelihood method. It provides unbiased parameters in missing at random circumstances and even when data is not missing at random (Enders, 2010). Analysis were conducted using the software Mplus 7.4 (Muthén & Muthén, 2017)

3. Results

3.1. Preliminary analysis

Means values, standard deviations, intraclass correlations, and correlations between major variables are shown in Table 1. Means varied between 3.869 (Harmonious Passion) and 4.944 (Teacher Focus on the Process), and standard deviations between 1.767 (Teacher Optimal Challenge) and 1.259 (Epistemic Curiosity). With regard to correlations, at the individual level, they ranged from .346 (Deep Strategy to Learn with Focus on the Process) to .959 (Positive Feedback with Optimal Challenge), and at the group level, they ranged from .170 (Focus on the Process with Passion) to .703 (Positive Feedback with Optimal Challenge).

Table 1

Descriptive statistics and correlations between major variables

	Mean	SD	ICC	1	2	3	4	5	6
1 Deep Strategy	4.717	1.267	.067		.820	.841	.427	.565	.346
2 Curiosity	3.918	1.259	.099	.535		.722	.582	.604	.458
3 Passion	3.869	1.471	.105	.327	.498		.473	.509	.442
4 Positive feedback	4.898	1.685	.385	.294	.327	.252		.959	.949
5 Optimal challenge	4.494	1.767	.293	.255	.318	.253	.703		.935
6 Focus on process	4.944	1.729	.260	.183	.236	.170	.626	.498	

Note. Lower diagonal triangle: Group level correlations. Upper diagonal triangle: Individual level correlations.

3.2. Teaching quality, harmonious passion, deep strategy to learn, and epistemic curiosity

We tested the hypothesized model, in which Teaching Quality predicts students' Harmonious Passion and this, in turn, predicts students' Deep Strategy to Learn and Epistemic Curiosity.

The χ^2 test and fit indexes for the MSEM χ^2 (1112, 1100) = 10230.016 (p = .000), RMSEA = .086, $SRMR_{within}$ = .061, $SRMR_{between}$ = .108, CFI = .94, TLI = .93. As depicted in Figure 2, at the group level, Teaching Quality predicted Harmonious Passion (β = .631; SE = .099; *p* =.000). Harmonious Passion predicted Deep Strategy (β = .874; SE = .132; *p* =.000), and Epistemic Curiosity β = .953; SE = .081; *p* =.000. At the individual level, Harmonious Passion predicted Deep Strategy (β = .614; SE = .131; *p* =.000), and Epistemic Curiosity (β = .749; SE = .018; *p* =.000).

With regard to the mediational effect of Harmonious Passion in the relationship between Teaching Quality and Deep Strategy to Learn, the unstandardized effect in the fully mediated model was significantly different from 0 (β = .127; SE = .041; *p* = .002). Regarding the mediational effect of Harmonious Passion in the relationship between Teaching Quality and Epistemic Curiosity, the unstandardized effect in the fully mediated model was also significantly different from 0 (β = .152; SE = .047; *p* = .001).

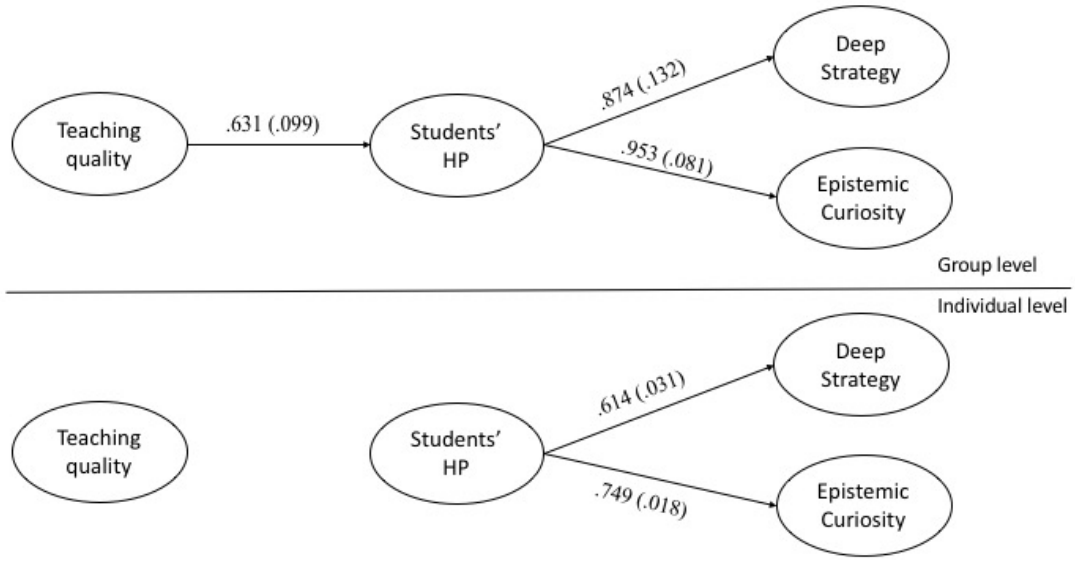

Fig. 2. Results of the multilevel structural equation model. The standardized parameters are above the narrows; standard errors are between parentheses.

4. Discussion

Building in prior research suggesting the role of teachers in fostering students' passion and the effect of harmonious passion in cognitive processes, in this study we attempted to analyze, on the one hand, the effect of a predictor of passion: teaching quality, and, on the other, two consequences of passion: deep strategy to learn and epistemic curiosity. To the best of our knowledge, never before has been examined how

the three specific teachers' characteristics of teaching quality tested in this study – teachers providing optimal challenge, offering positive feedback and focusing on the process – influence students' harmonious passion, and how this, in turn, affects their deep strategy to learn and epistemic curiosity. Moreover, it seems particularly important to analyze these relationships in a sample of secondary math teachers and students, since at this period the students' interest in the subject declines and it is important to offer teachers specific and concrete strategies to promote a better learning toward this subject.

Thus, this study provided support for the hypotheses tested. First, teaching quality – specifically teachers providing optimal challenge, focusing on the processes, and offering positive feedback – affects students' harmonious passion (Hypothesis 1). Secondly, students' harmonious passion affects their deep strategy to learn (Hypothesis 2), and third, students' harmonious passion also predicts their epistemic curiosity (Hypothesis 3).

On the one hand, we provided evidence of the relationship between teaching quality and harmonious passion. In this sense, results indicated that a significant amount of the variance in harmonious passion (10%) was due to the context, so there is a significant scope for action and improvement to foster students' passion.

Although there is no research that has specifically tested the teachers' aspects assessed in this study, previous research on passion has shown that the more students' perceive their teachers as autonomy supportive, the more harmonious passion they display. In this sense, in this study we focused on three strategies that support students' autonomy (Tessier et al., 2010) – teachers focusing on the process, providing optimal challenge, and offering positive feedback – so our findings are consistent with those

studies that showed a positive relationship between these variables (e.g. Bonneville-Roussy et al., 2013; Coleman & Guo, 2013; Fredricks et al., 2010). Bonneville-Roussy et al. (2013) noticed that college students who perceived their teachers as autonomy supportive rather that controlling displayed higher levels of harmonious passion. Coleman and Guo (2013) observed, in a sample of middle school students, that passionate learners tend to perceive their context as autonomy supportive. Finally, Fredricks et al. (2010) also noticed that passionate students usually perceived their teachers to be caring, encouraging and supportive, as well as they observed that their teachers usually provided opportunities for choice and to work on varied activities. However, unlike in our study, none of these have analyzed the relationship between teaching quality and passion taking into account the nested data structure, so their results could be interpreted as reflect of individual rather that contextual differences (Hospel & Galand, 2016).

On the other hand, our results also provide evidence of the association between students' harmonious passion and their deep strategy to learn and epistemic curiosity. Although no studies to date have analyzed these connections, our results fit well within the Dualistic Model of Passion (Vallerand, 2003). Earlier studies have suggested, in different contexts, a close relationship between harmonious passion and other cognitive processes as concentration (e.g. Forest, Mageau, Sarrazin, & Morin, 2011; Ho, Wong, & Lee, 2011), resilience and mental toughness (e.g. Gucciardi, Jackson, Hanton, & Reid, 2015), or absorption (Stoeber et al., 2011). Although it is difficult to stablish comparisons between our and previous results, ours could be also in line with the vast literature that has suggested a close relationship between deep strategy to learn and epistemic

curiosity with students who relish learning and they deliberate engage on it (e.g., Chin & Brown, 2000; Dinsmore & Alexander, 2012; Litman, 2008; Piotrowski et al., 2014).

Finally, to complete our model, we looked at the mediational pathways of students' harmonious passion between teaching quality and students' deep strategy and epistemic curiosity. In this sense, we observed a significant indirect effects in all relations, so we can conclude that the teaching quality can enhance students' deep strategy to learn and epistemic curiosity via their harmonious passion. For example, if teachers focus on the process and not emphasize just the final result, they offer positive feedback and they take into account students' level when teaching, students might feel more harmonious passion toward math, and thus, engage in the subject adopting a deep approach and for the pleasure of acquiring new knowledge.

To sum up, as was expected, our study provides evidence - for the first time in the literature, in an academic discipline such as mathematics, and taking into account the nested nature of the data - for the effect of specific teachers' behavior as providing optimal challenge, focusing on the process, and offering positive feedback, on the students' harmonious passion. As well, we also provide evidence, for the first time, for the effect of students' harmonious passion and their deep strategy to learn and epistemic curiosity.

4.1. Limitations and future research

Despite the novel features of the present research, the results should be considered by accounting for the following limitations. First, because it is a cross-sectional study, it is impossible to establish casual relationships between the variables tested. Although previous research evidences that teachers' characteristics influence on students' practices, and that harmonious passion predicts cognitive processes, in this

study we cannot provide accurate information about the direction of the effects. Thus, we propose for future research to assess these directions conducting longitudinal studies, as well as to test if the mediating variables can be considered as mechanism to establish clear associations between the variables (Kazdim, 2007).

The second limitation refers to our data. Although aggregated students' perceptions are reliable measures of classroom characteristics (Morin, Marsh, Nagengast, & Scalas, 2014; Wentzel, Muenks, McNeish, & Russell, 2017), we suggest for future studies to be complemented by other approaches, including the own teacher perception and observers' ratings.

Finally, because no previous studies have analyzed the variables that we have tested, it is very difficult to stablish comparisons between our results and previous one. So that, more studies using multilevel analyses are needed to reproduce and give consistency to our results. As well, it is interesting for future research to test other classroom practices that promote students' passion, in order to propose training programs to show teachers how they can improve their students' passion, and the importance of passion in other aspects that contribute to the optimal functioning in the subject and the classroom.

4.2. Conclusion

We adopted a multilevel model to test if teaching quality affects students' harmonious passion and this, in turn, their deep strategy to learn and epistemic curiosity. As expected, the results confirmed the hypotheses tested. Taking into account our results and previous studies where passion has been related to other important outcomes, we encourage teachers to realize the importance they have in fostering students' passion. The results of this study contribute to instruct math teachers about

three specific strategies that they can take into account to foster their students' passion: providing students' optimal challenge, focusing on the process, and offering them positive feedback.

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